

# PROJECT MANUAL

for

## Cypress River Lofts Oklahoma Street at Duane Street Baton Rouge, Louisiana 70802

February 12, 2021



REMSON | HALEY | HERPIN ARCHITECTS

200 GOVERNMENT STREET | SUITE 100  
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A PROFESSIONAL ARCHITECTURAL CORPORATION

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**GEOTECHNICAL ENGINEERING REPORT, Date 6-8-2018**

**MEMORANDUM # 1, Date 7-25-2018**

**MEMORANDUM # 2, Date 8-25-2019**





# Section 00 01 01

## Instruction To Bidders

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### ARTICLE 1

#### 1.01 DEFINITIONS

- A. The Bidding Documents include the following:
  - 1. General Conditions of the Contract for Construction, AIA Document A201, 2007 Edition
  - 2. Supplementary Conditions to the Contract
  - 3. Specifications
  - 4. Drawings
  - 5. Addenda issued during the bid period
- B. All definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201, or in other Contract Documents are applicable to the Bidding Documents.
- C. Addenda are written or graphic instruments issued by the Architect prior to the opening of bids which modify or intercept the Bidding Documents by additions, deletions, clarification's, corrections and prior approvals.
- D. A bid is a complete and properly signed proposal to do the work or designated portion thereof for the sums stipulated therein support by data called for by the Bidding Documents.
- E. Stipulated sum is the sum stated in the bid for which the Bidders offers to perform the work described to which work may be added or deleted for sums stated in alternate bids.
- F. A Bidder is one who submits a bid for a prime Contract with the Owner for the work described in the proposed Contract Documents.
- G. A Sub-bidder is one who submits a bid to a Bidder for materials and/or labor for a portion of the work.
- H. Where the word "Architect" is used in any of the documents, it shall refer to the Prime Designer of the project, and Architect, Engineer or Landscape Architect.

### ARTICLE 2

#### 2.01 BIDDER'S REPRESENTATION

- A. Each Bidder by making his bid represents that:
  - 1. He has read and understand the Bidding Documents and his bid is made in accordance therewith.
  - 2. He has visited the site and has familiarized himself with the local conditions under which the work is to be performed.
  - 3. His bid is based solely upon the materials, systems, and equipment described in the Bidding Documents as advertised and as modified by addenda.
  - 4. Hid bid is not based on any verbal instructions contrary to the Contract Documents and addenda.
- B. The Bidder must be fully qualified under any State or local licensing law for Contractors in effect at the time and at the location of the work before submitting his bid. In the State of Louisiana, Revised Statutes 37:2150, et seq. will be considered, if applicable. The Contractor shall be responsible for determining that all of his Sub-bidders or prospective Sub-bidders are duly licensed in accordance with law. Upon acceptance of the successful Contractor's bid, the successful Contractor shall furnish the names and license numbers for all of the sub-bidders to be used on this project.

### ARTICLE 3

#### 3.01 BIDDING DOCUMENTS

- A. Interpretation or Correction of Bidding Documents
  - 1. Bidders shall promptly notify the Architect of any ambiguity, inconsistency or error which they may discover upon examination of the Bidding Documents or of the site and local conditions.
  - 2. Bidders requiring clarification or interpretation of the Bidding Documents shall make a written request to the Architect, to reach him at least seven days prior to the date for receipt of bids.
  - 3. Any interpretation, correction or change of the Bidding Documents will be made by addendum. Interpretations, corrections or changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon such interpretations, corrections and changes
- B. Substitutions
  - 1. The materials, products and equipment described in the Bidding Document to establish a standard of required function, dimension, appearance and quality are to be met by any proposed substitution. No substitutions shall be allowed after bidding.
  - 2. No substitution will be considered unless written request for approval has been submitted by the Proposer and has been received by the Architect at least seven (7) days prior to the date for receipt of bids. Each such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute including

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- model numbers, drawings, cuts, performance and test data any other information necessary for any evaluation. A statement setting forth any changes in other materials, equipment or work that incorporation of the substitute would require shall be included. It shall be the responsibility of the proposer to include in his proposal all changes required of the Contract Documents if the proposed product is used. Prior approval is given contingent upon supplier being responsible for any costs which may be necessary to modify the space or facilities needed to accommodate the materials and equipment approved.
3. If the Architect approves any proposed substitution, such approval will be set forth in an addendum. Bidder shall not rely upon approvals made in any other manner.
- C. Addenda
1. Addenda will be mailed or delivered to all who are known by the Architect to have received a complete set of Bidding Documents.
  2. Copies of addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.
  3. Addenda shall not be issued within a period of twenty-four (24) hours prior to the advertised time for the opening bids, excluding Saturdays, Sundays, and any other legal holidays; however, if the necessity arises to issue an addendum modifying plans and specifications within the twenty-four (24) hour period prior to the advertised time for the opening of bids, then the date opening of bids shall be extended.
  4. The Owner shall have the right to extend the bid date. Bidder shall ascertain from the Architect prior to submitting his bid that he has received all addenda issued, and he shall acknowledge their receipt on the Bid Form.
- D. Correlation and Intent of Contract Documents
1. To further define the intent of Article 3-2 of the General Conditions, in the event of conflicting information within the plans, and within the specifications, the Contractor shall bid the more costly (of monetary value) of the conflicting information; the Contractor shall request verification and/or clarification of the conflicting information prior to commencement of the Work at the Preconstruction Meeting. These requirements set forth herein shall not apply if the items in question have been addressed, clarified, and/or corrected by Addendum.

### ARTICLE 4

#### 4.01 POST-BID INFORMATION

- A. Submissions
1. At the Pre-Construction Conference, the Contractor shall submit the following information to the Architect:
    - a. A designation of the work to be performed by the Contractor with his own forces.
    - b. A breakdown of the Contract cost attributable to each item listed in the Schedule of Values Form A.I.A. G703.
    - c. The proprietary names and the suppliers of principal items or systems of material and equipment proposed for the work.
    - d. A list of names and business domiciles of all Subcontractors, manufacturers, suppliers or other persons or organizations (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the work.
  2. The Contractor will be required to establish to the satisfaction of the Architect the reliability and responsibility of the proposed Subcontractors to furnish and perform the work described in the sections of the Specifications pertaining to such proposed Subcontractor's respective trades. The General Contractor shall be responsible for actions or inactions of Subcontractors and/or material supplier. The General Contractor is totally responsible for any lost time or extra expense incurred due to a Subcontractor's/or Material Supplier's failure to perform. Failure to perform includes a Subcontractor's financial failure, abandonment of the project, or failure to do work up to standard. Under no circumstances shall the Owner mitigate the General Contractor's losses or reimburse the General Contractor for losses caused by these events.
  3. Subcontractors and other persons and organizations selected by the Bidder must be used on the work for which they were proposed and shall not be changed except with the written approval of the Owner and the Architect.

### ARTICLE 5

#### 5.01 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

- A. Form to be Used

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- 1. A.I.A. Contract A series Stipulated Sum.
- B. Award
  - 1. At the Preconstruction Conference, the Contractor shall furnish a schedule of values for this project. A.I.A. Form G703.

### ARTICLE 6

#### 6.01 COMPLETION TIME

- A. The completion of the Contract must be 240 calendar days, subject to such extensions as may be granted under Paragraph 8.3, "Delays and Extensions of Time" in the General Conditions and the Supplementary Conditions.
- B. The Contract time begins when the Architect issues the notice to proceed.

### ARTICLE 7

#### 7.01 LIQUIDATED DAMAGES

- A. The Bidder shall agree to pay as Liquidated Damages the amount of One Thousand Dollars (\$1,000.00) for each consecutive calendar day for which the work is not complete, beginning with the first day beyond the contract completion date stated on the "Notice to Proceed" or as amended by change order.

### ARTICLE 8

#### 8.01 CONSTRUCTION DOCUMENTS – DRAWINGS AND SPECIFICATIONS

- A. The Contractor shall include in his bid price the cost of any and all required sets of contract documents (drawings and specifications) that will be required for the completion of the job. Copies of Contract Documents will not be supplied by the Architect or the Owner. PDFs will be transmitted to the Contractor for his use and distribution.

### ARTICLE 9

#### 9.01 OWNER'S CONTRACTORS

- A. The Contractor shall coordinate work by Owner's Contractors during the Contract period including but not limited to the following:
  - 1. Data
  - 2. Audio Visual
  - 3. Security
  - 4. Furniture

**END OF SECTION**

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**Section 00 01 05**  
**General Conditions**

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**American Institute for Architects, AIA Document A201, 2007 edition, General Conditions of the Contract for Construction**, is included in this project by reference.

Obtain this copyrighted form by purchasing from AIA Louisiana office (tel. 225-387-5579), or other agencies authorized to issue this form.

**END OF SECTION**

**Section 00 01 05**  
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## Section 00 01 10 Supplementary Conditions

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These Supplementary Conditions amend or supplement the General Conditions of the Contract for Construction (AIA Document A201, 2007 Edition) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

The terms used in these Supplementary Conditions which are defined in the General Conditions of the Contract for Construction (AIA Document A201, 2007 Edition) have the meanings assigned to them in the General Conditions.

### ARTICLE 1 - GENERAL PROVISIONS

#### 1.2 EXECUTION, CORRELATION, AND INTENT

Add the following to subparagraph 1.2.3:

In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities.

- A. The Agreement.
- B. Addenda, with those of later date having precedence over those of earlier date.
- C. The Supplementary Conditions.
- D. The General Conditions of the Contract for Construction.
- E. Drawings and Specifications.

In the case of an inconsistency between Drawings and Specifications or within either Document not clarified by addendum, the better quality or greater quantity of Work shall be provided in accordance with the Architect's interpretation.

### ARTICLE 3 – CONTRACTOR

- 3.15.1 Add the following: Construction debris and rubbish as generated by the Work shall be removed from the point of origin daily and shall not be allowed to accumulate. Construction debris and rubbish shall be deposited in a trash container provided on the site until hauled away. Scrap materials intended for reuse shall be segregated and properly sorted, protected and covered.

### ARTICLE 5 – SUBCONTRACTORS

- 5.3 Add the following: Each subcontract shall be in writing and shall specifically provide that the Owner is an intended third-party beneficiary of such subcontract. The Contractor will provide copies of its subcontracts, agreements and current information on the status of its accounts upon request by the Owner.

### ARTICLE 7 - CHANGES IN THE WORK

#### 7.2 CHANGE ORDERS

Delete Subparagraph clauses 7.2.1, 7.2.1.1, 7.2.1.2 and 7.2.1.3 and paragraph 7.2.2, and substitute the following:

- 7.2.1 "A Change Order is a written order to the Contractor signed by the Owner and the architect, issued after execution of the Contract, authorizing a change in the work or an adjustment in the Contract Sum or the Contract Time. The Contract Sum and the Contract Time may be changed only by Change Order. A Change Order signed by the Contractor indicates his agreement therewith, including the adjustment in the Contract Sum or the Contract Time."

Delete Subparagraph 7.2.2 and substitute the following:

- 7.2.2 "The cost to the Owner resulting from a change in the work shall be the sum of:  
Contractor's material and labor cost.

Subcontractor's and/or Sub-Subcontractor's (as defined in Article 5) material and labor cost.

Overhead and profit.

The credit to the Owner resulting from a change in the work shall be the sum of:

Contractor's material and labor cost.

Subcontractor's and/or Sub-Subcontractor's material and labor cost.

Credit will not be required for overhead and profit.

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Add the following subparagraphs:

- 7.2.3 "Before a Change Order is prepared, the Contractor shall provide and deliver to the Architect the following information, not subject to waiver, within a reasonable time after being notified to prepare said Change Order:  
An itemized list of material and labor costs for each Subcontractor's and/or Sub-Subcontractor's work including quantities and unit costs for each item of labor and each item of material.  
  
An itemized list of material and labor costs for the General Contractor's work including quantities and unit costs for each item of labor and each item of material."
- 7.2.4 "Overhead and profit shall be computed by one of the following methods: (not to exceed 25% on any portion of work):
- 7.2.4.1 When all of the work is General Contract work; 9% of the cost of the work as defined hereafter.
- 7.2.4.2 When the work is all Subcontract work for Subcontractor's overhead and profit plus 9% of the cost of the Subcontractor's work for General Contractor's overhead and profit plus 9% of the cost of General Contract work for General Contractor's overhead and profit."
- 7.2.4.3 When the work is a combination of General Contract work and Subcontract work; 15% of the cost of Subcontract work for Subcontractor's overhead and profit plus 9% of the cost of the Subcontractor's work for General Contractor's overhead and profit plus 9% of the cost of General Contract work for General Contractor's overhead and profit."
- 7.2.5 "After a Change Order has been approved, no future requests for extensions of time or additional cost shall be considered for that Change Order."
- 7.2.6 "Cost of the work for the purpose of Change Orders shall be costs necessarily incurred in performance of the work and paid by the Contractor which shall consist of:  
Wages paid.  
Cost of all materials and supplies.  
Cost of necessary machinery and equipment.  
Cost of applicable taxes, insurance, fringe benefits, unemployment compensation, social security, old age, bond premiums, and any other documents costs."
- 7.2.7 "Subcontract cost shall consist of the items in 7.2.6 above plus overhead and profit as defined in 7.2.4."
- 7.2.8 "Cost of the work whether General Contract cost or Subcontract cost shall not apply to the following:  
Salaries or other compensation of the Contractor's personnel at the Contractor's principal office and branch offices.  
Any part of the Contractor's capital expenses, including interest on the Contractor's capital employed for the work.  
Overhead and general expenses of any kind or the cost of any item not specifically and expressly included above in cost of the work.  
Cost of supervision not specifically required by the Change Order.  
Costs due to the negligence of the Contractor, any Subcontractor or Sub-Subcontractor, anyone directly employed by any of them, or for whose acts any of them may be liable, including but not limited to the correction of defective or non-conforming work, disposal of materials and equipment wrongly supplied, making good any damage to property, or delays caused by failure to provide adequate Change Order documentation."

### ARTICLE 9 - PAYMENTS AND COMPLETION

- 9.3 APPLICATIONS FOR PAYMENT  
Delete Subparagraph clauses 9.3.1, 9.3.1.1, and 9.3.1.2 and substitute the following:
- 9.3.1 "Monthly, the Contractor shall submit to the Architect an Application & Certificate for Payment on the AIA Document G702-1992, notarized if required, accompanied by AIA Document G703-1992, and supported by any additional data substantiating the Contractor's right to payment as the Owner or the Architect may require. Application for Payment shall be submitted on or about the first of each month for the value of labor and materials incorporated into the work and of materials, suitably stored, at the site as of the twenty-fifth (25th) day of the preceding month, less normal retainage of **five percent (5%)** for the Subcontractor's portion of work only. The normal retainage shall not be due the Contractor for distribution until after substantial completion and expiration of the forty-five (45) day lien period and submission to the Architect of a clear lien certificate and invoice for retainage."
- 9.3.2 Add the following: All Applications for Payment submitted by the Contractor shall include: (1) the Contractor's Affidavit of Payment of Debts and Claims, AIA Document G706; (2) the Contractor's Affidavit of Release of Liens, AIA Document G706A; (3) executed and notarized Release and Waiver of Lien on Owner's form for Contractor and all subcontractors and material suppliers; (4) the Contractor's sworn statement showing the names and addresses of all subcontractors furnishing materials or labor and the amount due or to become due each; (5) the Contractor's sworn statement showing the names and addresses of all material suppliers furnishing materials or labor and the amounts due or to become



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due each; and (6) a sworn statement from each subcontractor showing names of all persons furnishing materials or labor and the amounts due or to become due each month.

Delete Subparagraph 9.3.2 and substitute the following:

- 9.3.2 "Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. Payments for materials or equipment stored on the site shall be conditioned upon submission by the Contractor of bills of sale or such other procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, including applicable insurance."
- 9.9.3 Add the following: If any subcontractor, laborer or materialman of the Contractor or any person directly or indirectly acting for, through or under it or any of them, serves a notice of claim of lien on funds or files or maintains a mechanic's lien or claim against the Project or any part thereof, or against any funds due or to become due from the Owner to the Contractor, and if Owner has made payment to Contractor as required by the Contract Documents, the Contractor agrees to cause such liens and claims to be satisfied, removed or discharged at its own expense by bond, payment or otherwise within 15 days from the date of notice thereof, and upon its failure so to do the Owner shall have the right, in addition to all other rights and remedies provided under the Contract Documents or by law, to cause such liens or claims to be satisfied, removed or discharged by whatever means the Owner chooses at the cost and expense of the Contractor including reasonable legal fees. The Contractor agrees to indemnify, protect and save harmless the Owner from and against any and all such liens and claims and actions brought or judgments rendered thereon, and from and against any and all loss, damages, liability, costs and expenses, including legal fees and disbursements, which the Owner may sustain or incur in connection therewith.
- 9.8 SUBSTANTIAL COMPLETION
- 9.8.1 Add the following: and Owner has received all Certificates of Occupancy or Temporary Certificates of Occupancy and other permits, approvals, licenses and other documents required from any governmental authority having jurisdiction thereof necessary for the beneficial occupancy of the Project.
- 9.8.2 Delete on Line 1 "or a portion thereof which the owner agrees to accept separately".
- After the first sentence, add the following sentence:  
"Prior to inspection by the Architect, the Contractor shall notify the Architect that the project is ready for inspection by the State Fire Marshal's office." The Architect shall determine if the project is substantially complete in accordance with Subparagraph 9.8.1."
- Add the following clause 9.8.2.1:
- 9.8.2.1 Delete the words "or designated portion thereof" wherever they appear in Subparagraph 9.8.1 and 9.8.2 above.
- Add the following clause 9.8.2.2:
- 9.8.2.2 "Upon the recommendation of the Architect, the Owner may issue a Notice of Acceptance or Substantial Completion of Building Contract which the Contractor will record with the Clerk of Court in the Parish in which the work has been performed. If the Notice of Acceptance has not been recorded seven (7) days after issuance, the Owner may record the acceptance at the Contractor's expense."
- Add the following clause 9.8.2.3:
- 9.8.2.3 A "punch list of "exceptions" and the dollar value related there-to will be prepared by the Architect. A monetary value will be assigned to this list, which is to be twice the estimated actual value of the work. Cost of these items shall be prepared in the same format as the schedule of values. None of these funds shall be due the Contractor until all punch list items are completed and are accepted by the Architect. If the dollar value of the punch list exceeds the amount of funds, less the retainage amount in the remaining balance of the Contract, then the project shall not be accepted as substantially complete. "If funds remaining are less than that required to complete the work, the Contractor shall pay the difference."

If delivery of material or equipment, required as part of the punch list work, that is beyond the control of the Contractor, the Contractor's completion time shall be extended and his surety so notified. IF all punch list items have not been completed by the end of the forty-five (45) day lien period, through no fault of the Architect or Owner, the Owner may hold the Contractor in default. If the Owner finds the

Contractor is in default, the Surety shall be notified. If within sixty (60) days after notification, the surety has not taken reasonable steps to complete the punch list, the Owner may, at his option, contract to have the balance of the work completed, and pay for such work with the unpaid funds remaining in the Contract sum. Failure to complete the punch list shall constitute a reason for disqualification of the contractor on future state contracts. If the surety fails to complete the punch list within the stipulated time period, the Owner may not accept bonds submitted, in the future, by the surety."

9.10 FINAL COMPLETION AND FINAL PAYMENT

9.10.1 Prior to last sentence add the following:

"If the Architect does not find the work acceptable under the Contract Documents, he shall make one additional inspection; if the work is still not acceptable, the Architect shall be paid \$150.00/hour for his time and each of his principal consultants for time at the project site, for each additional inspection to be withheld from the unpaid funds remaining in the Contract sum." The payment shall be made by the owner and deduction from the construction contract funds.

Add the following to Subparagraph 9.10.3:

"If upon final inspection of the work it shall be found by the Owner that the plans, specifications, contract, or change orders for the work shall not have been fully complied with, the Owner shall, until such compliance shall have been effected or adjustments satisfactory to it shall have been made, refuse to direct final payment."

**ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY**

10.2 SAFETY OF PERSONS AND PROPERTY

Subparagraph 10.2.2, in the second line between the words "on" and "safety", add the words "health and",

Delete Subparagraph 10.3.1 and substitute the following:

10.3.1 "In an emergency affecting the safety of persons or property, or if any hazardous materials or substances are encountered, the Contractor shall notify the Owner and Architect immediately of the emergency, simultaneously acting at his discretion to prevent damage, injury, or loss. Any additional compensation or extension of time claimed by the Contractor on account of emergency work shall be determined as provided in Article 4.3."

**ARTICLE 11 - INSURANCE AND BONDS**

11.1 Contractor's Liability Insurance

11.1.2 This insurance required by Section 11.1.1 shall be written for the following limits of liability or as required by law, whichever is greater.

**General Liability**

<b>Per Occurrence:</b>	<b>\$1,000,000.00</b>
<b>General Aggregate</b>	<b>\$2,000,000.00</b>

**Automobile Liability**

**\$1,000,000.00**

**Workers Compensation**

**\$1,000,000.00 (per accident)**

Coverages, whether written on occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment or termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in Contract Documents.

11.3 Property Insurance

11.3.1 The **General Contractor** shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis

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without optional deductibles,. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

11.3.1.1 Shall remain in force as written in AIA A201-2007

11.3.1.2 Delete this section

11.3.1.3 Shall remain in force as written in AIA 201-2007

11.3.1.4 Shall remain in force as written in AIA 201-2007

11.3.1.5 Shall remain in force as written in AIA 201-2007

11.4. Performance Bond and Payment Bond

11.4.1 **The Owner shall** require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising there under as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the contract.

11.4.2 Shall remain in force as written in AIA 201-2007

11.5 OWNERS AND CONTRACTORS PROTECTIVE

11.5.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Owner from claims set forth which may arise from Bodily Injury (BI) and property damage (PD) caused, in whole or in part, by an independent contractor's work for the insured.

Coverage limit per occurrence shall not be less than \$1,000,000.00. Annual aggregate limit shall not be less than \$2,000,000.00.

### ARTICLE 13 - MISCELLANEOUS PROVISIONS

13.5 TESTS AND INSPECTIONS

In Subparagraph 13.5.1 delete the second sentence and substitute the following:

"The Contractor shall make arrangements for such tests, inspections and approvals with the Testing Laboratory provided by the Owner, and the Owner shall bear all related costs of tests, inspections and approvals."

Delete the last sentence of Subparagraph 13.5.1

13.6 INTEREST

Delete Paragraph 13.6

13.7 COMMENCEMENT OF STATUTORY LIMITATION PERIOD

Delete Paragraph 13.7.

13.8 SUPERVISION – add the following:

The Construction Manager shall be responsible for establishing, implementing, maintaining and supervising adequate safety precautions and programs for protecting the Work, laborers and all other persons who may come onto the Project site during performance of the Work. The Construction Manager shall comply with all laws, statutes, ordinances, building codes, rules and regulations applicable to the safety and protection of the Work, laborers and all other persons who may come onto the Project site during performance of the Work or who may in any way be affected by performance of the Work on the Project site.

**ARTICLE 15 – CLAIMS AND DISPUTES**

15.1.5.2 Delete subparagraph 15.1.5.2 and substitute the following:

15.1.5.2 If adverse weather conditions are the basis for a claim for additional time, the Contractor shall document that weather conditions had an adverse effect on the scheduled construction. An increase in the contract time due to weather shall not be cause for an increase in the contract sum.

Add the following subparagraph 15.1.5.3:

15.1.5.3 The following are considered reasonably anticipated days of adverse weather on a monthly basis:

January	11 days	July	6 days
February	10 days	August	5 days
March	8 days	September	4 days
April	7 days	October	3 days
May	5 days	November	5 days
June	6 days	December	8 days

The Contractor shall ask for total adverse weather days, the Contractor's request shall be considered only for the days over the allowable number of days stated above; the Contractor shall be required to make detailed documentation to support his requests, or the requests shall not required to be considered.

**END OF SECTION**

## Section 01 00 00 General Requirements

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### PART 1 - GENERAL

- 1.01 CONTRACTOR SUBMITTALS: Prior to the approval of the Contractor's Initial Pay Application, the following shall be submitted for approval by the Architect and review by the Owner:
- A. Progress Schedule.
  - B. Schedule of Values.
  - C. List of ALL Subcontractors, Principal Suppliers & Fabricators, and Specialty Contractors.
  - D. List of Contractor's staff assignments and principal consultants.
  - E. Copy of Building Permit.
- 1.02 PROGRESS SCHEDULE: Contractor shall submit his/her proposed Construction Progress Schedule to the Owner and the Architect at the Pre-Construction Meeting. The Schedule shall clearly identify the following:
- A. The Substantial Completion of the project within the Contract Time.
  - B. Milestone dates as appropriate and applicable to the project.
  - C. Refer to 01 32 00 Project Scheduling for additional information.
- 1.03 SCHEDULE OF VALUES: Contractor shall prepare his/her Schedule of Values for each Work Line Item in accordance with the General Conditions.
- 1.04 CONTRACTOR'S INITIAL PAYMENT APPLICATION:
- A. Cover data submitted on AIA Document G702 (no substitutions) with all required information, signatures, and notarization.
  - B. Outline Work Line Items and Schedule of Values and Stored Materials in format similar to AIA Document G702 Continuation Sheets.
  - C. Must bear Architect approval signature prior to review/approval action by the Owner.
  - D. Owner will not approve for payment until all data listed in Paragraph 1.02 above has been submitted and approved.
  - E. Payment will be made in accordance with Owner's published schedule pending timely receipt & approval action.
- 1.05 CONTRACTOR'S PROGRESS PAYMENT APPLICATIONS:
- A. Shall comply with items 1.04a, 1.04b, 1.04c, and 1.04e above.
  - B. Contractor shall concurrently submit UPDATED Progress Schedules.
  - C. Shall include payment adjustments for FULLY EXECUTED Change Orders.
  - D. Affidavits of major subcontractors for no claims.
- 1.06 CONTRACTOR'S FINAL PAYMENT APPLICATION:
- A. Shall comply with items 1.04a, 1.04b, 1.04c, and 1.04e above.
  - B. Shall be clearly marked "**FINAL**".
  - C. Payment will be made ONLY after completion of all Contract Close-Out items.
  - D. Payment after submission of clear lien and privilege certificate.
- 1.07 BARRICADES:
- A. Contractor shall not allow anyone nearby to be exposed to any harmful construction debris or hazardous materials (i.e., lead-based paint, asbestos, dust, noise, vapors, etc.). The Contractor shall install barricades as necessary for the protection and safety of pedestrian traffic and for protection of contiguous surfaces and items in the area of Construction. Barriers shall be erected and maintained for the duration of the Work in a room by room basis; air containment shall be required to minimize dust/odors. These containment barriers shall be subject to approval by Owner/Architect.
  - B. Barricades shall be maintained by the Contractor at all times during the course of construction; caution tape shall not be considered a safety barricade.
  - C. The Contractor shall keep the building secure and watertight (at any and all areas of the Contractor's work) at all times.
- 1.08 ACCESS, DAMAGE TO EXISTING STRUCTURES AND TRAFFIC RESTRICTIONS:
- A. The Contractor shall be permitted access to the site at the Owner's convenience. The Contractor shall be responsible for any repair and/or replacement of existing lawns, ditches, concrete walks, fencing or any other structures, including utilities damaged by the Contractor's operations.
  - B. The Contractor shall conduct a pre-construction site survey with a Owner's representative so that any such elements then needing repair or which is already damaged in any manner may be

## Section 01 00 00 General Requirements

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- properly identified, described, and recorded. If no such damage is recorded, then any structures over which the Contractor has crossed during construction which are later found to be damaged shall be considered to have been so damaged by him and shall be repaired and/or replaced by the Contractor as necessary to return them to their original no cost to the Owner.
- C. The Owner shall designate areas for parking. The construction operations of the Contractor may not cause any obstruction to the free flow of traffic on the adjacent streets without the prior consent of the proper authority.
- D. Equipment (tools, etc.) that leak oil or other stains will not be allowed on existing paving. Contractor shall be responsible to repair surfaces to original condition.
- 1.09 TOILETS
- A. The Contractor shall provide and maintain temporary toilets as necessary for use of workmen unless otherwise noted. Locate toilets where directed, and keep toilets in sanitary condition.
- 1.10 DEMOLITION
- A. The Contractor shall perform all demolition necessary or required to complete the work shown on the drawings or described in the specifications. Take special precautions to protect existing work which is to remain in place or to replace or repair any damage to such work.
- 1.11 TRASH AND DEBRIS
- A. The Contractor shall not permit construction waste, trash, debris to accumulate in the building or on the ground in the vicinity of the building and/or project area. The Contractor shall establish and maintain regular daily routine for removing construction waste, trash, debris and hauling it away from the premises.
- B. The Contractor shall be responsible for the removal and offsite disposal of all construction waste, trash and debris from the Campus originating from the Project.
- 1.12 WARRANTY PERIOD
- A. All workmanship, materials, and equipment shall be guaranteed for a period of one year from the date of the official acceptance of the Contract, unless a longer period is stated in the specifications or in the manufacturer's literature.
- B. When items of equipment or material fail to perform or to give satisfactory service during this warranty period, the Owner may require that corrections be made even to the extent of installing new equipment or materials. When this becomes necessary, the warranty period shall extend for a period of one year from the date of acceptance of the new installation. The extended warranty period shall apply only to those items which have not performed satisfactorily.
- 1.13 PUNCHLIST ITEMS
- A. At the time of the final inspection, a punch list with assigned monetary values will be compiled by the design professional in charge. If these items are not completed within the 45 day lien period, the monetary value of the items will be withheld and the item will be completed by the Owner.
- 1.14 TEMPORARY UTILITIES
- A. The Contractor shall provide utilities for the construction of the renovation of the Project.
- 1.15 RECORD DOCUMENTS:
- A. Contractor shall maintain one clean set of Contract Documents at the project site for the sole purpose of identifying by date and/or authority all As-Built conditions and authorized modifications as they occur during the progress of the Work.
- B. Contractor shall maintain an orderly file at the project site of all "APPROVED" and "APPROVED AS NOTED" submittals, shop drawings, etc.
- C. At each site visit, the Architect shall review the Contractor's As-Built Documents to see that they are correct and current; Architect shall advise the Owner accordingly.
- D. At completion of project, Contractor shall transmit on-site As-Built Documents to the Architect.
- 1.16 CONTRACTOR CLOSE-OUT DOCUMENTS:
- A. Owner requires three complete sets.
- B. Contractor shall logically organize similar to O&M manual criteria.
- C. ARCHITECT shall review (and sign where required) prior to transmitting to the Owner.

## Section 01 00 00 General Requirements

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- D. Required documents include, but may not be limited to, originals and copies (put all originals in one three ring binder; put copies in the other two) of the following:
    - 1. General Contractor's Warranty
    - 2. All Subcontractor & Specialty Contractor Warranties.
    - 3. All Manufacturer Warranties and Extended Warranties
    - 4. Executed Certificate of Substantial Completion.
    - 5. Executed Consent of Surety.
    - 6. Executed Waivers of Liens.
- 1.17 OSHA COMPLIANCE:
- A. The Contractor must send a copy of the site safety plan (Written documentation of a working and active employee safety program as defined by the OSHA Construction Standard), along with the site safety supervisors name and a 24-hour phone number to the Architect for submittal to the Owner.
  - B. The Contractor shall make available the Material Safety Data Sheet (MSDS) for any hazardous material used or stored on-site. A copy of the MSDS will be sent to the Architect for submittal to the Owner for review prior to the project start date.
  - C. Any injury requiring medical attention which occurs on site must be reported to Owner, and the Contractor shall conduct an investigation and develop action plan for prevention. This action plan may be reviewed by the Owner upon request at their option and/or OES may be an observer in investigations.
  - D. Activities involving utility lines shall be closely coordinated with Utility Companies to avoid outages and accidents. Extreme caution must be taken to assure proper lockout/tagout of circuits to prevent injury and electrical flash/explosion.
  - E. The Contractor shall be responsible for the proper disposal of waste materials. (Solid Waste, Hazardous Waste, etc.) Any regulated hazardous waste shipped off-site by the Contractor (or his subcontractors) shall be manifested to the Contractor (or his subcontractors).
  - F. The Contractor shall be responsible for compliance with Water and Air Quality Standards as they relate to unauthorized releases or emissions of regulated substances into the environment (storm drains, bayous, etc.).

**END OF SECTION**

## Section 01 10 00 Summary of Work

Specifications

01 10 00-1

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Contract Description.
- B. Site Verification.

#### 1.02 CONTRACT DESCRIPTION

- A. Work of the Project includes the construction of an apartment building located at Oklahoma Street and Duane Street in Baton Rouge, Louisiana. Construction materials and systems include, but is not limited to, slab/foundation, wood framed structures, fiberglass doors and vinyl windows, cementitious and metal siding, TPO roofing, interior doors, insulation, gyp board wall and ceiling finishes, tile, and resilient flooring, painting, miscellaneous specialties, lighting, power, HVAC and plumbing.
- B. Contractor shall provide all work indicated in drawings, specifications and contract. Contractor shall also coordinate installation and accommodation of utilities for Owner-supplied items noted in drawings.
- C. Contract Type: Standard Form of Agreement between Owner and Contractor, where the basis of payment is negotiated, fixed amount.

#### 1.03 ALTERNATES

- A. Description
  - 1. An alternate is an amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to the Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
  - 2. The cost for each alternate is the net addition to the Contract Sum to incorporate the Alternate into the Work. No other adjustments are made to the Contract Sum.
  - 3. Related Work Described Elsewhere:
    - a. Materials and methods to be used in the Base Bid and in the Alternates have been described on the Drawings and in pertinent Sections of these Specifications.
    - b. Method for stating the proposed Contract Sum is described in the bid form.
- B. All alternates described in this Section are required to be reflected on the Bid Form as submitted by Bidders. Do not submit Alternates other than as described in the Section, further defined by drawings.
- C. If the Owner elects to proceed on the basis of one or more of the Alternates, make all modifications to the work required in furnishing and installing the selected Alternates to the approval of the Architect and at no additional cost to the Owner other than as proposed on the Bid Form.
- D. Alternates must be executed with an appropriate response. A "blank space", or a "No Bid" statement is inappropriate. The space must include a "Specific Sum" or a "No Change in Price" statement. Failure to provide this information may be cause for rejection of the bid at the Owner's discretion.

### PART 2 - PRODUCTS

No information necessary.

### PART 3 - EXECUTION

No information necessary.

**END OF SECTION**



**Section 01 10 00**  
**Summary of Work**  
Specifications

01 10 00-2

## Section 01 25 00

### Substitutions

Specifications

01 25 00-1

#### PART ONE - GENERAL

##### 1.01 REQUIREMENTS

- A. Substitutions for products specified shall be allowed only under the conditions stated in this section.

##### 1.02 SUBSTITUTIONS/PRIOR APPROVALS

- A. If it is desired to use products different from those indicated in the Contract Documents, the party requesting the substitution shall make written application as described herein. The burden of proving equality of proposed substitutions rests on the party making the request for substitution. Requests for substitution shall reach the Architect not less than seven (7) working days prior to the date for the submittal of GMP. Requests received by the Architect after this date will be considered, but no additional costs will be considered.

##### 1.03 SUBMITTALS

- A. Submit a separate request for each substitution. Support each request with:
1. Date of request.
  2. Name of party proposing substitution.
  3. Project name.
  4. Specification reference.
  5. Complete data substantiating compliance of proposed substitution with requirements stated in Contract Documents:
    - a. Product identification, including manufacturer's name and address.
    - b. Manufacturer's literature, identify:
      - (1) Product description.
      - (2) Reference standards.
      - (3) Performance and test data.
      - (4) Manufacturer's recommendations for use and installation.
    - c. Samples, as applicable.
    - d. Name and address of similar projects on which product has been used, and date of each installation.
  6. Itemized comparison of the proposed substitution with product specified, list all variations.
  7. Data relating to changes in construction schedule.
  8. Any effect of substitution on separate contracts.
  9. List of changes required in other work or products.
  10. Designation of required license fees or royalties.
  11. Designation of availability of maintenance services, sources of replacement materials.
- B. If a proposed substitution is approved by the Architect, an addendum will be issued to prospective bidders not less than three (3) days prior to the date set for opening bids. If a substitution does not appear in an addendum it shall mean that the Architect has not approved the product and the successful bidder shall be responsible for furnishing materials and products in accordance with the Contract Documents. Following the receipt of bids, no further requests for substitution of products or materials will be considered that result in an additional cost to the Owner.

- 1.04 CONTRACTOR'S REPRESENTATION: In connection with the use of any substitute item approved by the Architect it shall be the General Contractor's responsibility to see that such items meet all space requirements, and that any alterations to connecting items necessitated by use of the alternate items are properly made at no increase in cost to the Owner, and that all items are in compliance with the specification requirements. Contractor waives all claims for additional costs caused by substitutions which may subsequently become apparent.

**END OF SECTION**

## Section 01 30 90 Coordination and Meetings

Specifications

01 30 90-1

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Coordination: Staging work with Owner's vacating immediate and remote areas where scope of work is to occur.
- B. Coordination of existing mechanical ventilation, technology requirements.
- C. Preinstallation meetings.
- D. Utility shut-downs for connections and scope of work.

#### 1.02 COORDINATION

- A. Coordinate scheduling, submittals, and Work of the various sections of the Project Manual to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating Owner's occupancy.
- B. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing such equipment.
- C. Contractor shall perform door removal and replacement but shall coordinate the Owner's removal of any security device contacts (logistics and procedure) with the Owner's maintenance contract Vendor.
- D. The Contractor shall take under consideration that some Work shall be required to take place after hours and on weekends; at the Owner's discretion, Work may be allowed to occur during normal working hours, with the condition that the Contractor schedule the location and timing of the Work so as to not create difficulty for the Occupant of the Building to perform their services to the Students and the Occupants' own duties. The Contractor shall coordinate the staging, removal, and installation as required by the Owner's representative and the Architect; the coordination and schedule parameters shall be established at the Pre-construction conference, with the Contractor revising and re-submitting his construction schedule to the Architect (for approval) in accordance with the parameters established at the Pre-construction conference.
- E. The installation of replacement doors shall follow demolition of existing doors immediately. If installation must occur on the following day, Contractor is responsible for providing temporary enclosure at openings. In no case, may the door opening remain enclosed for more than 24 hours.
- F. Coordinate completion and clean up of Work of separate sections in preparation for Substantial Completion.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

#### 1.03 PREINSTALLATION MEETING

- A. When required in individual specification sections, convene a preinstallation meeting at work site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect/Engineer four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
  - 1. Review conditions of installation, preparation and installation.
  - 2. Review coordination with related work.
- E. Unless otherwise noted, required preinstallation meetings:
  - 1. Doors, Frames and Hardware
  - 2. Suspended Ceiling
  - 3. Greenhouse System

**END OF SECTION**

**Section 01 30 90**  
**Coordination and Meetings**

Specifications

01 30 90-2

## Section 01 31 00 Coordination Drawings

Specifications

01 31 00-1

### PART 1 - GENERAL

- 1.01 SECTION INCLUDES
- A. Coordination Drawings
  - B. Coordination with Requirements of related sections of the Specifications.
- 1.02 RELATED SECTIONS
- A. Refer to Mechanical and Electrical Sections
- 1.03 COORDINATION DRAWINGS
- A. The Contractor shall coordinate work of all various sections having interdependent responsibilities for installing, connecting to, and placing such equipment. At the Contractor's expense, all (including, but not limited to, mechanical, plumbing, electrical system) necessary offsets, bends, duct size/configurations, crossings/cross-overs shall be provided and installed as necessary to integrate within the structural system and the architectural features (ceilings and walls, etc.)
  - B. Coordination Drawings: The purpose of the coordination drawings is to assure proper forethought and coordination of integrating all systems of the building within the structural framework, architectural ceilings, floors, and walls of the building. The Contractor shall provide coordination drawings prior to the submittal of all system shop drawings. The coordination drawings shall include ductwork and all mechanical HVAC piping and associated items, plumbing verticals and sprinkler piping, chases, electrical conduit, and shall indicate sizes of these items and the structural members.
  - C. The Contractor shall submit the Coordination Drawings to the Architect for the Architect's approval no later than one month after the Work has commenced on the project site. The Contractor shall revise and re-submit the Drawings as the Architect may require.
  - D. The Coordination Drawings shall include, but is not limited to, the following:
    - 1. Plan drawings for each floor indicating structural member sizes, HVAC components sizes/routes/locations, major electrical conduit grouping/routes, vertical chases/openings, and all other items as necessary to comply with the requirements of 1.03.A and 1.03.B of this Section.
    - 2. Section Drawings through major pathways for systems (such as corridors, if appropriate), and exemplary rooms.
    - 3. Prior to commencement of preparing the Drawings, the Contractor shall confirm the proposed listing of drawings to be submitted.
    - 4. Any and all other drawings, schedules, and information necessary to illustrate the Contractor's understanding of the architectural design intent of the critical ceiling heights, wall locations, and all other design parameters and how they are accommodated upon the Contractor's proposed integration of the Systems noted in the Contract Documents.
  - E. During the course of construction, the Contractor shall update the Coordination Drawings in a clean, clear, and legible manner and have the Drawings readily available on-site for the Architect's access. Upon Substantial Completion, the Contractor shall submit the updated Coordination Drawings to the Architect for the Owner's future use and shall be the property of the Owner.

**END OF SECTION**

**Section 01 31 00**  
**Coordination Drawings**

Specifications

01 31 00-2

# Section 01 31 19 Project Meetings

Specifications

01 31 19-1

## PART 1 - GENERAL

### 1.01 SUMMARY

- A. Project meetings:
1. Regular meetings throughout Project life for discussion and resolution of Project issues. These meetings will be held on a frequency related to Project status, ie., weekly, bi-weekly, monthly, or others.
  2. Attendance by the Contractor, Owner, and Architect is mandatory. Architect's engineers or consultants, Contractor's subcontractors, suppliers, and others are to attend on an as-needed basis or as directed by Architect.
  3. Suggested agenda:
    - a. Progress review.
    - b. Schedule
    - c. Submittal's status.
    - d. Change Order status.
    - e. RFI status
    - f. Other business
- B. Requirements below are intended for Contractor, subcontractors, sub-subcontractors, and material suppliers for discussion and resolution of Project specific situations. Attendance by Owner, Architect, Architect's engineers or consultants is not mandatory.
1. Meetings between Contractor, Owner, Architect, or any combination for purpose of discussing Project progress or resolving problems are delineated above.
  2. Owner and Architect may attend meetings to ascertain work is expedited consistent with Contract Documents and construction schedules.
- C. Contractor requirements include:
1. Schedule and administer preconstruction meeting, periodic progress meetings, and specially called meetings throughout work progress.
  2. Prepare agenda for meetings.
  3. Distribute written notice of each meeting four days in advance of meeting date.
  4. Make physical arrangements for meetings.
  5. Preside at meetings.
  6. Record minutes; include significant proceedings and decisions.
  7. Reproduce and distribute copies of minutes within three days after each meeting as follows:
    - a. One copy to each participant in meeting.
    - b. One copy to parties affected by decisions made at meeting.
    - c. Three copies of minutes to Architect.
    - d. One copy to Owner's representative.
- D. Representatives of contractors, subcontractors, and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.
- E. Related sections:
1. Section 01 30 90: Coordination and Meetings
  2. Section 01 33 00: Submittals
- F. Pre-construction meeting:
1. Schedule within 10 days after date of Notice of Award.
  2. Location: Central site, convenient for all parties, designated by the Owner.
  3. Attendance:
    - a. Owner's Representative
    - b. Architect and professional consultants.
    - c. Resident Project Representative
    - d. Contractor's Superintendent
    - e. Major subcontractors.
    - f. Major suppliers.
- G. Suggested agenda:
1. Distribution and discussion of:
    - a. List of major subcontractors and suppliers.
    - b. Projected Construction Schedules
  2. Critical work sequencing.
  3. Major equipment deliveries and priorities.
  4. Project coordination: Designation of responsible personnel.
  5. Procedures and processing of:
    - a. Field decisions.

## Section 01 31 19 Project Meetings

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- b. Proposal requests.
- c. Submittals.
- d. Change Orders
- e. Applications for Payments
6. Adequacy of distribution of Contract Documents.
7. Procedures for maintaining Record Documents.
8. Use of premises:
  - a. Office, work and storage areas.
  - b. Owners requirements.
9. Temporary facilities, controls, and construction aids.
10. Temporary utilities.
11. Safety and first-aid procedures.
12. Security procedures.
13. Housekeeping procedures.
- H. Progress meetings:
  1. Schedule regular periodic meetings as required, but not less than two meetings monthly.
  2. Hold called meetings as required by progress of work.
  3. Meeting's locations: Project field office of Contractor.
  4. Attendance:
    - a. Subcontractors, as appropriate to agenda.
    - b. Suppliers, as appropriate.
    - c. Architect and professional consultants, as needed or required.
  5. Suggested agenda:
    - a. Review, approval of minutes of previous meeting.
    - b. Review of work in progress since previous meeting.
    - c. Field observations, problems, conflicts.
    - d. Problems which impede Progress Schedule
    - e. Review of off-site fabrication, delivery schedules.
    - f. Corrective measures, procedures to regain projected schedule.
    - g. Revisions to Progress Schedule.
    - h. Progress; schedule, during succeeding work period.
    - i. Coordination of schedules.
    - j. Review submittal schedules; expedite as required.
    - k. Maintenance of quality standards.
    - l. Pending changes and substitutions.
    - m. Review proposed changes for effect on:
      - 1) Progress schedule and on completion date.
      - 2) Other contracts of Project.
    - n. Review Monthly Pay Applications

**END OF SECTION**



## Section 01 32 00 Project Scheduling

Specifications

01 32 00-1

### PART 1 - GENERAL

- 1.01 SECTION INCLUDES
- A. Construction Schedules
  - B. Coordination with Requirements of related sections of the specifications.
- 1.02 RELATED SECTIONS
- A. Refer to Mechanical and Electrical Sections
- 1.03 COORDINATION
- A. Coordinate scheduling, submittals, and Work of the various sections of the Project Manual to assure efficient and orderly sequence of installation of construction elements , with provisions for accommodating Owner's items.
  - B. Coordinate work of various sections having interdependent responsibilities for scheduling, installing, connecting to, and placing such equipment.
  - C. The Contractor shall coordinate his work in conjunction with that of the Owner's other contractors upon the onset of nearing Substantial Completion.
  - D. Key Submittals Schedule with Project Construction Schedule such that the Submittals receive approval from the Designer prior to the ordering and subsequent delivery of the materials.
  - E. The Contractor shall coordinate completion and clean up of Work of separate sections in preparation for Substantial Completion.
  - F. Construction Schedule: The Contractor shall provide the baseline, electronic version (in the original software format) to the Architect for his review and file. The Schedule shall include all start, stop, and completion dates for all building components and systems, as deemed appropriate by the Architect. The Contractor shall submit a schedule with a credentialed scheduling professional's review and approval. The Contractor's Submittal Schedule shall be coordinated with the Construction Schedule.
- 1.04 CPM SCHEDULE PREPARATION
- A. All scheduling requirements listed herein shall be provided in both printed and electronic format. Review and approval of the CPM Schedule(s) by the Design Team does not relinquish the responsibility of the Contractor to complete the project within the Contract Performance Period, as amended in accordance with the Agreement.
  - B. Upon execution of the Agreement, the Contractor shall prepare a bar chart schedule which shall depict the general approach to the construction process. This bar chart schedule shall include all major events and key milestones broken out by CSI Divisions. This bar chart schedule shall be distributed for use and discussion at the Pre-Construction Meeting.
  - C. Upon execution of the Agreement, the Contractor shall prepare an initial submittal schedule which shall depict all submittals required for the project as indicated in the Project Manual. The submittal schedule shall be prepared in a manner that indicates the submittal review period of 10 days, a 10 day re-review, procurement duration, and delivery. This initial submittal schedule shall be distributed for use and discussion at the Pre-Construction Meeting.
  - D. Within 10 days after the Pre-Construction Meeting, the Contractor shall prepare a detailed CPM Schedule, in Bar Chart Format, for the first 120 days of the project for review and approval by the Design Team. Approval of this submittal is a pre-requisite to the first Application for Payment. This 120 day CPM Schedule shall include all administrative and work activities that will occur during this period. Activities shall be clearly identifiable with the required performance of scope. All activities shall have a maximum duration of 15 calendar days. The CPM Schedule shall include the following for each Activity – ID, Description, Early Start date, Early Finish date, Duration, Total Float. The CPM Schedule shall incorporate the submittal schedule previously provided, with modifications as necessary to coordinate with the detailed schedule data.
  - E. Within 45 days after the Pre-Construction Meeting, the Contractor shall prepare a detailed CPM Schedule, in Bar Chart Format, for the entire Contract Performance Period for review and approval by the Design Team. Approval of this submittal is a pre-requisite to the second Application for Payment, and shall become the Baseline or Target Schedule for the project. The Target schedule performance period shall be representative of that indicated within the Agreement, and shall include all administrative and work activities that will occur during the project. Activities shall be clearly identifiable with the required performance of scope. All activities shall have a maximum duration of 15 calendar days. The CPM Schedule shall include the following for each Activity – ID, Description, Early Start date, Early Finish date, Duration, Total Float. The CPM Schedule shall incorporate the submittal schedule previously provided, with modifications as necessary to coordinate with the detailed schedule data.

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## Section 01 32 00 Project Scheduling

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- F. Included in Schedule shall be milestones for all utility tie-in verification (both site and existing building as applicable), and coordination drawings submittals – including all critical verification included in the coordination drawing submittal.
- 1.05 CPM SCHEDULE UPDATES
- A. Project Schedule updates shall be prepared for distribution, review and approval and at a frequency as required by the Design Team. A Project Schedule update shall be prepared to accurately reflect the progress of work and shall be submitted with the Application for Payment, at a minimum. Failure to provide an accurate CPM update may delay the processing of payment. Updated Project Schedules shall represent the performance period stipulated or as modified in accordance with the Agreement. In the event that extended performance periods are evident in the Project Schedule update(s), the Contractor shall prepare a recovery schedule within 7 days and submit to the Design Team for review and approval. Failure to provide an accurate CPM recovery schedule may delay the processing of payment.
- 1.06 CPM SCHEDULE AND REQUESTS FOR CHANGE by the Contractor
- A. For any Request for Change (RFC) or Change Order Request (COR) where an adjustment to the Contract Performance Period is included, the Contractor shall include an adjusted CPM schedule substantiating the request for the time extension. An extension to the Contract Performance Period shall be considered only when the project schedules critical path is impacted, as validated by the Design Team.
- 1.07 CPM SCHEDULE AND REQUESTS FOR CHANGE by the Design Team
- A. In the event that the Design Team initiates a proposed change in scope (PCS) that may impact the project, the Contractor shall prepare an adjusted CPM schedule to substantiate the impact, and submit same to the Design Team within 7 days of the receipt of the PCS. Contingent upon the impact, the PCO may be withdrawn.

**END OF SECTION**

Specifications

## Section 01 33 00

### Submittals

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#### PART ONE - GENERAL

##### 1.01 DESCRIPTION

- A. Submittals: General term including samples, shop drawings and product data, as applicable and as defined by the General Conditions.
- B. General Provisions:
  - 1. Provisions in this section are mandatory procedures for review, approval and submitting samples, shop drawings and product data in accordance with the General Conditions.
  - 2. Submittals which are received directly from sources other than through the Contractor's office will be returned to the Contractor "without action".
  - 3. Job delays occasioned by requirement of re-submission of samples, shop drawings and product data not in accord with Contract Documents and/or submittals sequenced contrary to the agreed schedule are Contractor's responsibility, and will not be considered valid justification for extension of contract time or increase in the contract sum.
  - 4. Any and all relevant deviations from the original Contract Documents and subsequent executed Changes shall be specifically and notably brought to the attention of both the Contractor and the Architect; failure to do so AND be specifically noted to be acceptable by the ARCHITECT shall void any proposed changes in the submittals to the original Contract Document/Executed Changes.

##### 1.02 SAMPLE PREPARATION

- A. Prepare samples in sizes, shape and finish in accord with provisions of individual specification sections.
- B. Samples are not to be confused with full size, on-the-site "Mock-Ups" called for in some specification sections.
- C. Samples shall be submitted for the Architect's selection and approval in accordance with the Contractor's submittal schedule or sooner as needed to maintain construction progress. Approvals and color selections will not be made unilaterally where samples or selections of adjacent materials must be made for the purpose of aesthetics. Submit samples for adjacent and interrelated materials concurrently. The Owner will approve colors before the Architect can take action.
- D. The number of samples submitted shall be the number required by the Contractor, plus two (2) which will be retained by the Architect and the Owner, unless otherwise indicated.

##### 1.03 SHOP DRAWING PREPARATION

- A. Drawing shall conform to the following requirements:
  - 1. Number sheets consecutively.
  - 2. Indicate working and erection dimensions, relationships to adjacent work.
  - 3. Show arrangements and sectional views, where applicable.
  - 4. Indicate material, gauges, thicknesses, finishes and characteristics.
  - 5. Indicate anchoring and fastening details, including information for making connections to adjacent work.
  - 6. Indicate working and erection dimensions and relationships to adjacent work. Concurrent submittals of different aspects of work may be required by the Architect as deemed necessary to demonstrate Contractor's ability to understand these relationships and coordinate the Work.
  - 7. Provide 6" x 6" clean space in lower right-hand area for entry of approval stamps.
  - 8. Cross-reference drawing details and specification paragraphs applicable to the submittal data.
- B. Form: Submit original shop drawings in the number required by the Contractor, plus two (2) which will be retained by the Architect and the Owner, unless otherwise indicated. Markings shall be in color on each copy, in a form suitable for opaque reproduction.

##### 1.04 PRODUCT DATA PREPARATION

- A. Include product manufacturer's standard printed material, dated, with product description and installation instructions indicated. Data not related to this project shall be deleted, marked-through or marked "VOID" as applicable.
- B. Form: Number of copies submitted shall be the number required by Contractor plus two (2) which will be retained by Architect and Owner.
- C. Printed material shall be:
  - 1. Legible.
  - 2. Sized no larger than 8-1/2" x 11", suitable for opaque reproduction.

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### Submittals

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3. Stamped (either on a clean-area space or the reverse side) with the Contractor's approval action.
  - D. All submitted data shall bear the Contractor's approval action stamp plus his review notes, comments, and corrections as required.
- 1.05 CONTRACTOR'S REVIEW
  - A. Review submittals and stamp with approval prior to submission to the Architect; Contractor's stamp shall bear the Contractor's name, the word "Approved", the signed initials of the approving agent, and the date of his approval action. By so noting, the Contractor indicates that he has reviewed and approves the materials, equipment, quantities and dimensions represented by the particular submittal.
  - B. Where work is indicated "By others", Contractor shall indicate responsibility for providing and coordinating such work.
  - C. Submissions made without Contractor's approval indicated thereon will be returned without being reviewed for compliance with this requirement.
  - D. Date each submittal and indicate name of Project, Architect, Contractor, Sub-Contractor, as applicable, description or name of equipment, material or product and identify location at which it is to be used in the Work. Cross-reference to specific drawing and specification references.
  - E. Accompany submittal with transmittal letter containing project name, Contractor's name, number of samples or drawings, titles and other pertinent data. Transmittal shall outline deviations, if any, in submittals from requirements of Contract Documents.
- 1.06 ARCHITECT'S REVIEW AND APPROVAL
  - A. Architect's Review will be in accordance with the General Conditions.
  - B. Architect will return only the following submittal data to the Contractor for his further reproduction and distribution.
    1. All but two (2) copies of the submitted Shop Drawings.
    2. All but two (2) copies of the submitted Product Data.
- 1.07 RESUBMISSION
  - A. Make corrections and changes indicated for unapproved submissions and resubmit in same manner as specified above, until Architect's approval is obtained.
  - B. In resubmission transmittal direct specific attention to revisions other than corrections requested by Architect on previous submissions, if any.
  - C. Contractor shall be responsible for bearing all costs associated with the review and approval process of resubmitted (and/or substituted) submittal data.
- 1.08 DISTRIBUTION
  - A. Contractor is responsible for obtaining and distributing copies of submittals to his subcontractors and material suppliers after, as well as before, final approval. Prints of reviewed shop drawings shall be made from transparencies which carry the Architect's appropriate stamp.
  - B. Contractor shall maintain a file of approved submittals for duration of project, which shall be delivered to Owner as a part of project close-out documents.
  - C. The Contractor shall maintain a file of all approved submittals, bearing the Stamp of the Architect, at the project site. In the event the Architect or Owner should question the installation of any aspect of the work requiring approved submittal data, the inability of the Superintendent to produce the required approved submittal data upon demand shall constitute cause for a "stop work" order to be issued on that particular questioned aspect of the work and all relevant appurtenant work. The cause shall be equal to the Contractor's not having received required approval of the submittal data. If so issued, such "stop orders" shall not be considered valid justification for extensions of contract time and/or claims for additional monetary compensation.
- 1.09 SCHEDULE OF SUBMITTALS
  - A. The Contractor shall, within ten (10) calendar days following award of the Contract, submit his proposed schedule of submittals to the Architect for review.
  - B. The purpose of the schedule is to:
    1. Demonstrate that all submittals, shop drawings, data, samples and mock-ups required for the Work are addressed by the Contractor.
    2. Demonstrate consistency with the Contractor's proposed Construction Schedule.
    3. Assist the Architect in scheduling timely review/approval action of submittals.
  - C. The schedule shall contain the description of the submitted item, the proposed date of submittal

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### Submittals

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- and the proposed date of requested return by the Architect.
- D. After the Architect's receipt of the Contractor's submittal schedule, the Architect and the Contractor shall jointly review the schedule and mutually agree to acceptability or necessary modifications.
  - E. Contractor shall submit his final accepted schedule within five (5) calendar days after the date of the joint review.

#### 1.10 MSDS SHEETS

- A. Contractor is responsible for showing that materials used in the Project contain 1.0 percent or less asbestos; this requirement pertains to every material in every Section of the CONTRACT, as applicable to Project, whether written therein or not. Submit MSDS Sheets for materials, including, but not limited to the following, as applicable to the Project:
  - 1. Surfacing Materials:
    - b. paint and stains
    - c. insulation
    - d. firestopping
    - e. joint sealers
  - 2. Thermal System Insulation:
    - a. taping compounds (thermal)
    - b. HVAC duct insulation
    - c. boiler insulation
    - d. breaching insulation
    - e. pipe insulation
    - f. thermal paper products
  - 3. Miscellaneous Material:
    - a. wallboard
    - b. vinyl floor tile
    - c. floor backing
    - d. construction mastic
    - e. ceiling tiles
    - f. packing materials
    - g. high temp gaskets
    - h. ductwork flex fabric connections
    - i. cooling towers
    - j. heating and electrical ducts
    - k. electrical panel partitions
    - l. electrical cloth/wiring insulation
    - m. base flashing
    - n. fire doors
    - o. caulking and putties

#### 1.11 CONSTRUCTION PHOTOGRAPHS

- A. Contractor is responsible for providing photographs of site and construction on a weekly basis throughout progress of the Work.
- B. Photographs: digital; sent to Architect via email, or provide on non-rewritable compact disk. Along with Application for Payment, include one (1) reproducible copy of contact sheet of all photographs taken during that period indicating Work completed and identified as stated below.
- C. Photograph project conditions five (5) days maximum prior to submitting indicating relative progress of the Work. As able, take photographs from same position indicating same view in successive installments.
- D. Take photographs as evidence of project conditions as follows:
  - 1. Site: Take four (4) site photographs at project corners.
  - 2. Interior views: Take two (2) minimum interior photographs of each space under construction from differing directions or as required.
  - 3. Exterior views: Take two (2) photographs of each elevation.
  - 4. Details: Take as required to document concealed conditions, including, but not limited to, underground construction, utility penetrations and installation, steel erection, concrete and masonry reinforcing, waterproofing and flashing, and roofing installation.
  - 5. Cavity wall: Provide photographic evidence that cavity wall was maintained clean and free of debris and excess mortar.
- E. Identify each photograph with name of Project, room or view, and date.

**Section 01 33 00**  
**Submittals**

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**END OF SECTION**

## Section 01 70 00 Contract Closeout

Specifications

01 70 00-1

### PART ONE - GENERAL

#### 1.01 DEFINITIONS:

Closeout is hereby defined to include the general requirements near the end of the Contract Time, in preparation for substantial completion, final acceptance, final payment, normal termination of the Contract, occupancy by the Owner and similar actions evidencing completion of the work. Specific requirements for individual units of work are specified in the sections of Division 1 through 16. The time of closeout is recognized to be directly related to "Substantial Completion", and therefore may be either a single time period for the entire work or a series of time periods for individual parts of the work which have been certified as substantially complete at different dates.

After the Contractor receives an executed copy of "Recommendation of Acceptance" of the project, he shall prepare, assemble and transmit the documents, brochures and drawings herein required in one package.

#### 1.02 SUBSTANTIAL COMPLETION: Prior to requesting Architect's inspection for Substantial Completion (for either the entire work or portions thereof), complete the following and list all known exceptions in the request:

- A. Submit last progress-payment request, with sworn statement showing 100 percent completion of the work (less value of items to be completed or corrected), complete with associated releases, consents.
- B. Advise Owner of pending insurance changeover requirements.
- C. Touch-up and otherwise repair and restore marred exposed finishes.
- D. A comprehensive list of the items to be completed or corrected.

#### 1.03 NOTICE OF ACCEPTANCE: Prior to requesting Architect's final inspection for final payment, as required by the General Conditions, complete the following and list known exceptions in request:

- A. Submit final payment request with final releases and supports not previously submitted and accepted.
- B. Submit record drawings (on vellum) and specs, and final record information.
- C. Submit record documents, special guarantees, warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.
- D. Submit copy of Architect's punch-list of itemized work to be completed or corrected, stating each item has been completed or otherwise resolved
- E. Complete the final cleaning.
- F. Submit a lien and privilege certificate from the Clerk of Court, 19th Judicial District Court, Parish of East Baton Rouge, dated at least forty-six (46) days after the date of the recording of the Owner's acceptance of the Project.

#### 1.04 SUBMITTALS:

- A. General: Specific requirements for submittal documents are indicated in individual Sections of these Specifications.
- B. Warranties:
  1. The words "Warranty" and "Guarantee" as used anywhere in the text of the Contract Documents shall be interchangeable and synonymous meaning "a legally binding guarantee".
  2. Specific warranties do not diminish implied warranties, and shall not deprive the Owner of actions, rights and remedies otherwise available to him for the Contractor's failure to fulfill requirements of the Contract Documents. Periods of warranties shall not be interpreted as limitations on the time in which the Owner can pursue actions, rights or remedies.
  3. Coincidental product warranties, which are in conflict with the requirements of the Contract Documents, will be rejected.
  4. Warranties: Refer to individual Sections for requirements.
  5. All warranties shall commence on date of Substantial Completion or the date the maintenance and operating manuals are submitted, whichever date is the latest.
  6. All warranties shall cover all costs for necessary material and labor to promptly replace or restore failing unit of work and other work damaged from its failure.
- C. Statutory and Non-Influence Affidavits (General Contractor and Subcontractor): Before final acceptance of the Work, the General Contractor shall furnish Statutory and Non-Influence Affidavits on the forms attached.
- D. Certificate of Recommendation of Acceptance: A certificate of Recommendation of Acceptance, for the project will be prepared by the Architect for the purpose of establishing a date when the project is substantially complete, identification of a punch list and determining actual damages or liquidated damages.

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- E. Thereafter, the Owner will issue a signed Recommendation of Acceptance, which the Contractor shall immediately record with the Clerk of Court for the 19th Judicial District Court, Parish of East Baton Rouge, Louisiana and provide the recording information to the Architect and the Owner.
- F. Submit written notice to the Architect prior to final inspection of the project verifying that punch list items are complete and all closing documents are in order, as shown by the accompanying project close-out check off list, and that all final payments are in order and establishing a date of final acceptance.
- G. Record Documents and As-Built Record Drawings: (Refer to Section 01 78 39). Submit in electronic version pdf and the printed documents.

**PART TWO - PRODUCTS:** There are no products in this Section.

### **PART THREE - EXECUTION**

#### 3.01 FINAL CLEANING

- A. General: Special cleaning for specific units of work is specified in the Sections of Division 2 through 16.
- B. Provide final cleaning of the Work, at the time indicated, consisting of cleaning each surface or unit of work to the normal "clean" condition expected for a first-class building cleaning and maintenance program. Comply with manufacturers instructions for cleaning operations. The following are examples, but not by way of limitation, of the cleaning levels required:
  - 1. Clean project site (yard and grounds), including landscape, development areas, of litter and foreign substances. Sweep paved areas to a broom-clean condition; remove stains, petro-chemical spills and other foreign deposits. Rake grounds clean of all debris that accumulated as a result of the construction.
- C. Time of Final Cleaning: Following Architect's certification of "Substantial Completion", and immediately before his "Final Acceptance" inspection.
- D. Removal of Protection:
  - 1. Except as otherwise indicated or requested by the Architect, remove temporary protection devices and facilities which were installed during the course of the work to protect previously completed work or hazardous conditions during the remainder of the construction period.
- E. Compliances: Comply with safety standards and governing regulations for cleaning operations. Do not burn waste materials at the site, or bury debris or excess materials on the Owner's property, or discharge volatile or other harmful or dangerous materials into drainage systems; remove waste materials from the site and dispose of in a lawful manner satisfactory to locally enforced waste disposal ordinances. Where extra materials of value remaining after completion of the associated work have become the Owner's property, dispose of these to Owner's best advantage as directed.

3.02 CONTINUING INSPECTIONS: Comply with the Owner's requests to participate in inspections at the end of each time period of such continuing commitments. Participate in the general inspection(s) of the work during the one-year period for correction after the date(s) of Substantial Completion.



**Section 01 70 00**  
**Contract Closeout**

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**CHECK-OFF LIST**

DOCUMENT	NO. OF COPIES	DATE RECEIVED
1. Keys and Hardware Schedule	_____	_____
2. Contractor's Affidavit	_____	_____
3. Electronic As-Built Drawings and Record Documents	_____	_____
4. Fire Marshal Plan Review Letter	_____	_____
5. Punchlist items (must be noted as completed)	_____	_____
7. Recommendation of Acceptance	_____	_____
8. Record Owner's Notice of Acceptance	_____	_____
9. Consent of Surety to Final Payment, AIA G707	_____	_____
10. Contractors Affidavit of Payment of Debts & Claims	_____	_____
11. Letter of Final Completion by Architect	_____	_____
12. Certificate from Clerk of Court Status of Liens & Privileges Recorded	_____	_____
13. Certificate of Final Payment to Contractor	_____	_____
14. Fire Marshal Stamped Plans and Specs	_____	_____
15. O & M Manuals (include Tech Air Balance Reports)	_____	_____
16. Warranties	_____	_____

I certify that, being familiar with the Contract Documents for this project, to the best of my knowledge, the items checked off herein above constitute all that are applicable to this project.

\_\_\_\_\_  
Contractor's Signature  
(For Submitting to the Architect)

\_\_\_\_\_  
Date Submitted to the Architect

\_\_\_\_\_  
Architect's Signature  
(For Submitting to the Owner)

\_\_\_\_\_  
Date Submitted to the Owner

**END OF SECTION**

**Section 01 78 39**  
**Project Record Documents**  
Specifications

01 78 39-1

**PART ONE - GENERAL**

1.01 REQUIREMENTS INCLUDED:

- A. Maintain at Project Site for Owner, one (1) record copy of:
  - 1. Drawings.
  - 2. Project Manual/Specifications.
  - 3. Addenda.
  - 4. Change Orders and other Modifications to Contract.
  - 5. Field Orders or written instructions.
  - 6. Approved and Approved As Noted Shop Drawings, Product Data and Samples.
- B. Make Record Documents available to Architect.
- C. Submit final Record Documents with Closeout Documents.

1.02 QUALITY ASSURANCE:

- A. Make entries within twenty-four (24) hours after receipt of information except note dimensional corrections and new dimensional data immediately upon determination.
- B. Do not permit record sets to be used for any other purpose.

1.03 RECORD DOCUMENTS:

- A. Field Record Drawings: One complete set of Drawings upon which all changes to Work are recorded daily with colored pencil to provide accurate, factual information relative to Work as constructed, both visible and concealed. Entries shall be made on line prints provided by Architect with each sheet bearing rubber stamp impression reading "Record Drawings".
  - 1. Identify entry by "cloud" type circle around affected Work. Initial and date each.
  - 2. Record the following:
    - a. Horizontal location and elevation of underground portions of Work.
    - b. Location, size and arrangement of exposed mechanical and electrical portions of Work.
    - c. Changes and corrections to dimensions.
    - d. Changes to materials, products, equipment and finishes.
    - e. Changes and deviations in Work from that indicated in Contract Documents.
    - f. Identify equipment, valves, piping, conduit, fixtures and devices using symbols and designations corresponding to those used in Contract Documents.
- B. Final Record Drawings: One complete set of opaque reproducible documents upon which all changes to Work are transferred from Field Record Drawings in red ink or red pencil.
- C. Field Record Specifications: One complete set of Project Manual/Specifications within which changes to materials, products, equipment, and systems are recorded; also, note which specified manufacturer was used. Make corrections with colored pencil and mark the Manual "Record Specifications" on outside back binding.
- D. Final Record Specifications: Either Field Record Specifications volume or new set of Specifications bearing all changes transferred from Field Record Specifications.

**END OF SECTION**

**Section 01 78 39**  
**Project Record Documents**  
Specifications

01 78 39-2

## Section 03 30 00 Cast-In-Place Concrete

Specifications

03 30 00-1

### PART 1 – GENERAL REQUIREMENTS

#### 1.01 DESCRIPTION – STRUCTURAL CAST-IN-PLACE CONCRETE

#### 1.02 REFERENCE STANDARDS AND CITED PUBLICATIONS

- A. American Concrete Institute (ACI) standards:
  - 1. ACI 301-05 Standard Specification for Structural Concrete
  - 2. ACI 117-06 Specifications for Tolerances for Concrete Construction and Materials
- B. American Society for Testing & Materials (ASTM) standards:
  - 1. A 185-02 Specification for Steel Welded Wire Fabric, Plain for Concrete Reinforcement
  - 2. A 615-04b Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
  - 3. C 31-03a Method of Making and Curing Concrete Test Specimens in the Field
  - 4. C 33-03 Specification for Concrete Aggregates
  - 5. C 39-03 Test Method of Compressive Strength of Cylindrical Concrete Specimens
  - 6. C 42-04 Methods of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
  - 7. C 94-04 Specification for Ready-Mixed Concrete
  - 8. C 138-01 Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
  - 9. C 143-03 Test Method for Slump of Portland Cement Concrete
  - 10. C 150-04a Specification for Portland Cement Concrete
  - 11. C 171-03 Specification for Sheet Materials for Curing Concrete
  - 12. C 172-04 Method of Sampling Freshly Mixed Concrete
  - 13. C 173-01 Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
  - 14. C 192-02 Method of Making and Curing Concrete Test Specimens in the Laboratory
  - 15. C 231-04 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
  - 16. C 260-01 Specification for Air-Entraining Admixtures for Concrete
  - 17. C 309-03 Specification for Liquid Membrane-Forming Compounds for Curing Concrete
  - 18. C 494-04 Specification for Chemical Admixtures for Concrete
  - 19. C 595-03 Specification for Blending Hydraulic Cements
  - 20. C 597-02 (1991) Test Method for Pulse Velocity through Concrete
  - 21. C 618-03 Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as Mineral Admixture in Portland Cement Concrete
  - 22. C 805-02 Test Method for Rebound Number of Hardened Concrete
  - 23. C 989-04 Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
  - 24. C 1017-03 Specification for Chemical Admixtures for Use in Producing Flowing Concrete
  - 25. C 1064-04 Test Methods for Temperature of Freshly Mixed Portland Cement Concrete
  - 26. C 1077-02 Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation

#### 1.03 SUBMITTALS

- A. General – Submittals required in this specification shall be submitted for review and acceptance.
- B. Product Data – Submit (5) sets of manufacturer's product data with application and installation instructions for proprietary materials and items, admixtures, patching compounds, curing compounds, and others as requested by the Architect.
- C. Testing and Inspection Reports – Testing agencies shall report results of concrete and concrete materials tests and inspections performed during the course of the work to the Owner, Architect/Engineer, Contractor, and the Concrete Supplier. Strength test reports shall include location in the work where the batch represented by test was deposited and the batch ticket number. Final reports shall be provided within (7) days of test completion.

## Section 03 30 00 Cast-In-Place Concrete

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### 1.04 QUALITY ASSURANCE

- A. General – Concrete materials and operations may be tested and inspected by the Testing Agency as work progresses. Failure to detect defective work or material will not prevent rejection later when a defect is discovered, nor shall it obligate Architect/Engineer for final acceptance.
- B. Testing Agencies – Agencies that perform testing services on concrete materials shall meet the requirements of ASTM C 1077. Testing agencies performing the test shall be acceptable to Architect/Engineer prior to performing any work. Field tests of concrete shall be made by an ACI Concrete Field testing Technician Grade 1 in accordance with ACI CP1 or equivalent. Equivalent certification programs shall include requirements for written and performance examinations as stipulated in ACI Publication CP1.
- C. Testing Responsibilities of Contractor:
  - 1. Submit data on qualifications of proposed testing agency for acceptance. Use of testing services will not relieve the Contractor of the responsibility to furnish materials and construction in full compliance with the Contract Documents.
  - 2. Duties and Responsibilities: Unless otherwise specified in the Contract Documents, the Contractor shall assume the following duties and responsibilities:
    - a. Qualify proposed materials and establish mixture proportions.
    - b. Furnish any necessary labor to assist the testing agency in obtaining and handling samples at the project site or at the source of the materials.
    - c. Advise the testing agency at least (24) hours in advance of operations to allow for completion of quality tests and for assignment of personnel.
    - d. Provide and maintain for the sole use of the testing agency adequate facilities for safe storage and proper curing of concrete test specimens on the job site for initial curing as required by ASTM C 31.
    - e. Submit data and test documentation on materials and mixture proportions.
    - f. Submit quality control program of the concrete supplier and provide copies of all test reports.
- D. Testing Services – The testing agency shall perform the following testing services:
  - 1. Obtain composite samples in accordance with ASTM C 172. Each sample shall be obtained from a different batch of concrete on a random basis, avoiding any selection of the test batch other than by a number selected at random before commencement of concrete placement. Obtain at least (1) composite sample for each 50 yd<sup>3</sup>, or fraction thereof, of each design mixture of concrete placed in any (1) day. When the total quantity of concrete with a given design mixture is less than 25 yd<sup>3</sup>, the strength tests may be waived by the Architect/Engineer, if in his judgment, adequate evidence of satisfactory strength is provided.
  - 2. Conduct strength tests of concrete during construction in accordance with the following procedures:
    - a. Mold and cure (4) cylinders from each sample in accordance with ASTM C 31. Record any deviations from the ASTM requirements in the test report.
    - b. Test cylinders in accordance with ASTM C 39. Test (1) specimen at (7) days for information, (2) specimens at (28) days for acceptance, and hold (1) specimen to be tested as directed by the Architect/Engineer. The compressive strength test results for acceptance shall be the average of the compressive strengths from the (2) specimens tested at (28) days.
  - 3. Determine slump of each composite sample and whenever consistency of concrete appears to vary, using ASTM C 143. In addition, the testing laboratory shall also estimate the slump of every truck by visual inspection and include the slump estimates in their report. Additional actual slump tests shall also be taken as directed by the Architect or Engineer.
  - 4. Determine temperature of each composite sample in accordance with ASTM C 1064.
  - 5. Air content tests will be made on samples from the first (3) batches in the placement and until (3) consecutive batches have air contents within the range specified at which time (1) test will be performed for each (100) cubic yards or fraction thereof of each design mixture of concrete placed in any (1) day. This test frequency will be maintained until a batch is not within the range specified, at which time testing of each batch will be resumed until (3) consecutive batches have air contents within the range specified. Additional tests may be performed as necessary for control. These air content tests may be taken on composite samples or on samples from the batch at any time after discharge of (2) cubic feet of concrete.

## Section 03 30 00 Cast-In-Place Concrete

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6. When it appears that material furnished or work performed by the Contractor fails to conform to the Contract Documents, testing agency will immediately report such deficiency to the Architect/Engineer, Contractor, and concrete supplier.
  7. Testing agency and its representatives are not authorized to revoke, alter, relax, enlarge, or release any requirement of the Contract Documents, nor to accept any portion of the work.
  8. The testing agency will report all test and inspection results to the Architect/Engineer, Contractor and concrete supplier within (7) days after tests and inspections are performed.
- E. Additional Testing and Inspection Services
1. The testing agency shall perform the following testing services when necessary, at the Contractor's expense.
    - a. Additional testing and inspection required because of changes in materials or mixture proportions requested by the Contractor.
    - b. Additional testing of materials or concrete occasioned by failure to meet specification requirements.
  2. When material furnished or work performed by the Contractor fails to conform to the Contract Documents the testing agency will perform the following testing services when required by the Architect/Engineer at the Contractor's expense:
    - a. Inspect concrete batching, mixing, and delivery operations.
    - b. Other testing or inspection services as required by the Architect/Engineer.
- F. Tests on Hardened Concrete in Place
1. General: Tests on hardened concrete will be performed by the testing agency when such tests are needed. Testing shall be at the Contractor's expense when tests are performed to verify the strength of the structure when required by this specification. Owner will pay costs if tests are at his request and not required by this specification.
  2. Non-destructive Tests: Use of the rebound hammer in accordance with ASTM C 805, pulse velocity methods in accordance with ASTM C 597, or other non-destructive devices may be permitted by the Architect/Engineer in evaluating the uniformity and relative concrete strength in place, or for selecting areas to be cored.
  3. Core Tests
    - a. When required by the Architect/Engineer, cores shall be obtained and tested in accordance with ASTM C 42.
    - b. At least (3) representative cores shall be taken from each member or area of concrete in place that is considered potentially deficient. The location of cores is to be determined by the Architect/Engineer. If, before testing, cores show evidence of having been damaged subsequent to or during removal from the structure, replacement cores shall be taken.
    - c. Fill core holes with low slump concrete or grout of a strength equal to or greater than the original concrete.
- G. Evaluation of Concrete Strength Tests
1. Standard molded and cured strength specimens: Test results from standard molded and cured test cylinders shall be evaluated separately for each specified concrete design mixture. Evaluation will be valid only if tests have been conducted in accordance with procedures specified. For evaluation, each specified design mixture shall be represented by at last (5) tests.
  2. Non-destructive Tests: Test results will be evaluated by the Architect/Engineer and will be valid only if tests have been conducted by properly calibrated equipment in accordance with recognized standard procedures.
  3. Core Tests: Core tests will be evaluated by the Architect/Engineer and will be valid only if tests have been conducted in accordance with specified procedures.
- H. Acceptance of Concrete Strength
1. Standard molded and cured strength specimens: The strength level of concrete will be considered satisfactory when the averages of all sets of (3) consecutive compressive strength test results equal or exceed the specified compressive strength  $f_c$  and no individual strength test result falls below the specified compressive strength  $f_c$  by more than (500) psi.
  2. Non-destructive tests: Non-destructive tests shall not be used as the sole basis for accepting or rejecting concrete, but may be used when permitted to evaluate concrete where standard molded and cured cylinders have yielded results not meeting the criteria in Paragraph 1.

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3. Core Tests: Strength level of concrete in the area represented by core tests will be considered adequate when the average compressive strength of the cores are equal to at least 85 percent of specified compressive strength  $f_c$ , and if not single core is less than 75 percent of the specified compressive strength,  $f_c$ .
  - I. Field Acceptance of Concrete
    1. Air content: Concrete not within the limits of the air-entrainment specified shall not be used in the work.
    2. Slump: Concrete not within the slump limits specified at the point of placement shall not be used in the work.
    3. Temperature: Concrete not within temperature limits specified shall not be used in the work.
- 1.05 ACCEPTANCE OF STRUCTURE
- A. General – Completed concrete work shall conform to applicable requirements of this Specification.
    1. Concrete work that fails to meet (1) or more requirements of the Contract Documents but subsequently is repaired to bring the concrete into compliance may be accepted.
    2. Concrete work that fails to meet (1) or more requirements of the Contract Documents and cannot be brought into compliance will be rejected.
    3. Repair rejected concrete work by removing and replacing or by reinforcing with additional construction required by the Architect/Engineer.
    4. Submit for acceptance the proposed repair methods, materials, and modifications needed to assure that concrete work will meet requirements of the Contract Documents.
    5. Document repair work to bring concrete work into compliance with the Contract Documents and submit the documentation to the Architect/Engineer for acceptance.
    6. The Contractor shall pay all costs to bring concrete work into compliance with requirements of this Specification.
    7. Concrete members cast in the wrong location will be rejected.
  - B. Dimensional Tolerances
    1. Formed surfaces resulting in concrete outlines smaller than permitted by the tolerances of ACI 117, may be considered deficient in strength and subject to the provisions of Paragraph D, Strength of Structure.
    2. Formed surfaces resulting in concrete outlines large than permitted by ACI 117 may be rejected. Excess materials will be subject to removal when required by the Architect/Engineer.
    3. Inaccurately formed concrete surfaces that exceed ACI 117 tolerances may be rejected.
    4. Concrete with tolerances and defects exceeding the specified limitations may be rejected.
  - C. Appearance
    1. Concrete exposed to view with defects that adversely affect the appearance of the specified finish will be rejected.
    2. Concrete not exposed to view may be rejected for non-conforming appearance.
  - D. Strength of Structure
    1. Criteria for determining potential strength deficiency: Strength will be considered deficient and concrete work will be rejected when the work fails to comply with requirements which control the strength of the structure including, but not limited to, the following conditions:
      - a. Concrete strength failing to comply with requirements of the Contract Documents.
      - b. Reinforcing steel size, quantity, strength, position, or arrangement at variance with the requirements of the Contract Documents.
      - c. Concrete elements which differ from the required dimensions or location.
      - d. Curing not in accordance with Contract Documents.
      - e. Inadequate protection of concrete from extreme temperature and other environmental conditions during early stages of hardening and strength development.
      - f. Mechanical injury, construction fires, accidents, or premature removal of formwork resulting in deficient strength.
    2. Action required when strength is potentially deficient: When strength of the structure is considered potentially deficient, corrective actions may be required by the Architect/Engineer.
  - E. Durability
    1. Criteria for determining potential durability deficiency: Durability of concrete work will be considered deficient and the concrete work will be rejected when it fails to comply with the

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requirements which control durability of the structure including, but not limited to, the following conditions:

- a. Strength failing to comply with that specified.
  - b. Materials for concrete not conforming with the specifications for Cements, Aggregated, Water, and Admixtures, including air entrainment.
  - c. Concrete not conforming with the air-entrainment requirements in the Contract Documents.
  - d. Curing not in accordance with the Contract Documents.
  - e. Inadequate protection of concrete from temperature and other environmental conditions during early stages of hardening and strength development.
2. Action required when durability is potentially deficient: When durability of the structure is considered to be deficient, the following actions will be taken by the Architect/Engineer:
- a. Require that samples of the ingredient materials used in the concrete be obtained and tested.
  - b. Require that samples of hardened concrete be obtained from the structure by coring, sawing, or other acceptable means.
  - c. Require a laboratory evaluation of concrete and concrete materials to assess the ability of concrete to resist weathering action, chemical attack, abrasion, or other deterioration.
  - d. Concrete rejected for lack of durability shall be repaired or replaced as directed by the Architect/Engineer.

### 1.06 PROTECTION OF IN-PLACE CONCRETE

- A. Loading and support of concrete – Do not allow construction loads to exceed the superimposed load which the structural member, with necessary supplemental support, is capable of carrying safely and without damage.
- B. Protection from mechanical injury – during the curing period, protect concrete from damaging mechanical disturbances including load stresses, shock and harmful vibration. Protect concrete surfaces from damage by construction traffic, equipment, materials, rain or running water, and other adverse weather conditions.

## PART 2 – CONCRETE MIXTURES

### 2.01 DESCRIPTION – Requirements for materials, proportioning, production, and delivery of concrete.

### 2.02 SUBMITTALS

- A. Mixture proportions – Submit concrete mixture proportions by weight.
- B. Concrete materials – Submit the following information for concrete materials:
  1. For cementitious material: types, classes.
  2. For aggregates: types, pit or quarry locations, producers' names, gradations, specific gravities.
  3. For admixtures: types, brand names, producers.
  4. For water and ice: source of supply.
- C. Mixture proportion adjustments – Submit any adjustments to mixture proportions or changes in materials, along with supporting documentation, made during the course of the work.
- D. Time of discharge – When it is desired to exceed time for discharge of concrete required by ASTM C 94, submit a request along with a description of the precautions to be taken.

### 2.03 PRODUCTS

- A. Materials
  1. Cementitious material – Cementitious material shall consist of Portland Cement conforming to ASTM C 150, or blended hydraulic cement conforming to ASTM C 595, or Portland Cement conforming to ASTM C 618, or a Portland Cement conforming to ASTM C 150 and a blast furnace slag cement conforming to ASTM C 989. Unless otherwise specified, cementitious material shall conform to ASTM C 150 Type I or Type II without the addition of cementitious or pozzolanic mineral admixtures. Cementitious material used in concrete shall be of the same brand and type, and from the same plant of manufacture as the cementitious material used in the concrete represented by the submitted field test data or used in the trial mixtures. If fly ash is used, it shall be Type C. Type F fly ash is not allowed.



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2. Aggregates – Aggregates shall conform to ASTM C 33 unless otherwise specified. When a single size or a combination of (2) or more sizes of coarse aggregates are used, the final gradation shall conform to the grading requirements of ASTM C 33 unless otherwise specified or permitted.
  3. Water and ice – Mixing water for concrete and water used to make ice shall meet the requirements of ASTM C 94.
  4. Admixtures – When required or permitted, admixtures shall meet the requirements of the following:
    - a. Air entraining admixtures – ASTM C 260.
    - b. Chemical admixtures – ASTM C 494.
    - c. Chemical admixtures for use in producing flowing concrete – ASTM C 1017.
  5. Change of materials – When brand, type, size, or source of cementitious materials, aggregates, water, ice, or admixtures are proposed to be changed, new data or evidence which indicates that the change will not adversely affect the relevant properties of the concrete shall be submitted for acceptance prior to use in concrete.
- B. Performance and Design Requirements
1. Cementitious material content – The cementitious material content shall be adequate for concrete to satisfy the specified requirements for strength, water-cementitious material ratio and finishing ability.
  2. Slump – Slump shall not exceed the specified slump. Concrete shall have, at the point of delivery, a slump of:
    - a. Ramps and sloping surfaces – 3" maximum
    - b. Reinforced foundations – 1" minimum to 3" maximum
    - c. Other concrete – 2" minimum to 4" maximum
    - d. Determine the slump by ASTM C 143. Slump tolerances shall meet the requirements of ACI 117. When use of a plasticizing admixture conforming to ASTM C 1017 or when a Type F or G high range water reducing admixture conforming to ASTM C 494 is permitted to increase the slump of concrete, concrete shall have a slump of 2 to 4 inches before the admixture is added and a maximum slump of 6 inches at the point of delivery after the admixture is added, unless otherwise specified.
  3. Size of coarse aggregate – Except when otherwise specified or permitted, nominal maximum size of coarse aggregate shall not exceed three-fourths of the minimum clear spacing between reinforcing bars, one-fifth of the narrowest dimensions between sides of forms, or one-third of the thickness of slabs or toppings.
  4. Air content – See plans for air-entrainment requirements. Unless otherwise specified, air content for exterior exposed concrete at the point of delivery shall conform to the requirements of ACI 301, Table 4.2.2.4 for mild exposure. For specified compressive strengths above 5,000 psi, the total air contents indicated in Table 4.2.2.4 may be reduced by one percent.
  5. Chloride ion concentration – Unless otherwise specified, maximum water soluble chloride ion concentrations in hardened concrete at ages from (28) to (42) days contributed from the ingredients including water, aggregates, cementitious materials, and admixtures shall not exceed .30 % by weight of cement. When testing is performed to determine water soluble chloride ion content, test procedures shall conform to AASHTO T 260.
  6. Concrete temperature – When the average of the highest and lowest temperature during the period from midnight to midnight is expected to drop below 40° F for more than (3) successive days, concrete shall be delivered to meet the following minimum temperature immediately after placement:
    - a. 55° F for sections less than 12 in. in the least dimension,
    - b. 50° F for sections 12 in. to 36 in. in the least dimension,
    - c. 45° F for sections 36 in. to 72 in. in the least dimension,
    - d. 40° F for sections greater than 72 in. in the least dimension.The temperature of concrete as placed shall not exceed these values by more than 20° F. These minimum requirements may be terminated when temperatures above 50° F occur during more than half of any (24) hour duration. Unless otherwise specified or permitted, the temperature of concrete as delivered shall not exceed 90° F.
  7. Strength – The compressive strength is to be as specified on the drawings. Unless otherwise specified, strength requirements shall be based on the 28-day compressive strength determined on a 6 x 12 inch cylindrical specimens made and tested in accordance with ASTM C 31 and C 39 respectively.

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8. Water-cementitious material ratio – The water-cement or water-cementitious material ratio of the concrete for each portion of the work shall not exceed .50 for 3,000 psi concrete and .48 for higher strength concrete.
  - a. If cementitious or pozzolanic mineral admixtures conforming to ASTM C 989 or ASTM C 618 are used, the cement portion of the water-cement ratio shall be the total weight of cementitious materials.
  - b. The combined weight of fly ash and pozzolan conforming to ASTM C 618 shall not exceed 20 percent of the total weight of cementitious material. The fly ash and pozzolan present in a ASTM Type IP or IPM blended cement conforming to ASTM C 595 shall be included in the calculated percentage.
9. Proportioning – Proportion concrete to conform with Paragraph C – Performance and Design Requirements, to provide workability and consistency so concrete can be worked readily into forms and around reinforcement without segregation or bleeding, and to provide the compressive strength specified.

### 2.04 EXECUTION

- A. Measuring, batching, and mixing – Production facilities shall produce concrete of the specified quality and conforming to the requirements of this Specification. Unless otherwise specified, measure, batch and mix concrete materials and concrete in conformance with ASTM C 94.
- B. Delivery – Deliver concrete which will possess the specified characteristics in the freshly mixed state at the point of placing. Transport and deliver concrete in equipment conforming to the requirements of ASTM C 94.
  1. Slump adjustment – When concrete arrives at the point of delivery with a slump below that which will result in the specified slump at the point of placement and is unsuitable for placing at that slump, the slump may be adjusted to the required value by adding water up to the amount allowed in the accepted mixture proportions unless otherwise specified by the Architect/Engineer. Addition of water shall be in accordance with ASTM C 94. Do not exceed the specified water-cementitious material ratio or slump. Do not add water to concrete delivered in equipment not acceptable for mixing. After plasticizing or high-range water-reducing admixtures are added to the concrete at the site to achieve flowable concrete, do not add water to the concrete. Measure slump and air content of air-entrained concrete, after slump adjustment, to verify compliance with specified requirements.
  2. Time of discharge – Time for completion of discharge shall be as specified by ASTM C 94, unless otherwise permitted. When discharge is permitted after more than 90 minutes have elapsed since batching or after the drum has revolved 300 revolutions, verify that air content of air-entrained concrete, slump, and temperature of concrete are as specified.

## PART 3 – HANDLING, PLACING, AND CONSTRUCTING

### 3.01 EXECUTION

- A. Preparation
  1. Do not place concrete until data on materials and mixture proportions are accepted.
  2. Before placing concrete in forms, complete the following:
    - a. Comply with formwork requirements specified.
    - b. Remove dirt, water, and other foreign material from surfaces, including reinforcement and embedded items, against which concrete will be placed.
    - c. Comply with reinforcing steel placement requirement specified.
    - d. Position and secure in place expansion joint material, anchors, and other embedded items.
    - e. Obtain acceptance of finished preparation.
  3. Before placing a concrete slab on grade, clean foreign material from the Subgrade and complete the following:
    - a. In-place density of Subgrade soils shall be uniform throughout the area and at least the minimum required by the Contract Documents.
    - b. Subgrade shall be free from frost or ice.
    - c. Subgrade shall be moist with no free water and no muddy or soft spots.
  4. When high ambient temperatures necessitate protection of concrete immediately after placing or finishing, make provisions in advance of concrete placement for windbreaks, shading, fogging, sprinkling, ponding, or wet covering.

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5. During ambient temperature conditions described in Section 2.03, Paragraph B, Subparagraph 6 – Concrete Temperature, make provisions in advance of concrete placement to maintain the temperature of the concrete as specified. Use heating, covering, or other means adequate to maintain required temperature without overheating or drying of concrete due to concentration of heat. Do not use combustion heaters unless precautions are taken to prevent exposure of the concrete to exhaust gases containing carbon dioxide.
- B. Placement of Concrete
1. Wet weather – Do not begin to place concrete while rain, sleet, or snow is falling. Do not allow rain water to increase mixing water or to damage the surface of the concrete.
  2. Cold weather – Concrete temperatures and ambient temperatures shall meet minimum temperature requirements of Section 2.03, Paragraph B, Sub Paragraph 6 – Concrete Temperature.
  3. Hot weather – The temperature of concrete as placed shall not exceed 90° F unless otherwise permitted. Loss of slump, flash set, or cold joints due to temperature of concrete as placed will not be acceptable. When temperature of concrete exceeds 90° F, obtain acceptance, when required, of proposed precautionary measures. When temperature of steel reinforcement, embedments, or forms is greater than 120° F, fog steel reinforcement, embedments, and forms with water immediately prior to placing concrete.
  4. Conveying – Convey concrete from mixer to the place of final deposit rapidly by methods which prevent segregation or loss of ingredients and will assure the required quality of concrete. Do not use aluminum pipes or chutes.
  5. Depositing – Deposit concrete continuously in (1) layer or in layers to have fresh concrete deposited on in-place concrete that is still plastic. Do not deposit fresh concrete on concrete that has hardened sufficiently to cause formation of seams or planes of weakness within the section, unless construction joint requirements are met. Do not use concrete that has surface dried, partially hardened, or contains foreign material. Do not subject concrete to any procedure that will cause segregation. Deposit concrete as near as practicable to the final position to avoid segregation.
  6. Consolidating – Consolidate concrete by vibration. Concrete shall be thoroughly worked around reinforcement and embedded items and into corners of forms, eliminating all air or stone pockets which may cause honey-combing, pitting, or planes of weakness. Use internal vibrators of the largest size and power that can properly be used in the work as described in ACI – 301, Table 5.3.2.5. Workers shall be experienced in use of the vibrators. Do not use vibrators to move concrete within the forms.
  7. Construction joints and other bonded joints – Locate construction joints as indicated on the Project Drawings or as accepted by the Architect/Engineer.
- C. Finishing formed surfaces – After removal of forms, give each formed surface (1) or more of the finishes as specified by the Architect/Engineer. Finishes are to be in accordance with ACI-301, Section 5.3.3.
- D. Finishing unformed surfaces – Place concrete at a rate that allows spreading, straight edging, and darbying or bull floating before bleed water appears. Strike smooth the top of walls, buttresses, horizontal offsets, and other similar unformed surfaces and float them to a texture consistent with finish of adjacent formed surface. Finish slab surfaces as specified by the Architect/Engineer. Finishes are to be in accordance with ACI-301. Flatness shall be  $F_F = 20$  and Levelness shall be  $F_L = 15$  unless noted otherwise in the Construction Documents and shall meet the requirements of ACI-117.
- E. Sawed control joints – Where saw cut joints are required or permitted, start cutting as soon as concrete has hardened sufficiently to prevent dislodgement of aggregates. Saw a continuous slot to a depth of one-fourth the thickness of the slab but not less than one inch. Complete sawing within (12) hours after placement.
- F. Curing and protection
1. General – Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury. Protect concrete during the curing period such that the concrete temperature does not fall below the requirements of Section 2.03, Paragraph B, Sub Paragraph 6 – Concrete Temperature. Cure concrete in accordance with ACI-301, 5.3.6.2 or 5.3.6.3 for (7) days after placement.
  2. Formed concrete surfaces – Keep absorbent wood forms wet until they are removed. After form removal, cure concrete by (1) on the methods in Sub Paragraph 3 – Unformed Concrete Surfaces.

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3. Unformed concrete surfaces – After placing and finishing, use (1) or more of the following methods to preserve moisture in concrete:
  - a. Ponding, continuous fogging or continuous sprinkling.
  - b. Application of mats or fabric kept continuously wet.
  - c. Continuous application of steam (under 150° F).
  - d. Application of sheet materials conforming to ASTM C 171.
  - e. Application of a curing compound conforming to ASTM C 309. Apply the compound in accordance with manufacturer's recommendation after water sheen has disappeared from the concrete surface and after finishing operations. The rate of application shall not exceed 200 ft<sup>2</sup>/gal. For rough surfaces, apply in (2) applications at right angles to each other, not to exceed 200 ft<sup>2</sup>/gal. for each coat. Do not use curing compound on any surface where concrete or other material will be bonded unless the curing compound will not prevent bond or unless measures are to be taken to completely remove the curing compound from areas to receive bonded applications.
  - f. When the ambient temperature exceeds 90° F, either ponding, continuous fogging, continuous sprinkling or application of mats or fabric kept continuously wet are required for curing. Other methods of curing are not allowed.
- G. Repair of surface defects
  1. General – Repair tie holes and surface defects immediately after form removal. Where the concrete surface will be textured by sandblasting or bush-hammering, repair surface defects before texturing. Repairs are to meet the requirement of ACI-301, Section 5.3.7.

**END OF SECTION**

**Section 03 30 00**  
**Cast-In-Place Concrete**  
Specifications

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## Section 03 54 00 Gypsum Cementitious Underlayment

Specifications

03 54 00-1

### PART 1 – GENERAL

- 1.1 SECTION INCLUDES
- A. Gypsum cement with sand aggregate
  - B. Floor primer
  - C. Concrete primer
  - D. Acoustical underlayment
- 1.2 RELATED DOCUMENTS
- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- 1.3 SUMMARY
- A. Section includes gypsum-cement-based, self-leveling underlayment for application below interior floor coverings.
- 1.4 SUBMITTALS
- A. Product Data: For each type of product indicated, including structural requirements of underlayment.
  - B. Mix Design: Provide required design mixture as required by manufacturer.
  - C. Shop Drawings: Include plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.
  - D. Qualification Data: For qualified Installer, including certification from gypsum cementitious underlayment manufacturer.
  - E. Product Certificates: Signed by manufacturers of underlayment and floor-covering systems certifying that products are compatible.
  - F. Warranty: Two (2) year manufacturer's warranty on labor and material
  - G. Minutes of preinstallation conference.
- 1.5 QUALITY ASSURANCE
- A. Installer Qualifications: Installer who is certified by manufacturer for application of underlayment products required for this Project with a minimum of five (5) years' experience with the company performing the work.
  - B. Product Compatibility: Manufacturers of underlayment and floor-covering systems certify in writing that products are compatible.
  - C. Fire-Resistance Ratings: Where indicated, provide gypsum-cement underlayment systems identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
    - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
  - D. Sound Transmission Characteristics: Where indicated, provide gypsum-cement underlayment systems identical to those of assemblies tested for STC and IIC ratings per ASTM E 90 and ASTM E 492 by a qualified testing agency.
  - E. Preinstallation Conference: Conduct conference at project site a minimum of seven (7) days prior to installation and after approval of all requirement submittals. Contractor to take minutes and issue to all parties present within seventy-two (72) hours of the meeting.
- 1.6 FIELD QUALITY CONTROL
- A. Slump Test: Gypsum cement underlayment mix shall be tested for slump as it's being pumped using a 2 inch by 4-inch (50mm by 101mm) cylinder resulting in a patty size of 9 inches (229mm) plus or minus 1-inch (25mm) diameter.
  - B. Field Samples: At least one set of five (5) molded cube samples shall be taken from each living unit and main corridor/common space during the application. Provide a diagram of location of each sample taken. Each sample shall be taken at a location at least ten (10) feet apart from other samples. Cubes shall be tested as recommended by the manufacturer in accordance with modified ASTM C 472. Testing shall be performed by Owner's testing agency at seven (7) and twenty-eight (28) days from pour.

## Section 03 54 00 Gypsum Cementitious Underlayment

Specifications

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- 1.7 WARRANTY
  - A. Manufacturer shall provide a two (2) year warranty (no dollar limit) covering the quality, strength, and installation of the gypsum cementitious underlayment.
- 1.8 DELIVERY, STORAGE, AND HANDLING
  - A. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.
- 1.9 PROJECT CONDITIONS
  - A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.
    - 1. Place gypsum-cement-based underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F (10 and 27 deg C) and as per manufacturer's requirements.
- 1.10 COORDINATION
  - A. Coordinate application of underlayment with requirements of floor-covering products and adhesives, to ensure compatibility of products.

### PART 2 – PRODUCTS

- 2.1 GYPSUM-CEMENT-BASED UNDERLAYMENTS
  - A. Underlayment: Gypsum-cement-based, self-leveling product that can be applied in minimum uniform thickness of 1 inch minimum.
    - 1. Products: Subject to compliance with requirements, provide the following:
      - a. Hacker Industries, Inc.; Firm-Fill 2010 Floor Underlayment
      - b. Maxxon Corporation; Gypcrete 2000
      - c. USG Corporation; Levelrock 2500
    - 2. Cement Binder: Gypsum or blended gypsum cement as defined by ASTM C 219.
    - 3. Compressive Strength: Not less than 3000 psi at 28 days from pour.
    - 4. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer, formulated for use with underlayment when applied to substrate and conditions indicated.
  - B. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm); or coarse sand as recommended by underlayment manufacturer.
    - 1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.
  - C. Water: Potable and at a temperature of not more than 70 deg F (21 deg C).
  - D. Reinforcement: For underlayment applied to wood substrates, provide corrosion-resistant reinforcement recommended in writing by underlayment manufacturer.
  - E. Primers: Product of underlayment manufacturer recommended in writing for substrate and finished surface gypsum cement.
    - 1. Primer shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D.
    - 2. Primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- 2.2 ACCESSORIES
  - A. Sound Mat:
    - 1. Manufacturer:
      - a. Hacker Industries, Inc.; Firm Fill SCM-250
      - b. Maxxon Corporation; Acoustic Mat II
      - c. USG; LevelRock SRM 25
      - d. Regupol QT scu 4005
    - 2. Perimeter Isolation Strips: As required by gypsum cement underlayment manufacturer.

## Section 03 54 00 Gypsum Cementitious Underlayment

Specifications

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### PART 3 – EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, with Installer/Contractor/Architect present, for conditions affecting performance.
  - 1. Wood substrate shall be structurally sound, properly fastened, and dry. Contractor shall clean subfloor to remove mud, oil, grease, and other contaminating factors before arrival of the authorized applicator.
  - 2. Proceed with application only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. General: Prepare and clean substrate according to manufacturer's written instructions.
  - 1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
  - 2. Fill substrate voids to prevent underlayment from leaking.
- B. Wood Substrates: Mechanically fasten loose boards and panels to eliminate substrate movement and squeaks. Sand to remove coatings that might impair underlayment bond and remove sanding dust.
  - 1. Install substrate primer recommended in writing by manufacturer.
- C. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.
- D. Sound Control Mat: Install sound control materials according to manufacturer's written instructions.
  - 1. Do not install mechanical fasteners that penetrate through the sound control materials.
- E. Perimeter Isolation Strips: Install at all floor/wall intersections and as required by the manufacturer.

#### 3.3 APPLICATION

- A. General: Mix and apply underlayment components according to manufacturer's written instructions.
  - 1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
  - 2. Coordinate application of components to provide optimum underlayment-to-substrate and intercoat adhesion.
  - 3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.
- B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- C. Apply underlayment to produce uniform, level surface.
  - 1. Apply a final layer without aggregate to product surface.
  - 2. Feather edges to match adjacent floor elevations.
- D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.
- E. Apply primer at finished gypsum cement surface as required by manufacturer.
- F. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.
- G. Contractor to test each room for "hollow" sound at gypsum cement underlayment at seven (7) days from installation. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped. Replace underlayment with manufacturer approved repair/floor patch system.
- H. Ceramic Tile Applications: Install ceramic tile, marble, porcelain, granite, natural stone in accordance with TCNA (Tile Council of North America, Inc.) printed recommendations.
- I. Wood Flooring Applications: Install hardwood, laminated, and engineered wood flooring according to NOFMA (National Wood Flooring Association) or manufacturer's printed recommendations.



**Section 03 54 00**  
**Gypsum Cementitious Underlayment**

Specifications

03 54 00-4

3.4 PROTECTION

- A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

**END OF SECTION**

## Section 04 20 00 Concrete Masonry Units

Specifications

04 20 00

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Block filler and finishes are included in Section 0990 00.

#### 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Concrete masonry unit for load bearing and non-load bearing walls.
  - 2. Decorative concrete masonry units.
  - 3. Through-wall flashing
- B. Products installed but not furnished under this Section include the following:
  - 1. Sheet Metal Flashing is included in Section 07 60 00.
- C. Provide concrete masonry units that develop installed compressive strength of 1500 psi, min.

#### 1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections:
  - 1. Product data for each different masonry unit, accessory, and other manufactured product indicated.
  - 2. Shop drawings for reinforcing detailing fabrication, bending, and placement of unit masonry reinforcing bars. Comply with ACI 315 "Details and Detailing of Concrete Reinforcing" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of masonry reinforcement.
  - 3. Samples for verification purposes of the following:
    - a. Full-size units for each different masonry unit required showing full range of exposed color, texture, and dimensions to be expected in completed construction.
    - b. Material certificates, signed by manufacturer and Contractor certifying that each material complies with requirements for:
      - 1. Mortar, including name of manufacturer, brand, type, and weight slips at time of delivery.
      - 2. Reinforcing bars.
      - 3. Anchors, ties, and metal accessories.
  - 4. Cold-weather construction procedures evidencing compliance with requirements specified in referenced unit masonry standard.
  - 5. Hot-weather construction procedures evidencing compliance with requirements specified in referenced unit masonry standard.
  - 6. Qualification data for firms to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, telephone numbers, names of Architects and Owners, and other information specified.

#### 1.04 QUALITY ASSURANCE

- A. Unit Masonry Standard: Comply with ACI 530.1/ASCE 6 "Specifications for Masonry Structures," except as otherwise indicated.
  - 1. Revise ACI 530.1/ASCE 6 to exclude Sections 1.4 and 1.7; Parts 2.1.2, 3.1.2, and 4.1.2; and Articles 1.5.1.2, 1.5.1.3, 2.1.1.1, 2.1.1.2, and 2.3.3.9 and to modify Article 2.1.1.4 by deleting requirement for installing vent pipes and conduits built into masonry.
- B. Single-Source Responsibility for Masonry Units: Obtain concrete 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.
- C. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality and color, from one manufacturer for each cementitious component and from one source and producer for each aggregate.

## Section 04 20 00 Concrete Masonry Units

Specifications

04 20 00

- D. Field-Constructed Mock-Ups: Prior to installation of concrete masonry, erect sample wall panels to further verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mock-ups to comply with the following requirements, using materials indicated for final unit of Work:
    - 1. Locate mock-ups on site as directed by Architect.
    - 2. Build mock-ups in sizes of approximately 4 feet long by 4 feet high by full thickness, including face and backup wythes as well as accessories.
    - 3. Notify Architect (1) week prior to dates and times when mock-ups will be erected.
    - 4. Protect mock-ups from the elements with weather-resistant membrane.
    - 5. Retain and maintain mock-ups during construction in undisturbed condition as standard for judging completed unit masonry construction.
    - 6. When directed, demolish and remove mock-ups from Project site.
  - E. Pre-installation Conference: Conduct conference at Project site, to comply with requirements of Division 1 Section "Project Meetings."
- 1.05 DELIVERY, STORAGE, AND HANDLING
- A. Deliver masonry materials to project in undamaged condition.
  - B. Store and handle masonry units off the ground, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not place until units are in an air-dried condition.
  - 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 and contamination avoided.
  - E. Store masonry accessories including metal items to prevent corrosion and accumulation of dirt and oil.
- 1.06 PROJECT CONDITIONS
- A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
  - B. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
  - C. Do not apply uniform roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
  - D. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Remove immediately any grout, mortar, and soil that come in contact with such masonry.
  - E. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
  - F. Protect sills, ledges, and projections from mortar droppings.
  - G. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes from mortar droppings.
  - H. Cold-Weather Construction: Comply with referenced unit masonry standard for cold-weather construction and the following:
    - 1. Do not lay masonry units that are wet or frozen.
    - 2. Remove masonry damaged by freezing conditions.
  - I. Hot-Weather Construction: Comply with referenced unit masonry standard.
- 1.07 COORDINATION
- A. Coordinate installation of other sections (conduit, plumbing, F.E. cabinets, board insulation).

### PART 2 - PRODUCTS

#### 2.01 MATERIALS, GENERAL

- A. Comply with referenced unit masonry standard and other requirements specified in this Section applicable to each material indicated.
- B. CONCRETE MASONRY UNITS
  - 1. General: Comply with requirements indicated below applicable to each form of concrete masonry unit required.

## Section 04 20 00 Concrete Masonry Units

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- a Provide special shapes and finishes where indicated and as follows:
  - 1. For lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
  - 2. **At all instructional spaces and corridors for students, use radius-edged units for outside corners (including at window sills); use special corner pieces to accommodate transition from where radius edge vertical pieces meet horizontal radius edge pieces. First course to have square corners with eased top corner to accept applied rubber base.**
- b Size: Provide concrete masonry units complying with requirements indicated below (or as specifically shown on plan) for nominal sizes, manufactured to specified face dimensions within tolerances specified in the applicable referenced ASTM specification for concrete masonry units.
  - 1. Hollow Load-Bearing Concrete Masonry Units: ASTM C 90, Grade N and as follows:
    - a. 8 inch x 8 inch x 16 inch (8 inch x 12 inch x 16 inch at elevator shaft enclosure) stretcher block with regular or plain ends as required by conditions.
    - b. 8 inch x 8 inch x 16 inch U-block at lintels and bond beams.
    - c. 16 inch x 8 inch x 8 inch U-block cut to match roof pitch at locations indicated.
    - d. 6 inch x 8 inch x 16 inch stretcher blocks where shown on plan.
    - e. Use 4 inch, 10 inch, and 12 inch units where so indicated in drawings.
  - c Unit Compressive Strength: Provide units with minimum average net area compressive strength of 1,900 psi.
  - d Weight Classification: Light weight.
- C. Decorative Concrete Masonry Units: ASTM C 90, Grade N, Type 1 moisture controlled.
  - 1. Weight Classification: Normal weight, Min. 2000 PSI compressive strength, manufactured with concrete weighing over 125 PCF.
  - 2. Size (width): Manufactured to dimensions specified in "Concrete Masonry Units" Paragraph above.
  - 3. Pattern and Texture: Burnished or Ground Face per manufacturer's standard.
  - 4. Approved Manufacturers:
    - a. E. Dillion & Company – Premier Line Ground Face CMU
    - b. Anchor Concrete Products – Trendstone Ground Face Masonry Units
    - c. Texas Building Products, Burnished Face
    - d. FeatherliteHill Country Stone, Ground Face
    - e. Approved Equal.
  - 5. Colors: As selected by Architect from manufacturer's full range.
  - 6. Location: As indicated on the drawings.
  - 7. Water Repellency: Integral Water Repellent.
  - 8. Units must conform to ASTM C744.
    - a. Craze Resistance: No evidence of crazing, cracking, or spalling
    - b. Abrasion Resistant.
    - c. Resistant to color change: No significant change in color, gloss, or texture after 500 hours of accelerated weatherometer testing.
  - 9. Solid Units: Provide solid "cap" finished minimum two sides; size and configuration as per drawings.

### 2.02 MORTAR

- A. General: Provide field mixed or proprietary mason's mix conforming to the same requirements as field mixed mortar conforming to ASTM C270, Type N.
  - 1. Portland Cement shall conform to ASTM C150, gray color.
  - 2. Masonry Cement: ASTM C91, Type N, "Magnolia Mason's Mix", "Atlas Masonry Cement", or "Lone Star Masonry Cement"

## Section 04 20 00 Concrete Masonry Units

Specifications

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3. Hydrated Lime shall conform to ASTM C207, Type S.
  4. Aggregate shall be fine masonry sand conforming to ASTM C144.
  5. Quicklime: ASTM C5, non-hydraulic type, slacked in accordance with manufacturer's directions.
  6. Non-staining Portland Cement: ASTM C150, Type I, containing not more than .03 percent of water soluble alkali, and shall not stain other materials and surfaces with which it is in contact. Cement shall be gray unless otherwise hereinafter specified.
  7. Water shall be clean and drinkable.
- B. Ready-Mixed Mortar: Cementitious materials, water, and aggregate complying with requirements specified, combined with set-controlling admixtures to produce a ready-mixed mortar complying with ASTM C 1142, Type RS.
- C. Mortar Color: Standard Gray
- D. Mortar Mixes
1. Mortar for load-bearing walls and partitions: ASTM C270, Type S utilizing the Proportion Method comprised of one (1) part Portland Cement, 1/4 part hydrated lime or lime putty, and three (3) parts sand; or one (1) part Portland Cement, one (1) part Type II masonry cement and six (6) parts sand.

### 2.03 REINFORCING STEEL

- A. General: Provide reinforcing steel complying with requirements of referenced unit masonry standard and this Section.
- B. Reinforcing Bars: Deformed billet steel complying with ASTM A615, Grade 60.
- C. Interior Partitions – Single Wythe Joint Reinforcement: Truss type hot-dipped galvanized after fabrication, cold drawn steel conforming to ASTM A82. No. 9 side rods with No. 9 inch cross ties; truss single width manufactured by Dur-O-Wall
- D. Reinforcing Steel: ASTM A615, 60 ksi yield grade, deformed bars, unprotected finish. Corner ties and strap anchors: No. 4 hooked ties at each course with vertical bars in grouted cells

### 2.04 REINFORCEMENT AND ANCHORAGE

- A. Coating: Hot dipped galvanized; 1.50 oz. psf
- B. Wire Gage: Standard weight.
- C. Type:
1. Truss type; with pintle extensions at veneer assemblies - extension length of pintles to accommodate 2" board insulation and air space (re: drawings).
    - a. Manufacturer:
      1. Hohmann & Barnard: LoxAll Adjustable Eye-Wire; adjustable wall ties.
      2. Dur-O-Wal.
    2. Dovetail, slotted; extension length to accommodate air space (re: drawings).
      - a. Manufacturer:
        1. Hohmann & Barnard: LoxAll; adjustable wall ties.
        2. Dur-O-Wal: D/A 210 with D/A 701.

### 2.05 FLASHINGS

- A. Copper 10 oz./ sq. ft. (corrugated) or 5 oz./sq. ft. laminated between glass fabrics (vinyl or rubber materials are not acceptable).
- B. Set flashing projected 1/2" beyond outside face of exterior wythe, extend through cavity, rising no less than 8" and terminate at depth of 4" into bed joint of interior wythe. Neatly trim excess from exterior wythe joint after architect has approved installation.
- C. Extend flashing minimum 8" beyond each side of opening; form end dams by turning up material minimum 2" each end.
- D. End laps: minimum 6 inches, sealed with flashing adhesive
- E. Install mortar break diagonally on top of flashing to ensure that the mortar droppings are broken up and deflected away from the weep holes

### 2.06 MASONRY CLEANERS

- A. Job-Mixed Detergent Solution: Solution of trisodium phosphate (1/2-cup dry measure) and laundry detergent (1/2-cup dry measure) dissolved in one gallon of water.

## Section 04 20 00 Concrete Masonry Units

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### 2.07 ACCESSORIES

- A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, cement fused joints. Rapid control joint manufactured by Dur-O-Wall
- B. Joint Filler: Closed cell polyurethane; oversized 50 percent to joint width; selfexpanding

### 2.07 SOURCE QUALITY CONTROL

- A. Concrete Masonry Units will be tested by qualified independent testing laboratory for strength, absorption, and moisture content per ASTM C 140.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other specific conditions, and other conditions affecting performance of unit masonry.
- B. Do not proceed until unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION, GENERAL

- A. Comply with referenced unit masonry standard and other requirements indicated applicable to each type of installation included in Project.
- B. Thickness: Build cavity walls to the full thickness shown. Build single-wythe walls to the actual thickness of the masonry units, using units of nominal thickness indicated.
- C. Leave openings for equipment to be installed before completion of masonry. After installation of equipment, complete masonry to match construction immediately adjacent to the opening.
- D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting where possible.
- E. Integrate joint reinforcement and brick masonry veneer ties.
- F. Where SGFT is required at the base course, coordinate joints, ties, and any other items that will affect the structural integrity and aesthetical appearance of the finished assembly.

### 3.03 CONSTRUCTION TOLERANCES

- A. Comply with construction tolerances of referenced unit masonry standard.

### 3.04 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.
- B. Lay up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.
- C. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 8-inch horizontal face dimensions at corners or jambs.
  - 1. One-half running bond with vertical joint in each course centered on units in courses above and below.
- D. Stopping and Resuming Work: In each course, rack back 1/2-unit length for one-half running bond. Do not tooth. Clean exposed surfaces of set masonry and remove loose masonry units and mortar prior to laying fresh masonry.
- E. Built-In Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

### 3.05 MORTAR BEDDING AND JOINTING

- A. Lay hollow concrete masonry units as follows:
  - 1. With full mortar coverage on horizontal and vertical face shells.
  - 2. Bed webs in mortar in starting course on footings, in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with concrete.
  - 3. For starting course on footings where cells are not filled with concrete, spread out full mortar bed including areas under cells.

## Section 04 20 00 Concrete Masonry Units

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- B. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, provide same type of bonding specified for structural bonding between wythes and space as follows:
    - 1. Provide continuity with horizontal joint reinforcement using prefabricated "T" units.
    - 2. Nonbearing Interior Partitions: Build full height of story to underside of or roof structure, unless indicated otherwise.
- 3.06 CONTROL AND EXPANSION JOINTS
- A. Install control and expansion joints where indicated on plans; keep joint free of mortar and foreign matter.
  - B. If size is not indicated in the drawings, bring to the attention of the Architect.
  - C. Do not span expansion joints with reinforcement or anchorage.
  - D. Provide control joints every 25'-0" regardless if not shown in drawings; bring to the attention of the Architect prior to installation at pre-installation conference.
- 3.07 CAVITIES/AIR SPACES
- A. Keep cavities/air spaces clean of mortar droppings and other materials during construction. Strike joints facing cavities/air spaces flush.
- 3.08 LINTELS
- A. Install steel lintels where indicated.
  - B. Coordinate bedding of masonry flashings as is indicated in drawings and is industry standard.
  - C. Provide masonry lintels where shown and wherever openings of more than 2'-0" for block size units are shown.
    - 1. Provide formed-in-place masonry lintels.
    - 2. Provide temporary support for formed-in-place lintels.
    - 3. Use specially formed bond beam units with reinforcement bars placed as indicated and filled with coarse grout.
      - a. Reinforce units with 2 #4 deformed bars, minimum, unless otherwise indicated.
      - b. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.
      - c. Fill block with concrete to full depth of 8 inch high block, unless otherwise indicated to be filled to 16 inches.
  - D. Where expansion and control joints are required, provide joints each side of wall with sealant specified in Section 07900, offset control joint to align with end of lintels and continue up to termination of CMU.
- 3.09 JAMBS
- A. Provide concrete in jamb cells at all masonry openings; reinforcement continuous from concrete slab, through jamb, and up into lintel piece.
    - 1. Provide (1) #4 rebar in each jamb, unless noted otherwise.
    - 2. Hook into concrete slab 12"; lap slab rebar and jamb rebar 12", minimum.
- 3.10 FIELD QUALITY CONTROL
- A. Testing Frequency: Tests and evaluations listed in this article will be performed during construction for each 5000 sq. ft. of wall area or portion thereof.
- 2.08 Mortar properties will be tested per property specification of ASTM C 270.
- 2.09 Evaluation of Quality Control Tests: In absence of other indications of noncompliance with requirements, masonry will be considered satisfactory if results from construction quality control tests comply with minimum requirements indicated.
- 3.11 REPAIRING, POINTING, AND CLEANING
- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units in fresh mortar, pointed to eliminate evidence of replacement.
  - B. Pointing: Joints shall have tooling to match existing on campus. During the tooling of joints, enlarge any voids or holes and completely fill with mortar. Point-up all joints including

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**Concrete Masonry Units**

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corners, openings, and adjacent construction to provide a neat, uniform appearance, prepared for application of sealants.

- 2.10 Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  - 2.10.1 Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2.10.2 Test cleaning methods on sample wall panel; leave 1/2 panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
    - 2.10.2.1 Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
- 2.11 Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

**END OF SECTION**



## Section 05 50 00 Architectural Metal Fabrications

Specifications

05 50 00-1

### PART 1 – GENERAL

#### 1.01 SECTION INCLUDES

- A. The work required under this section consists of metal fabrications made of steel shapes, sheets, plates, pipes as required for miscellaneous supports and railings.

#### 1.02 WORK INCLUDES

- A. Stairs, Guardrails, Handrails where indicated in drawings.
- B. Miscellaneous steel that may be required for brick lintels, pipe supports, etc.

#### 1.03 SUBMITTAL

- A. Provide Shop Drawings of all components to be constructed: Provide submittal requirements as per Section 01 33 00 – Submittal Procedures.

### PART 2 – PRODUCTS

#### 2.01 MISCELLANEOUS MATERIALS

- A. Ferrous Metals:
  - 1. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
  - 2. Steel Angles, Plates, Shapes and Bars: ASTM A 36.
  - 3. Steel Pipe: ASTM A 53; Type and grade as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (sched. 40), unless otherwise indicated.
  - 4. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
  - 5. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.
- B. Aluminum:
  - 1. Material: Tension-levleed, smooth aluminum sheet, ASTM B 209 (ASTM B 209M), minimum 0.125 inch (3.18 mm) thick.
- C. Grout:
  - 1. Non-Shrink Non-Metallic Grout: Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE CRD-C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.
- D. 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 and style as required.
  - 9. Lock washers: Helical spring type carbon steel, FS FF-W-84.
- E. Paint:
  - 1. Shop Primer for Ferrous Metal: Manufacturer's or Fabricator's standard, fast-curing, lead-free, "universal" primer; selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure; complying with performance requirements of FS TT-P-645.
  - 2. Galvanizing Repair Paint: High zinc dust content paint for regalanizing welds in galvanized steel, complying with the Military Specifications MIL-P-21035 (Ships) or SSPC-Paint-20.
- F. Galvanizing: Provide a zinc coating for those items indicated or specified to be galvanized, as follows:
  - 1. ASTM A 153 for galvanizing iron and steel hardware.
  - 2. ASTM A 123 for galvanized rolled, pressed and forged steel shapes, plates, bars and strip 1/8" thick and heavier.
  - 3. ASTM A 386 for galvanizing assembled steel products.

## Section 05 50 00 Architectural Metal Fabrications

Specifications

05 50 00-2

- G. Shop Painting:
  - 1. Apply shop primer to surfaces of metal fabrications except those which are galvanized or as indicated to be embedded in concrete or masonry, unless otherwise indicated, and in compliance with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting (red oxide).
- 2.02 HANDRAILS
  - A. Provide sizes and wall thickness indicated in drawings as required to complete work, but not less than that required by code to support the design loading. Welds shall be ground smooth. Support brackets shall be so designed as to meet requirements of IBC and NFPA (most recent editions adapted by Authorities Having Jurisdiction)

### PART 3 – EXECUTION

- 3.01 EXAMINATION
  - A. Verify that field conditions are acceptable and are ready to receive Work.
- 3.02 PREPARATION
  - A. Clean and strip primed steel items to bare metal where site welding is required.
  - B. Supply steel items required to be cast into concrete or embedded in masonry with setting templates to appropriate sections.
- 3.03 INSTALLATION
  - A. Install items plumb and level, accurately fitted, free from distortion or defects.
  - B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
  - C. Field weld components indicated on shop drawings.
  - D. Perform field welding in accordance with AWS D1.1.
  - E. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.
- 3.04 ERECTION TOLERANCES
  - A. Maximum Offset from True Alignment: 1/4 inch.
  - B. Maximum Out-of-Position: 1/4 inch.

**END OF SECTION**

## Section 05 51 00

### Metal Stairs

Specifications

05 51 00-1

#### PART 1 GENERAL

##### 1.01 RELATED DOCUMENTS

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

##### 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Interior preassembled steel "means-of-egress" stairs with concrete-filled treads, complete with all steel attachments and ancillary framing necessary for attachment to structural main steel framing provided and installed by that section.
  - 2. Handrails and railings attached to metal stairs.
  - 3. Handrails attached to walls adjacent to metal stairs.
  - 4. Stairs shall be fabricated by company or fabricator that has at least five years experience in metal stair production.

##### 1.03 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal stairs capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each component of metal stairs.
  - 1. Treads and Platforms of Metal Stairs: Capable of withstanding a uniform load of 100 lbf/sq. ft. or a concentrated load of 300 lbf on an area of 4 sq. in, whichever produces the greater stress.
  - 2. Stair Framing: Capable of withstanding stresses resulting from loads specified above in addition to stresses resulting from railing system loads.
  - 3. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch, whichever is less.
- B. Structural Performance of Railings: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - 1. Handrails:
    - a. Uniform load of 50 lbf/ ft. applied in any direction.
    - b. Concentrated load of 200 lbf applied in any direction.
    - c. Uniform and concentrated loads need not be assumed to act concurrently.
    - d. Top Rails of Guards:
      - e. Uniform load of 50 lbf/ ft. applied in any direction.
      - f. Concentrated load of 200 lbf applied in any direction.
      - g. Uniform and concentrated loads need not be assumed to act concurrently.
    - h. Infill of Guards:
      - i. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
      - j. Uniform load of 25 lbf/ ft. applied horizontally.
      - k. Infill load and other loads need not be assumed to act concurrently.

##### 1.04 SUBMITTALS

- A. Product Data: For metal stairs and the following:
  - 1. Pre-filled metal-pan stair treads.
  - 2. Nonslip aggregates and nonslip-aggregate finishes.
  - 3. Wall mounted handrail brackets.
  - 4. Paint products.
- B. Shop Drawings: Show fabrication and installation details for metal stairs. Include plans, elevations, sections, and details of metal stairs and their connections. Show ancillary framing, anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.
  - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

##### 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Arrange for metal stairs specified in this Section to be fabricated and installed by the same firm.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of

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### Metal Stairs

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the kind indicated. Engineering services are defined as those performed for installations of metal stairs (including handrails and railing systems) that are similar to those indicated for this Project in material, design, and extent.

- C. Fabricator Qualifications: A firm experienced in producing metal stairs similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
  - D. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
  - E. Comply with all requirements of the Authority Having Jurisdiction (AHJ) including but not limited to:
    - 1. NFPA 101 Life Safety Code
    - 2. International Building Code
    - 3. Americans with Disabilities Act
    - 4. OSHA Standards & Regulations
- 1.06 COORDINATION
- A. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
  - B. Contractor shall be responsible for stairs to be fabricated for custom fit within enclosures actual-built dimensions.

#### PART 2 PRODUCTS

##### 2.01 MANUFACTURERS

- A. Alfab, Inc. Stairco
- B. American Stair Corp., Inc.
- C. Lapeyre Stair Inc.
- D. Pinnacle Metal Products
- E. Substitutions 01 25 00

##### 2.02 FERROUS METALS FOR STAIR COMPONENTS

- A. Metal Surfaces, General: Provide metal free from pitting, seam marks, roller marks, and other imperfections where exposed to view on finished units. Do not use steel sheet with variations in flatness exceeding those permitted by referenced standards for stretcher-leveled sheet.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.
- D. Uncoated, Cold-Rolled Steel Sheet: Commercial quality, complying with ASTM A 366/A 366M; or structural quality, complying with ASTM A 611, Grade A, unless another grade is required by design loads or:
- E. Uncoated, Hot-Rolled Steel Sheet: Commercial quality, complying with ASTM A 569/A 569M; or structural quality, complying with ASTM A 570/A 570M, Grade 30, unless another grade is required by design loads.

##### 2.03 PAINT

- A. Shop Primers: Provide primers that comply with Division 9 Section "Painting."

##### 2.04 CONCRETE FILL AND REINFORCING MATERIALS

- A. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, ready-mixed concrete with a minimum 28-day compressive strength of 3000 psi, unless higher strengths are indicated.
- B. Nonslip-Aggregate Finish: Factory-packaged abrasive aggregate made from fused, aluminum-oxide grits or crushed emery; rustproof and non-glazing; unaffected by freezing, moisture, or cleaning materials.
  - 1. "Euco Non-Slip Aggregate"; Euclid Chemical Company, 800-321-7628, as a basis of design.
  - 2. "Grip It"; L&M Construction Chemicals, Inc., 800-362-3331, as a basis of design.
- C. Welded Wire Fabric: ASTM A 185, 6 by 6 inches--W1.4 by W1.4, unless otherwise indicated.

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#### 2.05 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, handrails, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
  - 1. Join components by welding, unless otherwise indicated.
  - 2. Use connections that maintain structural value of joined pieces.
- B. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.
  - 1. Commercial class, unless otherwise indicated.
- C. Shop Assembly: Preassemble stairs in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- D. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Shear and punch metals cleanly and accurately. Remove sharp or rough areas on exposed surfaces.
- E. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- F. Weld connections to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. Weld exposed corners and seams continuously, unless otherwise indicated.
  - 5. At exposed connections, finish exposed welds and surfaces smooth and blended (grind) so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

#### 2.06 STEEL-FRAMED STAIRS

- A. Stair Framing: Fabricate stringers of structural-steel channels. Construct platforms of structural-steel channel headers and miscellaneous framing members as indicated. Bolt or weld headers to stringers; bolt or weld framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
  - 1. Provide closures for exposed ends of channel stringers.
  - 2. Where stairs are enclosed by gypsum board assemblies, provide hanger rods to support landings from floor construction above. Locate hanger rods within stud space of wall construction.
  - 3. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
- B. Metal Risers, Sub-tread Pans, and Sub-platforms: Form to configurations shown from steel sheet of thickness necessary to support indicated loads, but not less than 0.0677 inch.
  - 1. Steel Sheet: Uncoated cold-rolled steel sheet, unless otherwise indicated.
  - 2. Directly weld metal pans to stringers; locate welds on side of sub-treads to be concealed by concrete fill. Do not weld risers to stringers.
  - 3. Attach risers and sub-treads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
  - 4. Shape metal pans to include nosing integral with riser.
  - 5. At Contractor's option, provide stair assemblies with metal-pan sub-treads filled with reinforced concrete during fabrication.
  - 6. Provide sub-platforms of configuration indicated or, if not indicated, the same as sub-treads. Weld sub-platforms to platform framing.

#### 2.07 STEEL TUBE HANDRAILS AND RAILINGS

- A. General: Fabricate handrails and railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.
  - 1. Interior Stairs: Guardrail/Handrail Configuration; 1-5/8-inch- round top and bottom rails, 1-1/2-inch- round posts, and 1/2-inch- round pickets spaced not more than 4 inches clear with 1-1/4 to 1-1/2 inch handrail attached to guardrail.

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### Metal Stairs

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- B. Interconnect members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.
  - 1. At tee and cross intersections, cope ends of intersecting members to fit contour of tube to which end is joined, and weld all around.
- C. Form changes in direction of handrails and rails as follows:
  - 1. By bending.
- D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- E. Close exposed ends of handrail and railing members with prefabricated end fittings.
- F. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch or less.
- G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting railings and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
  - 1. Connect railing posts to stair framing by direct welding, unless otherwise indicated.
  - 2. Wall handrail brackets shall be designed to hold handrail a minimum of 2-1/4 inches clear from finish wall surface.
- H. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.
- I. Provide ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.

#### 2.08 FINISHES

- A. Comply with NAAMM'S "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal stairs after assembly.
- C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed products:
  - 1. Interiors (SSPC Zone 1A): SSPC SP 3, "Power Tool Cleaning."
- D. Apply shop primer to prepared surfaces of metal stair components, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

### PART 3 EXECUTION

#### 3.01 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free from rack.
- C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete, unless otherwise indicated.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- F. Field Welding: Comply with the following requirements:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.

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4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

#### 3.02 INSTALLING STEEL TUBE RAILINGS AND HANDRAILS

- A. Adjust handrails and railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:
  1. Anchor posts to steel by welding directly to steel supporting members.
  2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with post-installed anchors and bolts.
- B. Attach handrails to wall with wall brackets. Provide bracket with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as follows:
  1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
  2. Use type of bracket with predrilled hole for exposed bolt anchorage.
  3. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
  4. For hollow masonry anchorage, use toggle bolts.
  5. For steel-framed gypsum board assemblies, use hanger or lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.
  6. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed reinforcements using self-tapping screws of size and type required to support structural loads.

#### 3.03 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 Section "Painting."

**END OF SECTION**

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**Metal Stairs**

Specifications

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## Section 06 00 00 Exterior Treated Wood Composite Trim

Specifications

06 00 00-1

### PART 1 – GENERAL

- 1.1 SECTION INCLUDES
- A. Exterior-grade, treated wood composite trim for non-structural applications.
- 1.2 RELATED SECTIONS
- A. Section 06 10 00 - Rough Carpentry
  - B. Section 10 73 16 – Aluminum Canopies
- 1.3 REFERENCES
- A. ASTM D 1037 - Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials.
  - B. AWPA E7 - Standard Method of Evaluating Wood Preservatives by Field Tests with Stakes.
  - C. AWPA E16 – Field Test for Evaluation of Wood Preservatives to be Used Out of Ground Contact: Horizontal Lap-Joint Method.
- 1.4 SUBMITTALS
- A. Comply with Section 01 33 00 - Submittal Procedures.
  - B. Product Data: Submit manufacturer's product data.
  - C. Certificate of Compliance: Submit manufacturer's certificate of compliance indicating composite panels comply with specified requirements.
  - D. Application: Submit manufacturer's application instructions
  - E. Warranty: Submit manufacturer's standard warranty.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
  - B. Storage:
    - 1. Store materials in accordance with manufacturer's instructions.
    - 2. Indoor Storage: Store composite materials flat.
    - 3. Outdoor Storage: Store composite materials under cover, protected from weather, off ground, and on flat base.
    - 4. Keep composite materials dry.
  - C. Handling: Protect materials during handling and installation to prevent damage.
- 1.6 WARRANTY
- A. Warranty: Provide 50-year material warranty.

### PART 2 – PRODUCTS

- 2.1 MANUFACTURER
- A. CMI, 500 West Monroe Street, Suite 2010, Chicago, Illinois 60661. Toll Free (800) 255-0785. Fax (312) 382-8703. Website [www.miratectrim.com](http://www.miratectrim.com). E-mail [info@cmicompany.com](mailto:info@cmicompany.com).
  - B. Approved Equal
- 2.2 EXTERIOR TREATED WOOD COMPOSITE
- A. Composite Trim: "MiraTEC" treated exterior composite trim.
    - 1. Description: Exterior-grade, treated wood composite trim for non-structural applications.
  - B. Boards:
    - 1. Material: Wood fibers combined with phenolic resins, zinc borate, and water repellent. No added urea formaldehyde. Provide minimal warts of 4", 6", and 8".
    - 2. Surface: Clear cedar wood grain texture on one side, smooth the other. Factory-primed on four sides with a low VOC primer with a mildewcide.
    - 3. Substrate: 1-piece solid substrate, uniform density, not laminated. No knots or voids.
    - 4. Thickness: 4/4 Nominal
  - C. Typical Properties, 4/4 Thickness:
    - 1. Density, ASTM D 1037: 48 pounds per cubic foot.
    - 2. Modulus of Rupture, ASTM D 1037: 3,011 psi.
    - 3. 24-Hour Soak, ASTM D 1037:
      - a. Water Absorption: 6.6 percent.
      - b. Thickness Swell: 2.5 percent.

## Section 06 00 00 Exterior Treated Wood Composite Trim

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4. Accelerated Aging Test, 6-Cycle, ASTM D 1037: Retained 90 percent of original strength.
5. Termite Resistance and Decay, AWPA E7 Rating Scale, 3-Year Exposure:
  - a. 7.8 out of 10.
6. Rot Resistance, AWPA E16:
  - a. 1.0 out of 5.

### 2.3 ADHESIVES

- A. Adhesives: Designed for use on wood composite materials.

### 2.4 FINISH

- A. Paint Application:
  1. Prime and paint all exposed field-cut edges of exterior trim using a high quality exterior oil/alkyd solvent based or acrylic latex primer recommended by the manufacturer for application over composite wood substrates.
  2. Coat all exposed surfaces including the bottom edge.
  3. Finish MiraTEC trim with two coats of paint within 90 days after installation. If the material is not painted within 90 days, reprime the trim using an exterior primer that is recommended for use on composite wood products and is compatible with the topcoat to be used. Use the same primer for repair of any damage to the original factory applied primer.
  4. A total field-applied dry film paint thickness of a minimum of 2-1/2 mils is required on MiraTEC trim.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and surfaces to receive composite materials. Notify Architect if areas or surfaces are not acceptable. Do not begin installation until unacceptable conditions have been corrected.

### 3.2 INSTALLATION

- A. Cutting
  1. Use a fine toothed hand saw or power saw with a combination blade.
  2. Cut into exposed face of the material
- B. Fastening
  1. Double nail a maximum of 16" O.C. for all trim applications.
  2. Double nail a maximum of 24" O.C. for fascia.
  3. Do not nail into cut edge of material.
  4. Nails must penetrate a minimum of 1 1/4" into framing member.
  5. Fasten MiraTEC trim from one end to the other, do not nail towards the ends from center.
- C. Butt Joints
  1. All joints must fall over a framing member.
  2. For runs over 30', space all butt and scarf joints 1/8" and apply sealant into the full depth of the 1/8" joint. For runs less than 30', butt joints should lightly touch.
  3. Double nail on both sides of joint, at least 1/2" from the edge.
- D. Fasteners
  1. Use 6d or 8d nails long enough to penetrate 1 1/4" into structural framing member.
  2. Use 304 Stainless Steel screws.
  3. Screws, ring shank nails, etc. can be used as long as they meet the same minimum performance criteria as above. Do not use staples or T nails.
  4. Tapered or bugle head fasteners are permitted when heads are properly seal from moisture.
  5. Do not countersink fasteners more than 1/8". All slightly counter sunk fasteners less than 1/8" should be filled with exterior putty and painted.
- E. Flashing and Moisture Control
  1. Do not apply trim to wet sheathing.
  2. Do not apply trim closer than 6" to finished grade or landscaping.
  3. Do not allow the trim to stand in water.
  4. Do not allow direct contact with masonry or concrete. Properly flash and space a minimum of 1/2" from any concrete flatwork or horizontal brick ledge.

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### Exterior Treated Wood Composite Trim

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5. At foundations or brick veneer, the product should be separated from the masonry by metal flashing, polyethylene film, 30 lb. felt or a ¼" to ½" air space using masonry standoffs.
- F. Sealant
1. Do not allow water to stand on or leak behind any trim.
  2. Sealant is required at butt joints and where trim abuts siding, windows, doors, or other materials.
  3. Do not use hard-setting caulk or Bondo®. Use exterior quality sealants and spackling putties that remain flexible over time.
  4. Caulks and sealants that at a minimum meet ASTM C920 are recommended.
- G. Machining
1. Maintain a minimum angle of 100 degrees from the vertical to provide positive drainage.
  2. Reprime all machined areas.

**END OF SECTION**

**Section 06 00 00**  
**Exterior Treated Wood Composite Trim**  
Specifications

06 00 00-4

# Section 06 10 00 Rough Carpentry

Specifications

06 10 00-1

## PART 1 - GENERAL

- 1.01 SECTION INCLUDES
- A. Blocking and bucks in wall openings; wood furring and grounds, concealed wood blocking.
  - B. Concealed wood blocking for support where illustrated in drawings, and as required for attachment and support of doors, reinforcing, and trim.
- 1.02 RELATED SECTIONS
- A. Section 01 81 13 – Sustainable Design Requirements
- 1.03 REFERENCES
- A. ALSC (American Lumber Standards Committee) - Softwood Lumber Standards.
  - B. ANSI A208.1 - Mat-Formed Wood Particleboard.
  - C. APA (American Plywood Association).
  - D. NFPA (National Forest Products Association).
  - E. SPIB (Southern Pine Inspection Bureau).
- 1.04 QUALITY ASSURANCE
- A. Perform Work in accordance with the following agencies:
    - 1. Lumber Grading Agency: Certified by ALSC.
    - 2. Plywood Grading Agency: Certified by APA.

## PART 2 - PRODUCTS

- 2.01 LUMBER MATERIALS
- A. Lumber Grading Rules: WWPA.
  - B. Non-Structural Light Framing: 1x, 2x, and 4x Southern Pine species, 19 percent maximum moisture content pressure preservative treat.
  - C. Plate, Nailers: Pressure treated Southern Pine.
  - D. Plywood: APA rated appropriate for use; thicknesses as required to achieve detail requirements or as specifically indicated in drawings.
- 2.02 FACTORY WOOD TREATMENT
- A. Wood Preservative Pressure Treatment: AWPA Treatment C1 using water borne preservative with 0.25 percent retainage.
  - B. Wood Preservative Surface Application: Clear type.
  - C. Composite wood and agrifiber products are to contain no added urea-formaldehyde resins.

## PART 3 - EXECUTION

- 3.01 SCHEDULES
- A. Blocking: S/P/F species, 19 percent maximum moisture content, pressure preservative treatment.
  - B. Plywood Underlayment: Comply with DOC PS 1. Exposure 1 shall have fully sanded face.

**END OF SECTION**

## Section 06 17 53

### Wood Trusses

Specifications

06 17 53-1

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION

- A. Trusses are single plane, metal plate connected wood trusses fabricated from conventional dimensional lumber.
- B. Work included: Provide the design and fabrication of wood trusses where shown on the drawings, as specified herein, and as needed for a complete and proper installation.

##### 1.2 APPLICABLE STANDARDS

- A. The applicable portions of the current editions of the following standards are a part of these specifications.
  - 1. National Design Specification for Wood Construction published by the National Forest Products Association.
  - 2. Design Specification for Metal Plate Connected Wood Trusses published by The Truss Plate Institute.
  - 3. American Society for Testing & Materials (ASTM)
    - a. ASTM A446 Grade A
    - b. ASTM A525 Coating Designation G60
  - 4. Timber Construction Manual published by American Institute of Timber Construction.

##### 1.3 QUALITY ASSURANCE

- A. Design:
  - 1. Provide the services of a structural engineer registered to practice in the State of Louisiana to design the wood trusses and any permanent bracing required by the truss design to support the specified design loads for the spans, profiles, and arrangements shown on the drawings.
  - 2. Comply with pertinent provisions of all applicable standards and the building code having jurisdiction.
  - 3. The truss manufacturer is to furnish the temporary bracing requirements as recommended by the Truss Plate Institute. The temporary bracing is to maintain the trusses in a stable condition until all specified permanent bracing and the roof deck are in place and properly attached.
- B. Fabrication:
  - 1. The trusses shall be manufactured by a firm established to perform this work. The manufacturer must have the prior approval of the Architect.
  - 2. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

##### 1.4 SUBMITTALS

- A. Product data: As soon as possible after the Contractor has received the Owner's Notice to Proceed, submit a minimum of five copies of the following:
  - 1. Materials list of items proposed to be provided under this Section.
  - 2. Hurricane clip cut sheets that show uplift capacity, fastener requirements and gage of metal.
  - 3. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
  - 4. Shop Drawings shall include component details and system layout drawings. Such submittals shall identify the project and list loading criteria. Drawings shall identify and locate all components and shall specify member sizes, species, and stress grades of lumber proposed to be used; pitch, span, camber, configuration, and spacing of trusses; connector type, thickness, size, location, and design value; bracing, anchorage, and all other necessary fabrication and erection information.
  - 5. Complete design calculations bearing the seal of a professional engineer registered to practice in the State of Louisiana.
  - 6. Manufacturer's recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the work.

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### Wood Trusses

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#### 1.5 PRODUCT HANDLING

- A. The TRUSSES if stored prior to erection shall be stored in a vertical position and protected from the weather. They shall be handled with care, so they are not damaged. The trusses are to be erected and installed in accordance with the plans, and the Truss Manufacturer's drawings and installation specifications. Temporary construction loads which cause member stresses beyond design limits are not permitted. Erection bracing in addition to specified bridging is to be provided to keep the trusses straight and plumb as required to assure adequate lateral support for the individual truss and entire system until the sheathing material has been applied. The Contractor will give notification prior to enclosing the trusses to provide opportunity for inspection of the installation by the manufacturer's representative.

#### PART 2 – PRODUCTS

##### 2.01 MATERIALS

- A. All truss members are to be manufactured from No. 2 K. D. Southern yellow pine having a maximum moisture content of 19%.
- B. Connector plates shall be a minimum thickness of 0.036 inches and shall be manufactured from steel meeting the requirements of ASTM A446 Grade A and shall be hot dipped galvanized according to ASTM A525 Coating Designation G60.
- C. All truss top and bottom chord members shall be 2x6 or larger unless noted otherwise.

##### 2.2 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

#### PART 3 – EXECUTION

##### 3.01 FABRICATION

- A. Prefabricate in strict accordance with the shop drawings and other data approved by the Architect.
- B. Size, stress and arrangement shall be determined by the dimensions and loads indicated on the plans, each truss shall be custom designed to fit the dimensions and loads indicated on the plans. Complete design calculations showing internal layout, member forces and stress control points are to be furnished for each truss design. The design of the SINGLEPLANE TRUSSES is to be under the supervision of a Registered Professional Engineer, furnish Engineer's Certification.

##### 3.02 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

##### 3.03 INSTALLATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.
- B. Install the work of this section in strict accordance with the original design, the approved shop drawings, pertinent requirements of governmental agencies having jurisdiction, and the Truss Plate Institute and manufacturer's recommended installation procedures. Anchor all components firmly into position.
  - 1. Hoist the trusses into position with proper bracing secured at designated lifting points.
  - 2. Exercise care to keep out-of-place bending of trusses to a minimum.
  - 3. Install temporary horizontal and cross bracing to hold trusses plumb and in safe condition until permanent bracing is installed.
  - 4. Install permanent bracing and related components prior to application of loads to trusses.
  - 5. Do not cut or remove any truss members.
  - 6. Roof truss anchorage shall be by hurricane clips. Hurricane clips shall have the ability to resist the design uplift loads. Hurricane truss anchors shall be provided at each corner and at every truss bearing point. Where an anchored truss bears on an intermediate point, a truss anchor shall be installed at that bearing point. Trusses to be set 2'-0" maximum spacing. Brace temporarily and permanently to sustain a vertical position under construction and design loads. Block eaves and ridges to provide straight alignment of trusses.

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### **Wood Trusses**

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- C. The Contractor is responsible for proper wood truss handling, alignment of the trusses, and proper temporary bracing. All permanent bracing and connections required by the truss design are also the responsibility of the Contractor as well as sufficient bracing to hold every truss member in the position assumed for its design. The proper temporary bracing provided by the Contractor shall equal or exceed those recommendations as set forth by the TRUSS PLATE INSTITUTE, INC. "BRACING WOOD TRUSSES: COMMENTARY AND RECOMMENDATIONS BW-76.

**END OF SECTION**



**Section 06 17 53**

**Wood Trusses**

Specifications

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# Section 06 40 00 Interior Architectural Woodwork

Specifications

06 40 00-1

## PART 1 GENERAL

### 1.01 SUMMARY: Section Includes:

- A. Specially fabricated custom casework, wood to receive paint finish or high pressure decorative laminate finish
- B. Specially fabricated custom countertops, solid surfacing fabrications
- C. Hardware typically furnished by the woodwork manufacturer:
  - 1. Cabinet door hinges
  - 2. Cabinet door and drawer pulls, when specified in this section
  - 3. Drawer glides
  - 4. Cabinet door and drawer locks, when specified in this section
  - 5. Adjustable shelf standards and/or support brackets or clips
  - 6. Grommets
- D. Shop or Factory finishing or pre-finishing of all transparent finish millwork
- E. Installation of work furnished under this section

### 1.02 RELATED SECTIONS

- A. Rough carpentry, wood blocking, and grounds within finished walls and above finished ceiling
- B. Finish carpentry, wood trim other than specified in this section
- C. Plumbing section(s)

### 1.03 REFERENCES

- A. Architectural Woodwork Institute AWI Quality Standards, current edition
- B. ANSI/BHMA A156.9 - Cabinet hardware
- C. ANSI A208.1 – Mat-Formed Wood Particleboard.
- D. ANSI A135.4 – Basic Hardboard.
- E. NEMA LD3 – High pressure decorative laminate
- F. ANSI/HPVA HP-1 – Decorative plywood and paneling

### 1.04 SUBMITTALS

- A. Product Data: For Plywood, solid-surfacing fabrications, high-pressure decorative laminate, adhesive for bonding plastic laminate, cabinet hardware and accessories, and finishing materials and processes.
- B. Shop drawings: Show locations of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.
  - 1. Submit according to Section 01 33 00. Include statement on front page indicating that Fabrication, Finishing and Installation will be performed in compliance under the specified AWI Quality Standard.
  - 2. Indicate plans and elevations, materials, surface grain directions, profiles, assembly methods, joint details, fastening methods, accessories, hardware, compliance with specified fire retardant treatments and schedule of finishes
  - 3. Show locations and sizes of furring, blocking and hanging strips, including concealed blocking and reinforcement specified in other Sections.
- C. Finish samples: Submit two or more sets of three samples illustrating expected range of finish color and grain for each species.
  - 1. Lumber with transparent finish, 5 inches wide by 17 inches long, for each species and cut, finished on 1 face and 2 edges.
  - 2. Wood veneer-faced panel products with or for transparent finish, 10 by 16 inches, for each species and cut. Include at least one face-veneer seam and finish as specified.
  - 3. Plastic-laminate clad panel products: 8 by 10 inches, for each type, color, pattern, and surface finish, with separate samples of un-faced panel product used for core.
  - 4. Solid-surfacing fabrications: 8 by 10 inches, for each type, color, pattern, and surface finish, including control sample of field-installed seaming.
  - 5. Corner pieces as follows: Miter joints for standing trim.
  - 6. Exposed cabinet hardware and accessories, one unit for each type and finish.

### 1.05 QUALITY ASSURANCE

- A. Perform work in accordance with the following:
  - 1. All woodwork: AWI Custom Grade quality.
- B. Work in this Section shall comply with the specified Grades of the current edition of the Architectural Woodwork Institute Quality Standards.

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- C. Woodwork manufacturers and installers shall be certified by the AWI Quality Certification Program as competent to perform the work.
  - D. Contractors and personnel engaged in work shall demonstrate successful experience with work of comparable extent, complexity and quality to that shown and specified.
- 1.06 MOCKUP
- A. Provide mockup of typical base cabinet, and countertop.
  - B. Provide units with hardware installed, and material thickness as indicated.
  - C. Contractor may use any species of finish materials for mock-up. If specified materials are used, at Contractor's option, the approved mockup may remain as part of the Work.
- 1.07 DELIVERY, STORAGE AND HANDLING
- A. Deliver, store, and handle products to site under provisions of applicable Sections.
  - B. Protect units from moisture damage according to AWI Quality Standards, Section 1700,
  - C. Millwork shall not be delivered to jobsite before building is fully enclosed and conditioned. If contractor elects to have millwork delivered to jobsite prior to building is conditioned, the contractor shall be responsible for any damage. Contractor acknowledges that this violates the requirements for AWI Premium Grade millwork, and assumes liability for this violation.
- 1.08 FIELD MEASUREMENTS
- A. Verify that field measurements are as indicated on shop drawings.
- 1.09 COORDINATION:
- A. Coordinate work with applicable electrical, special systems, mechanical trades and rough-in
- 1.10 WARRANTY:
- A. Provide manufacturer's five (5) year warranty against defects in materials. Warranty shall provide material and labor to repair or replace defective materials.
- 1.11 CLOSEOUT
- A. Comply with Section 01 70 00 for Closeout Procedures.
  - B. Submit list of approved cleaning materials and procedures, and a list of substances harmful to the component materials. Include instructions for stain removal, surface and gloss restoration.

### PART 2 PRODUCTS

- 2.01 MANUFACTURERS
- A. Acceptable manufacturers shall be certified by the AWI Quality Certification Program to perform work in this Section of the AWI Grade of Work specified
- 2.02 WOOD MATERIALS
- A. Softwood Lumber: Graded in accordance with AWI for Grade of Work Specified mill-option species, moisture content of 6-8 percent
  - B. Hardwood Lumber: Graded in accordance with AWI for Grade of Work specified; plain-sawn Red Oak, moisture content of 8-10 percent; of quality suitable for transparent finish
- 2.03 SHEET MATERIALS
- A. Hardwood Plywood 1: Graded in accordance with AWI for Grade of Work specified; plywood only (no particleboard or MDF allowed), type of glue recommended for application; plain-sawn Red Oak, clear finish to match sample in Architect's office. Bookmatched between adjacent veneer leaves, panel endmatched, and center balanced matched. **\*\*NOTE: Matching requirements will be strictly reviewed and adhered to.\*\***
    - 1. Door and Drawer fronts: plain-sawn select red oak
    - 2. Drawer construction: min. 5/8" thick white melamine with fully housed 1/4" black melamine bottom
  - B. Hardwood Plywood 2: Graded in accordance with AWI for Grade of Work specified; plywood only (no particleboard or MDF allowed), type of glue recommended for application; high pressure decorative laminate, in color and finish as indicated on Drawings.
    - 1. Door and Drawer fronts: HPDL
    - 2. Drawer construction: min. 5/8" thick white melamine with fully housed 1/4" black melamine bottom

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- 2.04 MANUFACTURERS – HIGH PRESSURE DECORATIVE LAMINATE  
Subject to compliance with requirements, provide products by one of the following:
- A. Plastic Laminate: Wilsonart, Formica, or Nevamar; colors and textures per the Drawings or as described in specifications
- 2.05 LAMINATE MATERIALS
- A. In addition to the plastic laminate quality levels indicated in the paragraphs below, AWI also includes the following sheet types:
    - 1. HGS – General Purpose .048" Horizontal faces
    - 2. VGL – General Purpose .020" Vertical faces
    - 3. CLS – Cabinet liner .020"
    - 4. BKL – Unfinished Backing Sheet .020"
  - B. Thermoset decorative overlay: White Melamine, no pattern, and matte surface texture as selected by Architect on #45 industrial rated particle board. For interiors of cabinets with fully closing doors. Open cabinet interiors to be covered with the same color and thickness of plastic laminate as that specified on door and drawer faces of adjacent cabinets.
  - C. Plastic laminate backings are to be used on the reverse surface of plastic laminated components, to assist in maintaining dimensional stability by reducing moisture intrusion and subsequent warping of the core material.
  - D. Edgebanding shall be continuously securely fastened and shall have "eased" edges.
  - E. Obvious changes in veneer appearance shall not be acceptable.
- 2.06 ACCESSORIES
- A. Fasteners: Size and type to suite application
  - B. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; all connections shall be concealed
  - C. Concealed Joint Fasteners: Threaded steel
  - D. Grommets: Plastic; install 2 ½" grommets with "Flip-Top" tab in cap; directly above all below-surface electrical and special system receptacles located below counter surfaces.
    - a. Manufacturer: Doug Mockett & Co., Model EDP3 or approved equal.
  - E. Cable Raceway at Millwork: Doug Mockett & Co. Model WM 27 or approved equal; provide at all kneespaces and where shown on drawings.
  - F. Keyboard Drawer: Knape & Vogt Model No. SD-1 or approved equal; provide at all kneespaces and where shown on drawings.
  - G. Edge Bands: PVC at laminated or painted millwork; color to match adjacent laminate or paint.
- 2.07 HARDWARE
- A. Manufacturers: Blum, Accuride, Knape and Vogt, Ives, Stanley and approved equals.
    - 1. Pulls: U-shaped, 4" centers, ¼" diameter chrome finish
    - 2. Drawer Slides: equal to Accuride 3832 SC, white finish.
    - 3. Adjustable Shelf Supports: Dual-pin design with anti-tip-up shelf restraints.
      - a. Include keel to retard shelf slide-off, and slot for mechanical attachment of shelf to clip.
      - b. Load rating of 300 pounds minimum each support without failure.
    - 4. Hinges: European Style, concealed, self-closing type; steel with polished finish.
      - a. One and Half pair per door to 48-inch height; two pair over 48 inches.
      - b. Hinge shall accommodate size doors for location, and allow 270 deg swing.
    - 5. Locks: Five disk tumbler cam-style with strike. Removeable lock core with control key, permitting lock arrangement change without tools. BHMA A156.11, chrome finish; NOTE: keyed to Owner's requirements.
- 2.08 FABRICATION
- A. Fabricate to **AWI Custom Standards**
  - B. Door and Drawer Fronts: 3/4" thick; flush overlay.
  - C. Shop-assemble casework for delivery to site in units easily handled and to permit passage through building openings
  - D. Fit shelves, doors, and exposed edges with matching veneer, matching hardwood edging. Use one piece for full length only.
  - E. Cap exposed plastic laminate finish edges with material of same finish and pattern

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- F. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
- G. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Locate counter butt joints minimum two feet from sink cut-outs.
- H. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces as required by AWI Quality Standard.
- I. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and fittings. Verify locations of cutouts from onsite dimensions. Seal contact surfaces of cut edges.
- J. Provide holes with trim rings or grommets between vertical dividers in base cabinet compartments and kneespaces.

### 2.09 FINISHING

- A. Sand work smooth and set exposed nails and screws as allowed by specified fabrication methods of AWI Quality Standard.
- B. Apply wood filler in exposed nail and screw indentations.
- C. Finish work in the factory in accordance with AWI Quality Standards – Section 1500 Systems
- D. Finish work to meet AWI premium Quality Standards.

### 2.10 WOOD TREATMENT

- A. All materials and assemblies specified in this section shall conform with NFPA 255, Class C for interior finishes in accordance with their flame spread and smoke development.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

### 3.02 MILLWORK INSTALLATION

Install work in accordance with AWI Premium Quality Standard.

- A. Set and secure materials and components in place, plumb and level
- B. Scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps
- C. Install hardware furnished under this section in accordance with manufacturer's instructions
- D. Use fixture attachments in concealed locations for wall mounted components
- E. Use concealed joint fasteners to align and secure adjoining cabinet units, and counter tops
- F. Secure cabinet, counter bases to floor using appropriate concealed angles and anchorages
- G. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces

### 3.03 SOLID SURFACING INSTALLATION

- A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
  - 1. Provide product in the largest pieces available.
  - 2. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. **Exposed joints/seams will not be allowed.**
  - 3. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
  - 4. Cut and finish component edges with clean, sharp returns.
  - 5. Rout radii and contours to template.
  - 6. Install lavatories as integral units to be seamless fully-adhered.
  - 7. Anchor securely to base cabinets or other supports.
  - 8. Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.
  - 9. Carefully dress joints smooth, remove surface scratches and clean entire surface.
  - 10. Install countertops with no more than 1/8-inch (3 mm) sag, bow or other variation from a straight line.
- B. Repair or replace damaged work which cannot be repaired to architect's satisfaction.
- C. Cleaning and Protection

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1. Keep components clean during installation.
2. Remove adhesives, sealants and other stains.

#### 3.04 CLEANING AND PROTECTION

- A. Adjust and Clean: Repair damaged or defective work as directed. Adjust and lubricate hardware for proper operation. Clean exposed interior and exterior surfaces. Clean casework, counters, shelves, hardware, fittings, and fixtures. Remove all glue and tape.
- B. Protection: Installer of architectural woodwork shall advise Contractor of procedures required to protect architectural woodwork during remainder of construction period to ensure that work will be without damage or deterioration at time of acceptance. Contractor is responsible for protection after installation.

**END OF SECTION**

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## Section 06 41 00 Pre-fabricated Cabinets

Specifications

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### PART 1 – GENERAL

#### 1.01 SUMMARY

- A. Section includes pre-fabricated, factory-finished cabinet units; cabinet hardware; kitchen counter tops; preparation for utilities in cabinets.

#### 1.02 RELATED SECTIONS

- A. Section 01 81 13 – Sustainable Design Requirements
- B. Section 06 10 00 – Rough Carpentry

#### 1.03 REFERENCES

- A. AWI (Architectural Woodwork Institute) - Architectural Woodwork Quality Standards Illustrated.
- B. ANSI A161.1.
- C. KCMA seal of approval.

#### 1.04 SUBMITTALS

- A. Shop Drawings: Indicate materials, component profiles and elevations, joint details, accessory listings, hardware location and schedule of finishes. The specifications from each, individual cabinet manufacturer may vary. Any variations with manufacturer specifications and these specifications must be approved by the Architect prior to approval.

#### 1.05 QUALITY ASSURANCE

- A. Perform work in accordance with AWI (Architectural Woodwork Institute) Custom Grade.
- B. No added urea formaldehyde shall be used in the glues and adhesives used in the manufacturer of the cabinets or its components.

#### 1.06 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

### PART 2 – PRODUCTS

#### 2.01 MANUFACTURERS

- A. Cabinets
  - 1. Advanta Cabinets (Basis of Design)
  - 2. Quality Cabinets, Inc.
  - 3. Approved Equal.
- B. Counter Top
  - 1. Hartson Kennedy
  - 2. Approved Equal.

#### 2.02 COMPONENTS

- A. Kitchen, Bath and Amenity Room
  - 1. Cross Town 802 CRT
  - 2. Color: From Manufacturer's standard color selections.
- B. Counter Tops
  - 1. Plastic laminate, RE: Section 06 40 00 Interior Architectural Woodwork.
- C. Accessible Cabinets shall be provided at all ADA units.

#### 2.03 ACCESSORIES

- A. Filler and blind panels, floor units, matching trimmable toekicks at appliances
- B. Fasteners: Size and type to suit application.
- C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; nickel finish in concealed locations and veneer-matching finish in exposed locations.
- D. Concealed Joint Fasteners: Threaded steel.
- E. Hinges: Concealed European style, 105 degree opening.
- F. Shelf Supports: Adjustable
- G. Drawer Slides: 75 lb. side mounted.



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- H. Pulls: selected by Owner.
- I. Finish of all cabinet hardware shall best match that of the door hardware of Section 08 71 00.

### 2.04 FABRICATION

- A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
- B. Fit shelves, doors, and exposed edges with matching veneer edging. Use one piece for full length
- C. Cap exposed decorative laminate finish edges with material of same finish and pattern.
- D. Door and Drawer Fronts: 3/4-inch-thick; poplar frame flat panel, flush fit.
- E. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
- F. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
- G. Mechanically fasten back splash to countertops with steel brackets at 16 inches on center.
- H. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, fixtures and fittings, etc. Verify locations of cutouts from on-site dimensions. Seal cut edges.

## PART 3 – EXECUTION

### 3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

### 3.02 INSTALLATION

- A. Set and secure casework in place; rigid, plumb, and level.
- B. Use fixture attachments in concealed locations for wall mounted components.
- C. Use concealed joint fasteners to align and secure adjoining cabinets, countertops, etc.
- D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 of an inch. Do not use additional overlay trim for this purpose.
- E. Secure cabinet and counter bases to floor using appropriate angles and anchorages.
- F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

### 3.03 ADJUSTING

- A. Adjust moving or operating parts to function smoothly and correctly.

### 3.04 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

**END OF SECTION**

# Section 06 60 00

## Plastic Fabrications

Specifications

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### PART 1 – GENERAL

- 1.1 WORK INCLUDES
  - A. “Cultured marble” fabrications as indicated in drawings.
- 1.2 SUBMITTALS
  - A. Product Data: Required.
  - B. Shop Drawings: Required
  - C. Samples: Required.
- 1.3 QUALITY ASSURANCE
  - A. Regulatory Requirements: Conform to applicable code for flame/smoke rating.

### PART 2 – PRODUCTS

- 2.1 PRODUCTS
  - A. Cast Plastic Fabrications:
    - 1. Proprietary resin, integral color.
    - 2. Fabricate components by mold to achieve shape and configuration.
    - 3. Gel coat the finish exposed surfaces with colored resin gel.
    - 4. Surface finish: flat sheen.
    - 5. Color to be determined.

### PART 3 – EXECUTION

- 3.1 SCHEDULES
  - A. On drawings.
  - B. Cast Plastic Fabrications:
    - 1. Bath Tubs / Shower Surround: One per bathroom, rectangular nominal size of 30 inches wide, 60 inches high, and 60 inches long, contoured interior, full surround 1/2 inch (13 mm) thick without joints, of flat surface finish. Surround shall have an integral soap dish on the 60” long surface. Verify all conditions on site. Install in strict accordance with manufacturer’s installation requirements.

**END OF SECTION**

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**Plastic Fabrications**  
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# Section 07 18 13 Pedestrian Traffic Coating

Specifications

07 18 13-1

## PART 1- GENERAL

### 1.01 SUMMARY

- A. Section Includes:
  - 1. Provide labor, materials, equipment and supervision necessary to install a fluid-applied pedestrian traffic coating system as outlined in this specification to concrete surfaces and exterior gypsum sheathing.
  - 2. The manufacturer's application instructions for each product used are considered part of this specification and should be followed at all times.
- B. Related Sections:
  - 1. Section 03300 – Cast-in-Place Concrete
  - 2. Section 07270– Weather Barriers

### 1.02 SYSTEM DESCRIPTION

- A. Pedestrian Traffic Coating shall be a complete system of compatible materials supplied by a single manufacturer to create a seamless waterproof membrane with integral wearing surface.
- B. Pedestrian Traffic Coating shall be designated for application on the specific type of deck indicated on the drawings.

### 1.03 SUBMITTALS

- A. Technical Data: Submit manufacturer's product data and material safety data sheets (MSDS) on each product.
- B. Samples: Submit samples of specified pedestrian traffic coating system. Samples shall be construed as examples of finished color and texture of the system only.
- C. Applicator Approval: Submit letter from manufacturer stating applicator is approved to install the specified pedestrian traffic coating system.
- D. Warranty: Submit copy of manufacturer's warranty, which has been prior approved by the State of Louisiana.

### 1.04 QUALITY ASSURANCE

- A. Supplier Qualifications: Manufacturer shall present at least three (3) installations of similar scope within 250 miles of project location.
- B. Applicator Qualifications: Applicator shall be approved to install specified system.
- C. Requirement of Regulatory Agencies: Comply with applicable codes, regulations, ordinances and laws regarding use and application of coating systems.
- D. Field Sample:
  - 1. Install a field sample of at least 4 square feet at the project site or pre-selected area as agreed to by owner's representative, applicator, and manufacturer.
  - 2. Apply material in accordance with manufacturer's written application instructions.
  - 3. Field sample will be standard for judging construction for workmanship comparison.
  - 3. Do not alter, move, or destroy field sample until work is completed and approved by Owner's representative.

### 1.05 DELIVERY, STORAGE, AND PROTECTION

- A. Delivery: Materials shall be delivered in original sealed containers, clearly marked with supplier's name, brand name and type of material.
- B. Storage and Handling: Recommended material storage temperature is 75°F (23°C). Handle products to prevent damage to container. All materials shall be stored in compliance with local fire and safety requirements. Do not store at high temperatures or in direct sunlight.

### 1.06 PROJECT CONDITIONS

- A. Prior to starting work, read and follow the Material Safety Data Sheets (MSDS) and container labels for detailed health and safety information.
- B. Do not proceed with application of materials when substrate temperature is less than 40°F, if precipitation is imminent, or to a damp, unclean or frosty surface. Ambient temperature should be a minimum 40°F and rising, and more than 5°F above dew point. Special precautions are to be taken

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- when ambient and/or substrate temperatures are approaching, at, or above 100°F and it may be necessary to limit material application to evening hours for exterior exposed decks
- C. Coordinate waterproofing work with other trades. Applicator shall have sole right of access to the specified area for the time needed to complete the application and allow the pedestrian traffic coatings to cure adequately.
  - D. Protect plants, vegetation or other surfaces not to be coated against damage or soiling.
  - E. Keep products away from spark or flame. Do not allow the uses of spark-producing equipment during application and until all vapors have dissipated. Post "No Smoking" signs.
  - F. Maintain work area in a neat and orderly condition, removing empty containers, rags and rubbish daily from the site.

### 1.07 WARRANTY

- A. Manufacturer shall provide a five (5) year warranty fully covering all labor and materials against failure of the system, water tightness or improper installation. Warranty shall begin upon Substantial Completion of the project.

## PART 2- PRODUCTS

### 2.01 MANUFACTURERS/PRODUCTS

- A. Acceptable Manufacturers
  - 1. PEDA-GARD® by NEOGARD® Division of Jones-Blair® Company, 2728 Empire Central, Dallas, TX 75235, (800) 321-6588, www.neogard.com.
  - 2. Carlisle

### 2.02 MATERIALS

- A. Pedestrian Traffic Coating Materials:
  - 1. Primer: T760/7761 epoxy primer
  - 2. Flashing Tape: 86216 flashing tape.
  - 3. Reinforcing Fabric: 86220 reinforcing fabric (Tietex T-272).
  - 4. Sealant: 7991 or 70995 urethane sealant.
  - 5. Aggregate: 7992 (16/30 mesh) silica (quartz) sand.
  - 6. Base Coat: 70410 urethane coating,
  - 7. Wear Coat: 7430 series urethane coating.
  - 8. Topcoat: 7430 series urethane coating.

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### 2.03 MATERIAL PERFORMANCE CRITERIA

A. Typical physical properties of cured pedestrian traffic coating materials used on this project are:

PERFORMANCE REQUIREMENTS OF CURED FILM			
PHYSICAL PROPERTIES	TEST METHOD	70410	7430 Series
Tensile Strength	ASTM D412	1,200 psi	2,500 psi
Elongation	ASTM D412	400%	400%
Permanent Set	ASTM D412	<10%	<30%
Tear Resistance	ASTM D1004	100 pli	200 pli
Water Resistance	ASTM D471	<3% @ 7 days	<3% @ 7 days
Taber Abrasion, 1,000 cs-17	ASTM D4060	N/A	25 mg
Shore A	ASTM D2240	70-75	75-80
Adhesion	ASTM D4541	300 psi	300 psi
"Standard Specifications for High Solids Content, Cold-Applied Elastomeric Waterproofing Membrane with Integral Wearing Surface"	ASTM C957	System Exceeds Requirements	

### 2.04 ACCESSORIES

A. Miscellaneous materials such as cleaning agents, adhesives, reinforcing fabric, backer rod, deck drains, etc., shall be compatible with the specified pedestrian traffic coating system.

### 2.05 MIXING

A. Comply with manufacturer's instructions for mixing procedures

## PART 3 – EXECUTION

### 3.01 EXAMINATION

- A. Concrete: Verify that the work done under other sections meets the following requirements:
1. That the concrete deck surface is free of ridges and sharp projections. If metal forms or decks are used, they should be ventilated to permit adequate drying of concrete.
  2. That the concrete was cured for a minimum of 28 days. (Minimum of 3,000 psi compressive strength). Water-cured treatment of concrete is preferred. The use of concrete curing agents, if any, shall be of the sodium silicate base only; others require written approval by NEOGARD®.
  3. That the concrete was finished by a power or hand steel trowel followed by a soft hair broom to obtain light texture or "sidewalk" finish.
  4. That damaged areas of the concrete deck be restored to match adjacent areas. Use 70714/70715-09 clear 100% solids epoxy and sand for filling and leveling.
- B. Exterior Sheathing: Verify that the sheathing work done under other sections meets the following requirements:
1. Joist spacing beneath plywood deck has a maximum spacing of 16" O.C.
  2. Prior to application of pedestrian traffic coating system, protect sheathing from moisture.

### 3.02 PREPARATION

- A. Concrete:
1. Cleaning: Surfaces contaminated with oil or grease shall be vigorously scrubbed with a stiff bristle broom and a strong non-sudsing detergent such as NEOGARD® 8500 BioDegradable Cleaner. Thoroughly wash, clean, dry. Areas where oil or other

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- contaminants penetrate deep into the concrete may require removal by mechanical methods.
2. Shot-Blasting: Required surface preparation method for remedial construction is also the preferred method for new construction. Mechanically prepare surface by shot-blasting to industry standard surface texture (ICRI's CSP3-CSP4) without causing additional surface defects in substrate. Shot-blasting does not remove deep penetrating oils, grease, tar, or asphalt stains. Proper cleaning procedures should be followed to ensure proper bonding of the deck coating.
  3. Acid Etching: If shot-blasting is not practical, treat concrete surfaces with 10% to 15% solution of muriatic acid to remove laitance and impurities. After acid has stopped foaming or boiling, immediately rinse thoroughly with water. Re-rinse as required to remove muriatic solution. Acid etching do not remove deep penetrating oils, grease, tar or asphalt stains. Proper cleaning procedures should be followed to ensure proper bonding of the deck coating.
  4. Cracks and Cold Joints: Visible hairline cracks (less than 1/16" in width) in concrete and cold joints shall be cleaned, primed as required and treated with thoroughly mixed 70410 base coat material a minimum distance of 2" on each side of crack to yield a total thickness of 30 dry mils. Large cracks (greater than 1/16" in width) shall be routed and sealed with 70991 or 70995 sealant. Sealant shall be applied to inside area of crack only, not applied to deck surface. Detail sealed cracks with thoroughly mixed 70410 base coat material a distance of 2" on each side of crack to yield a total thickness of 30 dry mils.
  5. Control Joints: Seal control joints equal to or less than 1" in width with 70995 urethane sealant. Depending on the width to depth ratio of the joint, backing material and a bond breaker may be required. Install sealants in accordance with ASTM C 1193 and manufacturer's instructions. Detail sealed joints with thoroughly mixed 70410 base coat material a distance of 2" on each side of joint to yield a total thickness of 30 dry mils.
  6. Flashing Tape: Install 86218 flashing tape and 86220 reinforcing fabric where indicated on the drawings and/or where required by the manufacturer prior to the application of base coat.
  7. Surface Condition: Surface shall be clean and dry prior to coating.
- B. Exterior Sheathing:
1. Ensure surface is fully cleaned and completely dried.
  2. Prime sheathing surface to receive coating.

### 3.03 APPLICATION

- A. Factors That Affect Dry Film Thickness: Volume of solids, thinning, surface profile, application technique and equipment, overspray, squeegee, brush and roller wet out, container residue, spills and other waste are among many factors that affect the amount of wet coating required to yield proper dry film thickness. To ensure dry film thickness is achieved, use a wet mil gauge to verify actual thickness of wet coating applied, adjusting as needed for those factors which directly affect the dry film build.
- B. Seed and Lock Method:
1. Primer: When required, thoroughly mix primer and apply at a rate of 300sf/gal (0.33 gal/100 sf) to all concrete surfaces. Within 24 hours of application of primer, base coat must be applied. If base coat cannot be applied within 24 hours, inspect surface for contaminants, clean surface as necessary, and re-prime.
  2. Base Coat: Thoroughly mix 70410 base coat material and apply at a rate of 66 sf/gal (1.5 gal/100 sf or 24 wet mils), to yield 18 dry mils. Extend base coat over cracks and control joints which have received detail treatment.
  3. Wear Coat: Thoroughly mix 7430 series wear coat material and apply at a rate of 200 sf/gal (0.5 gal/100 sf or 8 wet mils), to yield 6 dry mils, and immediately broadcast aggregate, evenly distributed, into wet coating at the rate of 10 lbs./100 sf. When dry, remove access aggregate.
  4. Topcoat: Thoroughly mix 7430 series topcoat material and apply at a rate of 150 sf/gal (0.66 gal/100 sf or 10 wet mils), to yield 8 dry mils. Note: System coating thickness is 32 dry mils exclusive of primer and aggregate.

## **Section 07 18 13 Pedestrian Traffic Coating**

Specifications

07 18 13-5

### 3.04 CLEANING

- A. Remove debris resulting from completion of coating operation from the project site.
- B. Reference NEOGARD® Traffic-Bearing Systems Maintenance Manual for typical cleaning methods.

### 3.05 PROTECTION

- A. After completion of application, do not allow traffic on coated surfaces for a period of at least 48 hours at 75°F, and 50% R.H., or until completely dried.

**END OF SECTION**



**Section 07 18 13**  
**Pedestrian Traffic Coating**  
Specifications

07 18 13-6

# Section 07 21 00 Building Insulation

Specifications

07 21 00-1

## PART 1 - GENERAL

- 1.01 SECTION INCLUDES
- A. Kraft faced insulation at exterior walls, Unfaced sound attenuation batts in partitions and above suspended ceilings.
  - B. Vapor Barrier at crevices, corners, intersections, where the insulation is not applied, as required to provide continuous vapor barrier envelope around building.
  - C. Mineral fiber insulation at perimeter gaps
- 1.02 RELATED SECTIONS
- A. Section 09 21 16 – Gypsum Board Assemblies.
- 1.03 SYSTEM DESCRIPTION
- A. Extent of insulation work is shown on drawings and indicated by this section.
- 1.04 REFERENCES
- A. ASTM C578 - Preformed, Cellular Polystyrene Thermal Insulation.
  - B. ASTM C665 - Mineral Fiber Batt Blanket Insulation
  - C. ASTM C612 – Mineral Fiber Block and Board Thermal Insulation
  - D. ASTM E 96 – Standard Test for Vapor Transmission
  - E. ASTM E 283 – Air Leakage Rate
  - F. ASTM D 2856 – Open Cell Content
  - G. ICC ES – Report ER-2331
- 1.05 ENVIRONMENTAL REQUIREMENTS
- A. Install insulation adhesives in accordance with manufacturer's instructions.

## PART 2 - PRODUCTS

- 2.01 INSULATION MATERIALS
- A. Batt Insulation: ASTM C665, preformed glass fiber batts, friction fit, conforming to the following:
    - 1. Kraft faced at exterior walls; unfaced (sound attenuating) at interior walls; between floor/ceiling joists and as indicated on plans.
    - 2. Thicknesses; verify, as indicated in drawings.
    - 3. Manufacturers:
      - a. Johns Manville
      - b. Owens Corning
      - c. Approved Equal
  - B. Mineral Fiber Insulation: ASTM C553 and E 96, conforming to the following:
    - 1. Absorption: less than 1% by weight and volume
    - 2. Thicknesses: minimum of 4" before compressed into cavities.
    - 3. Manufacturers:
      - a. Thermafiber LLC: FireSpan
      - b. Owens Corning: Safing Insulation/MW
      - c. Approved Equal
- 2.02 ADHESIVES
- A. Adhesive: Type recommended by insulation manufacturer for application.
- 2.03 ACCESSORIES
- A. Tape: Mesh reinforced; compatible with insulation board.
- 2.04 VAPOR BARRIER
- A. Vapor Barrier: ASTM E96, reinforced 3 ply polyethylene vapor barrier; Type-65.
  - B. Tape: Asphalt mastic tape used at overlaps of vapor barrier sheets.
  - C. Patch Tape: Self-adhesive tape used to repair any holes in the vapor barrier that are caused during installation and adjacent construction.
  - D. Tape and patch tape shall be made by same manufacturer of vapor barrier.

## Section 07 21 00 Building Insulation

Specifications

07 21 00-2

### PART 3 - EXECUTION

- 3.01 EXAMINATION AND PREPARATION
- A. Verify that substrate, adjacent materials are dry and ready to receive insulation and adhesive.
  - B. Verify that vapor barrier and adjacent surfaces to be adhered are clean and dry.
- 3.02 INSTALLATION - BATT INSULATION
- A. Install insulation and vapor retarder in accordance with insulation manufacturer's instructions.
  - B. Fit insulation tight in spaces. Leave no gaps or voids.
  - C. Where insulation is required on ceilings, provide and install on associated HVAC and electrical items (diffusers/necks, light fixture backs, etc.); leave no crevasses, fitting tightly on the items so as to provide a continuous, uninterrupted layer of insulation on ceiling and all associated and integral items.
- 3.03 INSTALLATION - VAPOR BARRIER
- A. Install vapor barrier in accordance with insulation manufacturer's instructions.
  - B. Install without gaps or voids.
  - C. Secure sheet barrier to surfaces with tape. Lap edges and ends 6 inches and adhesive seal to ensure complete and continuously seal. Patch all holes with patch tape
  - D. Lap all window and door frame perimeters with barrier at wall with 3 inches of contact over frame bearing to frames with 1 inch of contact and seal.
  - E. Vapor barrier shall be installed at perimeter gap at wall and roof deck; lap vapor barrier at perimeter of corrugated steel roof deck, down face/edge of deck at building perimeter so as to prevent outside air from seeping into interstitial space.
- 3.04 SCHEDULE
- A. Install sound attenuating batts around internal walls (and perimeter of ceilings) of all rooms in such a manner to achieve attenuating performance for sound transmission.
  - B. Install mineral fiber at perimeter of exterior walls of building at crevasses between walls, beams and roof deck.
  - C. Install fiberglass batts at exterior wall for insulating purposes as indicated in drawings.

**END OF SECTION**

## Section 07 26 16 Under-Slab Vapor Barrier

Specifications

07 26 16 - 1

### PART 1 – GENERAL

#### 1.01 SUMMARY

- A. Products Supplied Under This Section
  - 1. Vapor barrier, seam tape, mastic, and pipe boots for installation under concrete slabs.
- B. RELATED SECTIONS
  - 1. Section 03 30 00 Cast-in-place Concrete

#### 1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM)
  - 1. ASTM E 1745-97 (2004) Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs
  - 2. ASTM E 154-99 (2005) Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs
  - 3. ASTM E 96-05 Standard Test Methods for Water Vapor Transmission of Materials
  - 4. ASTM F 1249-06 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor
  - 5. ASTM E 1643-98 (2005) Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs
- B. American Concrete Institute (ACI)
  - 1. ACI 302.1R-04

#### 1.03 SUBMITTALS

- A. Quality Control / Assurance
  - 1. Manufacturer's samples, literature
  - 2. Manufacturer's installation instructions and details for placement, seaming and pipe boot installation

### PART 2 – PRODUCTS

#### 2.01 MATERIALS

- A. Vapor Barrier must have all of the following qualities:
  - 1. Permeance of less than 0.01 Perms [grains/ (ft<sup>2</sup> \*hr. \* in.Hg)] per ASTM F 1249 or ASTM E 96; 15 mil thickness minimum
  - 2. ASTM E 1745 Class A
- B. Vapor Barrier products:
  - 1. Stego Wrap Vapor Barrier (15-mil) by Stego Industries LLC
  - 2. Zero Perm Vapor Barrier by Alumiseal
  - 3. Perminator by W.R. Meadows
  - 4. Substitutions: Section 01 25 00.

#### 2.02 ACCESSORIES

- A. Seam Tape:
  - 1. Permeance less than 0.3 perms per ASTM F 1249 or ASTM E 96
- C. Vapor Proofing Mastic:
  - 1. Permeance less than 0.3 perms per ASTM F 1249 or ASTM E 96
- E. Pipe Boots
  - 1. Construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

### PART 3 – EXECUTION

#### 3.01 PREPARATION

- A. Ensure that subsoil is approved by Architect or Geotechnical Engineer.
  - 1. Level and tamp or roll aggregate, sand or granular base.

#### 3.02 INSTALLATION

- A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E 1643.
  - 1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete pour.
  - 2. Lap vapor barrier over footings and/or seal to foundation walls.

**Section 07 26 16**  
**Under-Slab Vapor Barrier**

Specifications

07 26 16 - 2

3. Overlap joints 12 inches and seal with manufacturer's tape.
  4. Seal all penetrations (including pipes) per manufacturer's instructions.
  5. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
  6. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 12 inches and taping all four sides with tape.
- B. Manufacturer's representative to visit site upon completion for submittal to Architect.

**END OF SECTION**

## Section 07 27 00 Weather Barriers

Specifications

07 27 00-1

### PART 1 – GENERAL

#### 1.1 SUMMARY

- A. Section includes
  - 1. Water resistive barriers and air barrier assembly in exterior walls; weather barriers.
  - 2. Provide flashing terminations at material transitions, openings, and perimeter of building faces (horizontal and vertical).

#### 1.2 REFERENCES

- A. ASTM International:
  - 1. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
  - 2. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors By Uniform Static Air Pressure Difference.
- B. Sealant, Waterproofing and Restoration Institute:
  - 1. SWRI - Sealant Specification.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Thickness: 0.121 inches average.
- B. Breaking Strength Test: 94 pounds mean value per ASTM D 5034.
- C. Water Vapor Transmission: 9-15 perms (grains per hr.in.Hg.sqft) per ASTM E96, desiccant method.
- D. Pliability: No signs of cracking per AC38, Sec. 3.3.4.
- E. Ultraviolet Exposure: Not less than 10 months prior to exterior cladding coverage.
- F. Accelerated Aging Cycling: No signs of failure at 21 days per AC38.
- G. Water Resistance Test: Exceeds one hour per ASTM D779.
- H. Elongation: 1.9 inches mean value per ASTM D 5034, 4 inch wide sample.

#### 1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on material characteristics, performance criteria, limitations.
- C. Submit detail drawings of all flashing termination conditions, typical opening details, and perimeter of building faces (horizontal and vertical).

#### 1.5 SEQUENCING

- A. Section 01 10 00 - Summary: Work sequence.
- B. Sequence Work to permit installation of materials in conjunction with related materials and seals.

#### 1.6 COORDINATION

- A. Coordinate the Work of this section with sections referencing this section.

### PART 2 – PRODUCTS

#### 2.1 WEATHER BARRIERS

- A. Manufacturers:
  - 1. VaproShield WallShield
  - 2. Dupont Tyvek Commercial Wrap D
  - 3. Substitutions: 01 25 00

#### 2.2 ACCESSORIES

- A. Tape: compatible with sheet material.
- B. Attachments: Galvanized steel bars and anchors.

## Section 07 27 00 Weather Barriers

Specifications

07 27 00-2

### PART 3 – EXECUTION

#### 3.1 Installation

- A. Installation: Comply with manufacturer's installation instructions including but not limited to the requirements specified in this section. Sequence construction such that barrier material is not exposed for more than 12 months before covering material is applied.
- B. At locations with Stucco/ Portland Cement Plaster, provide one layer of corrugated Tyvek "Stucco Wrap" (or approved equal) over the weather barrier.
- C. Overlaps: Install shingle style to shed water, with minimum 2 inch (50 mm) overlap horizontally, 6 inch (300 mm) overlap vertically, and 12 inches (600 mm) overlap at corners, at all locations where this is possible.
- D. Fasteners at Metal Studs: Use manufacturer's recommended fasteners with up to 2 inch (50 mm) plastic disk around shank of No. 10 stainless steel self-taping screws. Use 2 inch (50 mm) long screws when 1/2 inch (12 mm) thick gypsum board is used.
- E. Fastener Pattern: Attach one fastener or more every 24 inches (600 mm) in horizontal and vertical direction.
- F. Edge Seal Where Material is Sealed to Itself: Construction Tape.
- G. Edge Seal Where Material is Sealed to Adjacent Material: Install approved sealant on the substrate 1 inch to 2 inches back from the edge of the barrier material. Press barrier material into the sealant to seal to create air and water seal. If required by location of termination, provide furring strip to hold the barrier material in place.
- H. Edge Seal at Penetrations: Install approved sealant on the substrate 1 inch (25 mm) back from the edge of the cut. Press barrier material into the sealant to create air and water seal. Install Flashing on the exterior of the barrier material to join the material to the penetration.
- I. Final Inspection of barrier material: When each section is complete, the installer shall visually inspect the installation and verify that all rows of material have overlapped the row below it, that all materials and components have been installed in a shingle fashion, that the fasteners are the proper ones, that the nailing pattern is correct, that all penetrations and terminations have been done correctly and that doors and windows have been properly flashed

#### 3.2 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.
- B. Do not permit adjacent work to damage work of this section.

**END OF SECTION**

## Section 07 42 13 Metal Wall Panels

Specifications

07 42 13-1

### PART 1 – GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications Sections, apply to this Section.

#### 1.02 SUMMARY

- A. Section Includes:
  - 1. Exposed-fastener, lap-seam metal wall panels.
- B. Related Sections
  - 1. Section 06 10 00 – Rough Carpentry
  - 2. Section 07 277 00 – Weather Barriers
  - 3. Section 07 60 00 – Flashing and Sheet Metal
  - 4. Section 07 92 00 – Joint Sealers

#### 1.03 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at project site.
  - 1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
  - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
  - 4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
  - 5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
  - 6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
  - 7. Review temporary protection requirements for metal panel assembly during and after installation.
  - 8. Review of procedures for repair of metal panels damaged after installation.
  - 9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

#### 1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. Sustainable Design Submittals:
  - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- C. Shop Drawings:
  - 1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
  - 2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 3" = 1'-0" (1:5).
- D. Calculations:
  - 1. Include calculations with registered engineer seal, verifying wall panel and attachment method resist wind pressures imposed on it pursuant to applicable building codes.
- E. Samples for Initial Selection: For each type of metal panel indicated with factory-applied finishes.
  - 1. Include Samples of trim and accessories involving color selection.
- F. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below:
  - 1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal panel accessories.

#### 1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and Manufacturer.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Field quality-control reports.
- D. Sample Warranties: For special warranties.



## Section 07 42 13 Metal Wall Panels

Specifications

07 42 13-2

- 1.06 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For metal panels to include in maintenance manuals.
- 1.07 QUALITY ASSURANCE
- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Manufacturer Qualifications: Company specializing in Architectural Sheet Metal Products.
- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Build mockup of typical metal panel assembly as shown on Drawings 16" X 48", including corner, supports, attachments, and accessories.
  2. Water-Spray Test: Conduct water-spray test of metal panel assembly mockup, testing for water penetration according to AAMA 501.2.
  3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- 1.08 DELIVERY STORAGE, AND HANDLING
- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Remove strippable protective covering on metal panels as panels are being installed. Do not leave the film on installed panels.
- 1.09 FIELD CONDITIONS
- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.
- 1.10 COORDINATION
- A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.
- 1.11 WARRANTY
- A. Galvalume Substrate Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
    - a. Structural failures including rupturing or perforating.
    - b. Deterioration of metals and other materials beyond normal weathering.
  2. Warranty Period: 20 years and 6 months from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, chipping, peeling, or failure of paint to adhere to bare metal.
  2. Finish Warranty Period: 20 years from date of Substantial Completion.

### PART 2 – PRODUCTS

- 2.01 PERFORMANCE REQUIREMENTS
- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 29 percent.
- B. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

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## Section 07 42 13 Metal Wall Panels

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1. Wind Loads: As indicated on Drawings.
2. Deflection Limits: For wind loads, no greater than 1/180 of the span.

### 2.02 EXPOSED-FASTENER, LAP-SEAM METAL WALL PANELS

- A. General: Provide factory-formed metal panels designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps. Include accessories required for weathertight installation.
- B. Corrugated-Profile, Exposed-Fastener Metal Wall Panels: Formed with alternating curved ribs spaced at 2.67 inches (68 mm) o.c. across width of panel.
  1. Manufacturer:
    - a. Berridge (Basis of Design):
      - 1) Model: S.Deck
    - b. PAC-Clad
    - c. ATAS
  2. Metallic-Coated Steel Sheet: Aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality.  
Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
    - a. Nominal Thickness: 24 Gauge
    - b. Exterior Finish: Metallic fluoropolymer
    - c. Color: As selected by Architect from manufacturer's full range.
      3. Rib Spacing: 2.67 inches (68 mm) o.c.
      4. Panel Coverage: 32 inches (813 mm)
      5. Panel Height: 0.875 inch (22 mm).

### 2.03 MISCELANEOUS MATERIALS

- A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
  1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
  2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
  3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- B. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- C. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- D. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
  1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
  2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
  3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

### 2.04 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
  1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
  2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

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3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
  - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

### 2.05 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel Panels and Accessories:
  1. Metallic Fluoropolymer: AAMA 621. Two-coat fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin by weight in color coat applied by panel manufacturer on a continuous coil coating line, with a top side dry film thickness of  $0.75 \pm 0.05$  mil ( $0.019 \pm 0.0013$  mm) over  $0.2 \pm 0.05$  mil ( $0.05 \pm 0.0013$  mm) primer coat, to provide a total dry film thickness of  $0.95 \pm 0.10$  mil ( $0.024 \pm 0.0025$  mm). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.35 mil (0.009 mm).

## PART 3 – EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
  1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
  2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
    - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

### 3.03 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
  1. Shim or otherwise plumb substrates receiving metal panels.
  2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
  3. Install screw fasteners in predrilled holes.
  4. Locate and space fastenings in uniform vertical and horizontal alignment.
  5. Install flashing and trim as metal panel work proceeds.
  6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
  7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.

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8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
  - B. Fasteners:
    1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
  - C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
  - D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
    1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
    2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
    3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
    4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
    5. Flash and seal panels with weather closures at perimeter of all openings.
  - E. Watertight Installation:
    1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels; and elsewhere as needed to make panels watertight.
    2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
    3. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.
  - F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
    1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.
  - G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.
    1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof performance.
    2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).
- 3.04 FIELD QUALITY CONTROL
- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
  - B. Water-Spray Test: After installation, test area of assembly as directed by Architect for water penetration according to AAMA 501.2.
  - C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.
  - D. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.
  - E. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
  - F. Prepare test and inspection reports.
- 3.05 CLEANING AND PROTECTION
- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
  - B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
  - C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

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**Metal Wall Panels**  
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**END OF SECTION**

# Section 07 46 46 Cementitious Siding

Specifications

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## PART 1- PRODUCTS

### 1.1 SECTION INCLUDES

- A. Fiber cement lap siding, panels, shingle, trim, fascia, moulding and accessories
- B. Factory-finished fiber cement lap siding, panels, shingle, trim, fascia, moulding and accessories; James Hardie HZ10 Engineered for Climate Siding.

### 1.2 REFERENCES

- A. AS D3359 - Standard Test Method for Measuring Adhesion by Tape Test, Tool and Tape.
- B. AS E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees
- C.

### 1.3 SUBMITTALS

- A. Submit under provisions of Section 01 33 00 – Submittals.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C. Shop Drawings: Provide detailed drawings of atypical non-standard applications of cementitious siding materials which are outside the scope of the standard details and specifications provided by the manufacturer.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 4 by 6 inches (100 by 150 mm), representing actual product, color, and patterns.

### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum of 2 years' experience with installation of similar products.
- B. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
  - 1. Finish areas designated by Architect.
  - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
  - 3. Remodel mock-up area as required to produce acceptable work.

### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store siding on edge or lay flat on a smooth level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

### 1.6 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

### 1.7 WARRANTY

- A. Product Warranty: Limited, non-pro-rated product warranty.
  - 1. HardiePlank HZ10 lap siding for 30 years.
  - 2. HardiPanel HZ10 vertical siding for 30 years.
  - 3. HardieSoffit HZ10 panels for 30 years.
  - 4. HardieTrim HZ10 boards for 15 years.
- B. Finish Warranty: Limited product warranty against manufacturing finish defects.
  - 1. When used for its intended purpose, properly installed and maintained according to Hardie's published installation instructions, James Hardie's ColorPlus finish with ColorPlus Technology, for a period of 15 years from the date of purchase: will not peel; will not crack; and will not chip. Finish warranty includes the coverage for labor and material.
- C. Workmanship Warranty: Application limited warranty for 2 years.

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### PART 2 – PRODUCTS

#### 2.1 MANUFACTURERS

- A. James Hardie Building Products, Inc., Toll Free Tel: 877-236-7526; [www.jameshardiepros.com](http://www.jameshardiepros.com) (Basis of Design)
- B. Equal by Allura.
- C. Requests for approval of equal substitutions will be considered in accordance with provisions of Section 01 25 00 – Substitutions.

#### 2.2 SIDING AND TRIM

- A. HardiePlank HZ10 lap siding, HardiPanel HZ10 vertical siding, HardieSoffit HZ10 panels and HardieShingle HZ10 siding requirement for materials:
  - 1. Fiber-cement siding - complies with ASTM C 1186 Type A Grade II.
  - 2. Fiber-cement siding - complies with ASTM E 136 as a noncombustible material.
  - 3. Fiber-cement siding - complies with ASTM E 84 Flame Spread Index = 0, Smoke Developed Index = 5.
  - 4. CAL-FIRE, Fire Engineering Division Building Materials Listing - Wildland Urban Interface (WUI) Listed Product.
  - 5. ICC-ES evaluation reports ESR-2290, ESR-1844, and ESR-2273 (IBC, IRC, CBC, CRC)
  - 6. City of Los Angeles, Research Report No. 24862.
  - 7. Miami Dade County, -Notice of Acceptance -15-0122.04.
  - 8. US Department of Housing and Urban Development Materials Release -1263f.
  - 9. California DSA PA-019.
  - 10. City of New York M EA 223-93-M.
  - 11. Florida State Product Approval -FL13192, FL13223, and FL13265
  - 12. Texas Department of Insurance Product Evaluation EC-23.
- B. Lap Siding: HardiePlank HZ10 Lap
  - 1. Type: Smooth 8-1/4 inches (210 mm) with 7 inches (178 mm) exposure.
  - 2. Type: Smooth 12 inches (305 mm) with 10-3/4 inches (273 mm) exposure.
- C. Vertical Siding: HardiePanel HZ10 siding
  - 1. Type: Smooth Vertical siding panel 4 feet by 8 feet (1219 mm by 2438 mm).
- D. Soffit Panels: HardieSoffit HZ10 soffit panel, factory sealed on 5 sides
  - 1. Type: Smooth non-vented, 12 inches (305 mm) by 12 feet (3658 mm).
- E. Trim:
  - 1. HardieTrim HZ10 boards
    - a. Product: Batten Boards, 2-1/2-inch (63 mm) width.

#### 2.3 FASTENERS

- A. Wood Framing Fasteners:
  - 1. Wood Framing: 4d common corrosion resistant nails.
  - 2. Wood Framing: 6d common corrosion resistant nails.
  - 3. Wood Framing: 8d box ring common corrosion resistant nails.
  - 4. Wood Framing: 0.089-inch (2.2 mm) shank by 0.221-inch (5.6 mm) head by 2 inches (51 mm) corrosion resistant siding nails.
  - 5. Wood Framing: 0.093-inch (2.4 mm) shank by 0.222-inch (5.6 mm) head by 2 inches (51 mm) corrosion resistant siding nails.
  - 6. Wood Framing: 0.093-inch (2.4 mm) shank by 0.222-inch (5.6 mm) head by 2-1/2 inches (64 mm) corrosion resistant siding nails.
  - 7. Wood Framing: 0.091-inch (2.3 mm) shank by 0.221-inch (5.6 mm) head by 1-1/2 inches (38 mm) corrosion resistant siding nails.
  - 8. Wood Framing: 0.091-inch (2.3 mm) shank by 0.225-inch (5.7 mm) head by 1-1/2 inches (38 mm) corrosion resistant siding nails.
  - 9. Wood Framing: 0.121-inch (3 mm) shank by 0.371-inch (9.4 mm) head by 1-1/4 inches (32 mm) corrosion resistant roofing nails.

#### 2.4 FINISHES

- A. Factory Primer: Provide factory applied universal primer.
  - 1. Primer: Factory primed.
  - 2. Topcoat: Refer to Section 09 90 00 - Painting and Coating and Exterior Finish Schedule.
- B. Factory Finish: Refer to Exterior Finish Schedule.
  - 1. Product: ColorPlus Technology

## Section 07 46 46 Cementitious Siding

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2. Definition: Factory applied finish; defined as a finish applied in the same facility and company that manufactures the siding substrate.
  3. Process:
    - a. Factory applied finish by fiber cement manufacturer in a controlled environment within the fiber cement manufacturer's own facility utilizing a multi-coat, heat cured finish within one manufacturing process.
    - b. Each finish color must have documented color match to delta E of 0.5 or better between product lines, manufacturing lots or production runs as measured by photo spectrometer and verified by third party.
  4. Protection: Factory applied finish protection such as plastic laminate that is removed once siding is installed
  5. Accessories: Complete finishing system includes pre-packaged touch-up kit provided by fiber cement manufacturer. Provide quantities as recommended by manufacturer.
- C. Factory Finish Color for Trim, Soffit and Siding Colors:
1. Select from manufacturer's complete color range.

### PART 3 – EXECUTION

#### 3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If framing preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Nominal 2 inch by 4-inch (51 mm by 102 mm) wood framing selected for minimal shrinkage and complying with local building codes, including the use of water-resistive barriers or vapor barriers where required. Minimum 1-1/2 inches (38 mm) face and straight, true, of uniform dimensions and properly aligned.
  1. Install water-resistive barriers and claddings to dry surfaces.
  2. Repair any punctures or tears in the water-resistive barrier prior to the installation of the siding.
  3. Protect siding from other trades.

#### 3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Install a water-resistive barrier is required in accordance with local building code requirements.
- D. The water-resistive barrier must be appropriately installed with penetration and junction flashing in accordance with local building code requirements.
- E. Install Engineered for Climate HardieWrap weather barrier in accordance with local building code requirements.
- F. Use HardieWrap Seam Tape and joint and laps.
- G. Install and HardieWrap flashing, HardieWrap Flex Flashing.

#### 3.3 INSTALLATION - HARDIEPLANK HZ10 LAP SIDING

- A. Install materials in strict accordance with manufacturer's installation instructions.
- B. Starting: Install a minimum 1/4 inch (6 mm) thick lath starter strip at the bottom course of the wall. Apply planks horizontally with minimum 1-1/4 inches (32 mm) wide laps at the top. The bottom edge of the first plank overlaps the starter strip.
- C. Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the manufacturer's installation instructions.
- D. Align vertical joints of the planks over framing members.
- E. Butt joints must not fall within 4 inches (102 mm) of a stud. Do not nail within 2 inches (51 mm) of the end of planks.
- F. Maintain clearance between siding and adjacent finished grade.
- G. Locate splices at least one stud cavity away from window and door openings.
- H. For proper fastener selection and fastening schedules for various wind load requirements and framing options, refer to the Technical Data Sheet at [www.aspyredesign.com](http://www.aspyredesign.com).
- I. Face nail to sheathing.
- J. Locate splices at least 12 inches (305 mm) away from window and door openings.



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- 3.4 INSTALLATION - HARDIEPANEL HZ10 VERTICAL SIDING
- A. Install materials in strict accordance with manufacturer's installation instructions.
  - B. Block framing between studs where HardiePanel siding horizontal joints occur.
  - C. Install metal Z flashing and provide a 1/4-inch (6 mm) gap at horizontal panel joints.
  - D. Place fasteners no closer than 3/8 inch (9.5 mm) from panel edges and 2 inches (51 mm) from panel corners.
  - E. Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the manufacturer's installation instructions.
  - F. Maintain clearance between siding and adjacent finished grade.
  - G. Specific framing and fastener requirements refer to Tables 2 and 3 in National Evaluation Service Report No. NER-405.
  - H. Factory Finish Touch Up: Apply touch up paint to cut edges in accordance with manufacturer's printed instructions.
    - 1. Touch-up nicks, scrapes, and nail heads in pre-finished siding using the manufacturer's touch-up kit pen.
    - 2. Touch-up of nails shall be performed after application, but before plastic protection wrap is removed to prevent spotting of touch-up finish.
    - 3. Use touch-up paint sparingly. If large areas require touch-up, replace the damaged area with new pre-finished siding. Match touch up color to siding color through use of manufacturer's branded touch-up kits.
- 3.5 INSTALLATION - HARDIETRIM HZ10 BOARDS
- A. Install materials in strict accordance with manufacturer's installation instructions. Install flashing around all wall openings.
  - B. Fasten through trim into structural framing or code complying sheathing. Fasteners must penetrate minimum 3/4 inch (19 mm) or full thickness of sheathing. Additional fasteners may be required to ensure adequate security.
  - C. Place fasteners no closer than 3/4 inch (19 mm) and no further than 2 inches (51 mm) from side edge of trim board and no closer than 1 inch (25 mm) from end. Fasten maximum 16 inches (406 mm) on center.
  - D. Maintain clearance between trim and adjacent finished grade.
  - E. Trim inside corner with a single board trim both side of corner.
  - F. Outside Corner Board Attach Trim on both sides of corner with 16 gage corrosion resistant finish nail 1/2 inch (13 mm) from edge spaced 16 inches (406 mm) apart, weather cut each end spaced minimum 12 inches (305 mm) apart.
  - G. Allow 1/8-inch gap between trim and siding.
  - H. Seal gap with high quality, paint-able caulk.
  - I. Shim frieze board as required to align with corner trim.
  - J. Fasten through overlapping boards. Do not nail between lap joints.
  - K. Overlay siding with single board of outside corner board then align second corner board to outside edge of first corner board. Do not fasten HardieTrim boards to HardieTrim boards.
  - L. Shim frieze board as required to align with corner trim.
  - M. Install HardieTrim Fascia boards to rafter tails or to sub fascia.
- 3.6 FINISHING
- A. Finish unprimed siding with a minimum one coat high quality, alkali resistant primer and one coat of either, 100 percent acrylic or latex or oil based, exterior grade topcoats or two coats high quality alkali resistant 100 percent acrylic or latex, exterior grade topcoat within 90 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.
  - B. Finish factory primed siding with a minimum of one coat of high quality 100 percent acrylic or latex or oil based exterior grade paint within 180 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.
- 3.7 PROTECTION
- A. Protect installed products until completion of project.
  - B. Touch-up, repair or replace damaged products before Substantial Completion.

**END OF SECTION**

## Section 07 54 23 TPO Membrane Roofing

Specifications

07 54 23-1

### PART 1 - GENERAL

- 1.01 SECTION INCLUDES
- A. TPO Induction welded fastened membrane roofing system.
  - B. Cover board.
  - C. Roof insulation.
- 1.02 RELATED SECTIONS
- A. Division 05 Section "Steel Decking" for furnishing acoustical deck rib insulation.
  - B. Division 06 Section "Miscellaneous Rough Carpentry" for wood nailers, cants, curbs, and blocking [ and for wood-based, structural-use roof deck panels].
  - C. Division 07 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
  - D. Division 07 Section "Manufactured Roof Expansion Joints."
  - E. Division 22 Section "Storm Drainage Piping Specialties" for roof drains.
- 1.03 REFERENCES
- A. Roofing Terminology: Refer to the following publications for definitions of roofing work related terms in this Section:
    - 1. ASTM D 1079 "Terminology Relating to Roofing and Waterproofing."
    - 2. Glossary of NRCA's "The NRCA Roofing and Waterproofing Manual."
    - 3. Roof Consultants Institute "Glossary of Roofing Terms."
  - B. Sheet Metal Terminology and Techniques: SMACNA Architectural Sheet Metal Manual.
- 1.04 DESIGN CRITERIA
- A. General: Installed roofing membrane system shall remain watertight; and resist specified wind uplift pressures, thermally induced movement, and exposure to weather without failure.
  - B. Material Compatibility: Roofing materials shall be compatible with one another under conditions of service and application required, as demonstrated by roofing system manufacturer based on testing and field experience.
  - C. Wind Uplift Performance: Roofing system shall be identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist wind uplift pressure calculated in accordance with ASCE 7-10 wind speeds.
    - 1. Location: Latitude: 30.383085, Longitude: -91.062081
    - 2. Risk Category: III-IV.
    - 3. Increase at Perimeter and Corners as per Code and Manufacturer's Warranty Requirements.
  - D. FMG Listing: Roofing membrane, base flashings, and component materials shall comply with requirements in FMG 4450 and FMG 4470 as part of a roofing system and that are listed in FMG's "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.
    - 1. Fire/Windstorm Classification: Class 1A-120 (starting at 60 and incrementing by 15)
  - E. EPA Energy Star:
    - 1. Roofing membrane shall achieve an initial reflectance of greater than 0.65 and a three-year aged reflectance of greater than 0.50.
- 1.05 SUBMITTALS
- A. Product Data: Manufacturer's data sheets for each product to be provided.
  - B. Detail Drawings: Provide roofing system plans, elevations, sections, details, and details of attachment to other Work, including:
    - 1. Base flashings, cants, and membrane terminations.
    - 2. Tapered insulation, including slopes.
    - 3. Crickets, saddles, and tapered edge strips, including slopes.
    - 4. Insulation fastening patterns.
  - C. Verification Samples: Provide for each product specified.
  - D. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.
  - E. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" and "Guarantees" Article.
    - 1. Provide evidence of meeting performance requirements and intent to guarantee.
  - F. Qualification Data: For Installer and manufacturer.
  - G. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and

## Section 07 54 23 TPO Membrane Roofing

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witnessed by a qualified testing agency, for components of roofing system.

- H. Maintenance Data: Refer to Johns Manville's latest published documents on [www.specJM.com](http://www.specJM.com).
- I. Guarantees: Special guarantees specified in this Section.

### 1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive the specified manufacturer's guarantee.
- B. Manufacturer Qualifications: Qualified manufacturer that has UL listing FMG approval for roofing system identical to that used for this Project.
- C. Source Limitations: Obtain all components from the single source roofing manufacturer guaranteeing the roofing system. All products used in the system must be labeled by the single source roofing manufacturer issuing the guarantee.
- D. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL [, FMG,] or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.
  - 1. Exterior Fire-Test Exposure: Class A
  - 2. ASTM E 108, for application and roof slopes indicated.
  - 3. Fire-Resistance Ratings: ASTM E 119, for fire-resistance-rated roof assemblies of which roofing system is a part.

### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storage.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle, store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

### 1.08 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when current and forecasted weather conditions permit roofing system to be installed in accordance with manufacturer's written instructions and guarantee requirements.

### 1.09 GUARANTEE

- A. Provide manufacturer's system guarantee equal to Johns Manville's Peak Advantage No Dollar Limit Roofing System Guarantee.
  - 1. Single-Source special guarantee includes roofing plies, base flashings, liquid applied flashing, roofing membrane accessories, roof insulation, fasteners, cover board, [substrate board], walkway products, manufacturer's expansion joints, manufacturer's edge metal products, and other single-source components of roofing system marketed by the manufacturer.
  - 2. Guarantee Period: 20 years from date of Substantial Completion.
- B. Installer's Guarantee: Submit roofing Installer's guarantee, including all components of roofing system for the following guarantee period:
  - 1. Guarantee Period: Two Years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Basis of Design: Johns Manville
- B. Equal by Firestone

### 2.02 THERMOPLASTIC POLYOLEFIN ROOFING MEMBRANE – TPO

- A. Fabric-Reinforced Thermoplastic (TPO) Polyolefin Sheet: ASTM D 6878, uniform, flexible sheet formed from a thermoplastic polyolefin, internally fabric or scrim reinforced. Basis of Design: JM TPO
  - 1. Thickness: 60 mils (1.52 mm), nominal.
  - 2. Accelerated Weathering: Minimum of 24,000 hours without cracking or crazing as tested using

## Section 07 54 23 TPO Membrane Roofing

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ASTM G155.

3. Tensile Strength: Minimum of 300 lbf as tested using ASTM D751
4. Tearing Strength: Minimum of 85 lbs. as tested using ASTM D751

### 2.03 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.
  1. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: Manufacturer's sheet flashing of same material, type, reinforcement, thickness, and color as sheet membrane. Basis of Design: JM TPO
- C. Sheet Flashing: Manufacturer's unreinforced sheet flashing of same material as sheet membrane. Basis of Design: JM TPO Detail Membrane
- D. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, with anchors. Basis of Design: JM Termination Systems
- E. Metal Battens: Manufacturer's standard aluminum-zinc-alloy-coated or zinc-coated steel sheet, prepunched. Basis of Design: Membrane Battens
- F. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer. Basis of Design: High Load Fasteners and Plates
- G. Induction Welding Plate: A round specially coated Galvalume® plate with a recessed center and raised flat bonding surface specifically designed for induction welding application. Product: JM TPO RhinoPlates
- H. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, cover strips, and other accessories. Basis of Design: JM TPO Pourable Sealer A & B, JM TPO Pipe Boots, JM TPO Universal Corners, JM TPO Edge Sealant, JM TPO T-Joint Patch, JM TPO Membrane Cleaner, JM TPO Membrane Primer, JM TPO Sealing Mastic, JM TPO Cover Tape, JM TPO Detail Membrane, JM TPO Peel & Stick 10" RPS, JM TPO Peel & Stick 6" RTS, JM TPO-Coated Metal and JM Single Ply Caulk

### 2.04 AUXILIARY ROOFING SYSTEM COMPONENTS

- A. Expansion Joints: Provide factory fabricated weatherproof, exterior covers for expansion joint openings consisting of flexible rubber membrane, supported by a closed cell foam to form flexible bellows, with two metal flanges, adhesively and mechanically combined to the bellows by a bifurcation process. Provide product manufactured and marketed by single-source membrane supplier that is included in the No Dollar Limit guarantee. Basis of Design: Expand-O-Flash Expand-O-Gard
- B. Coping System: Manufacturer's factory fabricated coping consisting of a base piece and a snap-on cap. Provide product manufactured and marketed by single-source membrane supplier that is included in the No Dollar Limit guarantee. Basis of Design: Presto-Lock Coping
- C. Fascia System: Manufacturer's factory fabricated fascia consisting of a base piece and a snap-on cover. Provide product manufactured and marketed by single-source membrane supplier that is included in the No Dollar Limit guarantee. Basis of Design: Presto Lock Fascia Presto-Tite Fascia
- D. Metal Flashing Sheet: Metal flashing sheet is specified in Section 07 60 00 "Sheet Metal Flashing."

### 2.05 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads sourced from membrane roofing system manufacturer. Basis of Design: JM TPO Walkpad

### 2.06 COVER BOARD

- A. High-Density Polyisocyanurate: High-density polyisocyanurate technology bonded in-line to mineral-surfaced, fiber glass reinforced facers with greater than 140 lbs. of compressive strength. Basis of Design: Invinsa Roof Board

### 2.07 ROOF INSULATION

- A. General: Preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Basis of Design: ENRGY 3
  1. Provide insulation package with R Value greater than 20.
  2. Provide insulation package with minimum thickness 3.5 inches

### 2.08 TAPERED INSULATION

- A. Tapered Insulation: ASTM C 1289, provide factory-tapered insulation boards fabricated to slope of 1/4

## Section 07 54 23 TPO Membrane Roofing

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inch per 12 inches unless otherwise indicated. Basis of Design: Tapered ENRGY 3

### 2.09 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.
- B. Provide factory preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated. Basis of Design: Tapered Pre-Cut Cricket Tapered Pre-Cut Miter Tapered Fesco Edge Strip
- C. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and furnished by roofing system manufacturer. Basis of Design: UltraFast Fasteners and Plates UltraFast Pre-Assembled Fasteners
- D. Wood Nailer Strips: Comply with requirements in Division 06 Section "Miscellaneous Rough Carpentry."

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with requirements affecting performance of roofing system:
  - 1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Clean and remove from substrate sharp projections, dust, debris, moisture, and other substances detrimental to roofing installation in accordance with roofing system manufacturer's written instructions.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.03 INSULATION INSTALLATION

- A. Coordinate installation of roof system components so insulation and cover board is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system mfg's. written instructions for installation of roof insulation and cover board.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install insulation boards with long joints in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with like material.
- E. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall thickness is 4.0 inches or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
- F. Trim surface of insulation boards where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- G. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
- H. Preliminarily Fastened Insulation for Mechanically Fastened Systems: Install insulation with fasteners at rate required by roofing system manufacturer or applicable authority, whichever is more stringent.
  - 1. Fasten top layer according to requirements in FMG's "Approval Guide" for specified Windstorm Resistance Classification.
  - 2. Fasten top layer to resist uplift pressure at corners, perimeter, and field of roof.
- I. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.04 COVER BOARD INSTALLATION

- A. Coordinate installing membrane roofing system components so cover board is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with membrane roofing system manufacturer's written instructions for installing roof cover board.
- C. Install cover board with long joints of cover board in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with cover board.
  - 1. Cut and fit cover board within 1/4 inch (6 mm) of nailers, projections, and penetrations.
- D. Trim surface of cover board where necessary at roof drains so completed surface is flush and does not restrict flow of water.
  - 1. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

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- E. Mechanically Fastened Cover Board: Install each layer of cover board and secure to deck using mechanical fasteners specifically designed and sized for fastening specified roof cover board to deck type.
    - 1. Fasten according to requirements in FMG's "Approval Guide" for specified Windstorm Resistance Classification.
    - 2. Fasten to resist uplift pressure at corners, perimeter, and field of roof.
  - F. Proceed with installation only after unsatisfactory conditions have been corrected.
- 3.05 ROOFING MEMBRANE INSTALLATION, GENERAL
- A. Install roofing membrane in accordance with roofing system manufacturer's written instructions, applicable recommendations of the roofing manufacturer and requirements in this Section.
  - B. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.
  - C. Where roof slope exceeds 1/2 inch per 12 inches (1:24, contact the membrane manufacturer for installation instructions regarding installation direction and backnailing
  - D. Cooperate with testing and inspecting agencies engaged or required to perform services for installing roofing system.
  - E. Coordinate installing roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is imminent.
    - 1. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation.
    - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
    - 3. Remove and discard temporary seals before beginning work on adjoining roofing.
  - F. Proceed with installation only after unsatisfactory conditions have been corrected.
- 3.06 INDUCTION WELDED ROOFING MEMBRANE INSTALLATION
- A. Install roofing membrane specification ST6RR over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.
  - B. Start installation of roofing membrane in presence of roofing manufacturer's technical representative.
  - C. Accurately align roofing membranes and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
  - D. Always install membrane laps perpendicular to deck flutes. "Picture Frame" installation method is not permitted.
  - E. Apply roofing membrane with side laps shingled with slope of roof deck where possible.
  - F. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
    - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
    - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
      - a. Remove and repair any unsatisfactory sections before proceeding with Work.
    - 3. Repair tears, voids, and lapped seams in roofing membrane that do not meet requirements.
  - G. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.
  - H. In-Splice Attachment: Secure one edge of roofing membrane using fastening plates or metal battens centered within membrane splice and mechanically fasten roofing membrane to roof deck. Field-splice seam.
  - I. Induction Welding Installation:
    - 1. Perform calibration and set-up as detailed by the Induction Welder Owner's Manual
    - 2. Adjust the handle height, if desired, by releasing handle clamps and pulling or pushing handle to desired position.
    - 3. Center the Induction Welder over the first plate in pattern and activate the weld.
      - a. Induction Welder must be centered over the plate to create a 100% bond.
      - b. If an error occurs during activation, refer to the induction welder owner's manual for corrective action.
    - 4. Place cooling clamp over the welded plate.
      - a. Keep clamp in place at least 45 seconds while the assembly cools.
    - 5. Repeat process for each plate.
  - J. Proceed with installation only after unsatisfactory conditions have been corrected.

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### 3.07 FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
- B. Flash penetrations and field-formed inside and outside corners with sheet flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas and overlap and firmly roll sheet flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.08 WALKWAY INSTALLATION

- A. Flexible Walkways: Install walkway products in locations indicated. Adhere with compatible adhesive and heat weld walkway products to substrate according to roofing system manufacturer's written instructions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.09 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform roof tests and inspections and to prepare test reports.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's Registered Roof Observer (RRO) to inspect roofing installation on completion and submit report to Architect.
  - 1. Notify Architect or Owner 48 hours in advance of date and time of inspection.
- C. Repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### 3.10 PROTECTION AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period.
- B. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

**END OF SECTION**

## Section 07 60 00 Flashing and Sheet Metal

Specifications

07 60 00 - 1

### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Fabricated sheet metal items for roof work, including flashings, gutters, downspouts, coping/fascia, joints, vents.
- B. Roof manufacturer's requirements for flashing and sheet metal work shall be met in order to maintain the roof warranty.
- C. Any conflicting requirements of this Section with the roof manufacturer's warranty requirements shall necessitate the Contractor to provide a higher quality product, installation, and/or quantity to satisfy warranty requirements.
- D. Manufactured coping systems at parapets and other locations detailed in drawings.

#### 1.02 SUBMITTALS

- A. Fabrication Drawings: Submit sheet metal fabrication shop drawings, drawn to scale, sheet metal components showing details of jointing and attachments, sizes, dimensions and shape of various members.
- B. Manufactured Items: Submit manufacturer's product data of required coping and flashing systems including related accessories.
- C. Submit manufacturer's standard color selection.
- D. Provide written endorsement from roof system manufacturer of all submitted proposed flashing details.
- E. Provide calculations for gutters and downspouts for resistance to winds and rain, as required by all applicable Codes. Indicate sizes, strengths, gauges, fasteners, support brackets, etc. and provide sections and details.

#### 1.03 JOB CONDITIONS

- A. Coordinate sheet metal with roofing, interfacing and adjoining work for proper sequencing of each installation.
- B. Ensure weather resistance and durability of the work and protection of materials and finishes.

#### 1.04 WARRANTIES

- A. Flashing & coping systems: 2-year material and labor covering all defects in materials and workmanship within warranty period. To be combined with roofing warranty
- B. Fluoropolymer coatings: 5-years against cracking, fading, crazing, peeling, loss of cohesion and/ or adhesion, and chalking.

### PART 2 PRODUCTS

#### 2.01 SHEET METAL MATERIALS

- A. Precoated Aluminum, with Kynar 500 paint finish; minimum 0.063 inch thick, unless otherwise indicated in drawings and elsewhere in this specification. 3003 alloy, meeting ASTM B-209. Use 2-coat fluoropolymer finish meeting AAMA 605.2-90 criteria or anodized finishes on all exposed-to-view items. Use mill finish on all concealed items.
  - 1. Manufacturers
    - a. Peterson Aluminum
    - b. Vincent Metals
    - c. Unaclad
    - d. Substitutions – Section 01 25 00.
  - 2. Manufacturer shall be recommended by the roofing manufacturer as per Roofing Warranty requirements.
- B. Lead: 4 lb. per sq.ft. (20 kg/m<sup>2</sup>), common desilverized pig lead.
- C. Counterflashing: .040 Aluminum (color clad type). minimum 16 oz./ s.f.
- D. Color: to be selected by Architect from manufacturer's standard colors

#### 2.02 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. Welding: Perform welding of aluminum sheet metal to applicable ASTM standards.
- B. Fasteners: Provide only corrosion resistant treated or stainless steel.
  - 1. Screws: the best type for the application. Include neoprene washers at exposed screw fasteners.



## Section 07 60 00 Flashing and Sheet Metal

Specifications

07 60 00 - 2

- 2. Nails: Hot-dipped galvanized, minimum 12 gauge (2.5 mm) with large flat head annular or spiral thread type shank of sufficient length to penetrate substrate a minimum of 7/8 inch (22 mm).
- 3. Rivets: Compatible with aluminum
- C. Bituminous Coating: SSPC-Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil (0.38 mm) dry film thickness per coat.
- E. Metal Accessories: Clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, non-corrosive, size and gage required for performance.
- F. Sealant: type specified in Section 07 92 00.

### 2.03 FABRICATED UNITS

- A. Metal Fabrication: Shop-fabricate work to greatest extent possible; manufactured systems may be used at the Contractor's option. Comply with details, with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels with exposed edges folded back to form hems.
- B. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and weld. Solder seams continuously at exposed side for waterproof performance. Smooth for visual appearance and, to provide even surface for application of overlaying roof membranes.
- C. Expansion Provisions: Fabricate as indicated. Include back-up and cover plates. Provide "hug" edges for cover plates.
- D. Corners and Intersections: Fabricate one-piece formed metal units at corners and intersections.
  - 1. Miter at each corner condition.
  - 2. Aluminum:
    - a. Double lap seam and solder both sides continuously.
    - b. At the outside corner of the drip, provide folded metal bridge to span the open corner. Weld bridge piece to each side of the within hem of drip.
  - 3. Extend each leg of the formed metal component up to 24 inches, unless indicated otherwise, and provide an expansion joint before continuation of the flashing.
- E. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with industry standards.
- F. Separations: Separate metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.
- G. Copings: Minimum 0.063" thickness aluminum; use shop (or factory) prefabricated corners, tees, crossovers, and transitions for minimum 24" distances in each respective dimension from intercepts. Apply finish coatings after fabrication
- H. Splashblocks: Minimum 4000 psi precast concrete, smooth formed, approximate 12" width by 18" length.
- I. Gutters, Downspouts, & Conductor Heads: Shape as indicated in Drawings, lapped in direction of water flow and sealed, seams oriented against building to greatest extent possible. Metal gutter anchors @ max. 3'-0" o.c. and metal downspout anchors max. 6'-0" o.c. Bottom downspout to terminate 1" above sub-surface drainage inlet. In specific cases where downspouts are not tied into sub-surface stormwater system, terminate downspouts 1" above splash blocks.
- J. Mastic: type recommended by roof system manufacturer for roof conditions and flashing materials used

### PART 3 EXECUTION

#### 3.01 SHEET METAL INSTALLATION REQUIREMENTS

- A. General: Except as otherwise noted, comply with manufacturer's installation instructions and recommendations, and SMACNA "Architectural Sheet Metal Manual".
  - 1. Anchor units of work to substrates securely.
  - 2. Conceal fasteners as much as possible.
  - 3. Set units true to line and level as indicated.

## Section 07 60 00 Flashing and Sheet Metal

Specifications

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4. Install work with laps, joints and seams which will be permanently watertight and waterproof.
  5. Bed flanges of work in a thickened coat of bituminous roofing cement where required for waterproof performance.
- B. Workmanship: Form sheet metal accurately to the dimensions and shapes required. Finish molded and broken surfaces with true, sharp and straight lines and angles. Where intercepting other members, cope to an accurate fit and weld securely. Unless otherwise specifically permitted by the Architect, turn exposed edges back ½ inch (13 mm).
  - C. Expansion: Form, fabricate and install sheet metal so as to adequately provide for expansion and contraction in the finished work.
  - D. Weatherproofing: Finish watertight and weathertight. Make lock seam work flat and true to line and sweated full of solder. Make lock seams and lap seams, when welded at least ½ inch (13 mm) wide, except that aluminum is to be welded. Where lap seams are not welded, lap according to pitch but in no case less than 3 inches (76 mm). Make flat and lap seams in direction of flow.
  - E. Joints: Join parts with rivets or sheet metal screws where necessary for strength or stiffness. Provide suitable watertight expansion joints as indicated on the Drawings or required for proper installation.
  - F. Nailing: Wherever possible, secure metal by means of clips or cleats without nailing through the metal. Unless indicated otherwise, space nails, rivets and screws not more than 8 inch (203 mm) apart and, where exposed to the weather, use lead washers. Nail into wood with barbed roofing nails 1-1/4 inch long by 11 gauges through flat tin discs. Fasten in masonry with expansion type anchors.
  - G. Welding: Thoroughly clean and tin joint materials prior to welding. Weld slowly in order to heat the seams thoroughly and to completely fill them with the weld. Make exposed welding on finished surfaces neat, full flowing and smooth.
- 3.02 METAL FLASHING AND COUNTERFLASHINGS
- A. Unless otherwise shown, all flashings shall be counterflashed.
  - B. Flashings and counterflashings generally shall not exceed 10 feet (3 m) in length. Flashings shall be free from longitudinal joints.
  - C. Counterflashings shall have both edges folded or returned upon themselves at least ½ inch and the lower edge shall overlap the flashing at least 4 inches with the lower edge parallel to the roof line. Counterflashing must be bent to the required shape before being placed.
  - D. Make joints between the units shall with a ½ inch (13 mm) expansion joint between sheets with 8 inches (203 mm) wide backup plates and 6 inches (152 mm) cover plates formed to exact profile of units. Fill space between copings and plates with 2 continuous beads of sealant.
  - E. Provide continuous cleats unless indicated otherwise.
- 3.03 VENT THROUGH ROOF FLASHING
- A. Provide sheet lead roof vent flashing where indicated.
- 3.04 CLEATS
- A. Provide continuous cleats where indicated or specified to secure loose edges of the sheet metalwork
  - B. Space butt joints approximately 1/8 inch (3 mm) apart.
  - C. Fasten cleats to the supporting construction with nails evenly spaced not over 12 inches (305 mm) on centers. Fasten to concrete or masonry with screws driven in expansion shields set in concrete or masonry. The cleat shall be of sufficient width to provide adequate bearing area to insure a rigid installation.
- 3.05 GUTTER AND DOWNSPOUTS
- A. Gutters: Fabricate to profile indicated. Ensure that the front (outside) edge of gutters ½ inch lower than the back (side adjacent and secured to building) edge. Include downspout outlets riveted and soldered to bottom of gutter.
    1. Size of outlet smaller than downspout for bayonet connection into downspout. Install gutter with hangers and straps in compliance with SMACNA guidelines, and as required to comply with all Code requirements.
    2. Slope for positive drainage to downspouts.
    3. Laps: Provide minimum 6-inch laps with continuous bead of sealant and rivet.
    4. Corners: Provide one-piece welded corners.
    5. Expansion Joints: Space expansion joints in accordance with SMACNA guidelines. Unless indicated otherwise, coordinate with Architect for locations of expansion joints.
  - B. Downspouts:

## Section 07 60 00 Flashing and Sheet Metal

Specifications

07 60 00 - 4

1. Set downspouts plumb. Make joints between lengths of downspouts by telescoping the end of the upper lengths at least  $\frac{3}{4}$  inch (19 mm) into the lower length. Terminate downspouts at splash blocks with elbow-type fittings.
  2. Connect gutter outlets to downspouts. Fit downspout over the gutter outlet bottom and rivet. Space rivets not more than 2 inches (51 mm).
  3. Locate downspout hangers adjacent to the joint at the top of each section of downspout except that the bottom section shall have an additional strap adjacent to the bottom joint to splash block.
  4. Install downspouts with straps in compliance with SMACNA guidelines, and as required to comply with all Code requirements.
- 3.06 COPING/FASCIA
- A. Fabricate to profile shown without longitudinal joints. Provide continuous cleat at bottom of fascia section. No exposed fasteners are permitted unless indicated otherwise. Provide clips at cant edge at roof side.
  - B. Provide expansion-contraction joints with backup and cover plates as indicated.
  - C. Fabricate internal, external corner units with mitered and continuously welded joints.
- 3.07 ROOF JOINTS
- A. Fabricate to profile shown without longitudinal joints. Provide continuous cleat at bottom of fascia section. No exposed fasteners are permitted unless indicated otherwise. Provide clips at cant edge at roof side.
  - B. Provide expansion-contraction joints with backup and cover plates as indicated.
  - C. Fabricate one-piece formed termination/connection units with mitered and continuously welded joints.
- 3.08 GRAVITY VENTS
- A. Fabricate as indicated.
  - B. At Contractor's option, provide manufactured units made of aluminum, similar in design and size as that indicated and appropriate for use in each condition.
- 3.09 SHEET METAL MATERIAL SCHEDULE
- A. General: Provide the following types of sheet metal at the locations indicated.
  - B. Lead:
    1. Plumbing piping roof vent flashings.
    2. Sheet lead pan under flashing/membranes at roof drains w/clamping rings.
  - C. Aluminum:
    1. Roof edge perimeter coping/fascia, .050 minimum.
    2. Gutters and downspouts.
    3. Flashings and counterflashings at roof-wall juncture
    4. Flashings at roof curbs and penetrations
    5. Pipe collar flashings. .032, minimum
    6. Curbs and Gravity vents. (Or manufactured units at Contractor's option as described above.)
    7. Concealed sleeves for piping, other roof penetrations. .032, minimum
    8. NOTE: Through-wall flashing shall be coated sheet metal or copper only.

**END OF SECTION**

## Section 07 71 00

### Roof Specialties

Specifications

07 71 00-1

#### PART 1 – GENERAL

##### 1.01 SUMMARY

- A. Section includes manufactured copings, manufactured counterflashing systems, manufactured gravel stops and fascias, reglets
- B. Related Sections:
  - 1. Section 07 60 00 - Flashing and Sheet Metal.
  - 2. Section 07 52 16 - SBS Modified Bitumen Membrane Roofing: Roof system and base flashings.

##### 1.02 REFERENCES

- A. ASTM International:
  - 1. ASTM D4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- B. National Roofing Contractors Association:
  - 1. NRCA - The NRCA Roofing and Waterproofing Manual.
- C. Sheet Metal and Air Conditioning Contractors:
  - 1. SMACNA - Architectural Sheet Metal Manual.

##### 1.03 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.
- C. Product Data: Submit data on shape of components, materials and finishes, anchor types and locations.
- D. Samples:
  - 1. Submit two samples for each color required, illustrating component shape, finish, and color.
- E. Manufacturer's Installation Instructions: Submit instructions for special procedures and perimeter conditions requiring special attention.

##### 1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with SMACNA details.

##### 1.05 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish five year manufacturer warranty for finish.

#### PART 2 – PRODUCTS

##### 2.01 MANUFACTURED ROOF SPECIALTIES

- A. Manufacturers:
  - 1. Petersen Aluminum Corp. – Continuous Cleat Coping
  - 2. W.P. Hickman Company
  - 3. Substitutions: Section 01 25 00.

##### 2.02 COMPONENTS

- A. Copings and Gravel Stops: Formed, 0.063 aluminum, shaped as indicated on Drawings. Include splice plates to conceal and weather seal joints and attachment flanges.

##### 2.03 ACCESSORIES

- A. Sealant: Manufacturer's standard type suitable for use with installation of system; non-staining, non-shrinking, and non-sagging; ultra-violet and ozone resistant; color as selected.
- B. Roofing Cement: ASTM D4586, Type II, cutback asphalt type.

##### 2.04 FINISHES

- A. Aluminum: Kynar 500, custom color to match adjacent finish.

## Section 07 71 00

### Roof Specialties

Specifications

07 71 00-2

#### PART 3 – EXECUTION

##### 3.01 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify deck, curbs, roof membrane, base flashing, and other items affecting Work of this section are in place and positioned correctly.

##### 3.02 INSTALLATION

- A. Conform to SMACNA - Architectural Sheet Metal Manual
- B. Coordinate installation of components of this section with installation of roofing membrane and base flashings.
- C. Coordinate installation of sealants and roofing cement with Work of this section to ensure water tightness.
- D. Coordinate installation of flashing flanges into reglets.

**END OF SECTION**

## Section 07 72 33

### Roof Hatches

Specification

07 72 33 - 1

#### PART 1 – GENERAL

- 1.01 SECTION INCLUDES
  - A. Roof hatch with integral curb.
  - B. hatch railing system
  - C. Safety Post
- 1.02 RELATED SECTIONS
  - A. Section 07 54 23 – TPO Membrane Roofing
- 1.03 SUBMITTALS
  - A. Submit under provisions of Section 01 30 00.
  - B. Product Data: Provide details of product description
  - C. Manufacturer's Installation Instructions: Indicate special procedures and conditions required.
- 1.04 DELIVERY, STORAGE, AND HANDLING
  - A. Deliver, store, protect and handle products to site under provisions of Section 01 60 00.

#### PART 2 – PRODUCTS

- 2.01 MANUFACTURERS
  - A. Milcor: RCS-3x3 (36"x36")
  - B. Bilco Type E (36" x 36")
  - C. Substitutions: Under provisions of Section 01 25 00.
- 2.02 OTHER REQUIREMENTS
  - A. Provide rated door assembly where to be installed in a rated roof or ceiling/floor.
  - B. Provide 42" high metal hatch railing system with painted finish.
  - C. Provide 36" high metal retractable security post.

#### PART 3 – EXECUTION

- 3.01 EXAMINATION
  - A. Verify opening is in proper location and will allow for access ladder to interface with scuttle frame without obstructing operation to open and close scuttle door.
- 3.02 INSTALLATION
  - A. Install all components and accessories in accordance with manufacturer's instructions.
  - B. Coordinate flashing for roofing.
- 3.03 PROTECTION TO FINISHED AND ADJACENT WORK
  - A. Protect adjacent surfaces.

**END OF SECTION**

**Section 07 72 33**

**Roof Hatches**

Specification

07 72 33 - 2

## Section 07 84 00

### Firestopping

Specifications

07 84 00 - 1

#### PART 1 – GENERAL

##### 1.01 SUMMARY

- A. Section includes firestopping and through-penetration protection system materials and accessories; firestopping tops and penetrations of fire rated walls; and smoke sealing.
- B. Related Sections:
  - 1. Section 07 21 00 – Building Insulation: Vapor retarder materials to adjacent insulation.
  - 2. Section 09 21 16 – Gypsum Board Assemblies: Rated partitions requiring firestopping at penetrations
  - 3. Division 23 – Mechanical: Mechanical work requiring firestopping.
  - 4. Division 26 – Electrical: Electrical work requiring firestopping.

##### 1.02 REFERENCES

- A. ASTM E84-Test Method for Surface Burning Characteristics of Building Materials.
- B. ASTM E119-Method for Fire Tests of Building Construction and Materials.
- C. ASTM E814-Test Method of fire Tests of Through Penetration Firestops.
- D. FM (Factory Mutual Engineering Corporation)-Fire Hazard Classifications.
- E. UL (Underwriters Laboratories, Inc.)-Fire Resistance Directory.
- F. UL 263 (Underwriters Laboratories)-Fire Tests of Building Construction and Materials.
- G. UL 723 Test for Surface Burning Characteristics of Building Materials.
- H. UL 1479 (Underwriters Laboratories, Inc.)-Fire Tests of Through-Penetration Firestops.
- I. WH (Warnock Hersey)-Directory of Listed Products.

##### 1.03 DEFINITIONS

- A. Firestopping (Through-Penetration Protection system): A sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest the movement of fire, smoke, heat and hot gases through fire rated construction.

##### 1.04 SYSTEM DESCRIPTION

- A. Firestopping Materials: UL 1479 to achieve fire ratings as noted on drawings for adjacent construction, but not less than 1-hour fire rating.
- B. Firestop interruptions to fire rated assemblies, materials and components.

##### 1.05 PERFORMANCE REQUIREMENTS

- A. Conform to UL requirements for fire resistance ratings and surface burning characteristics.
- B. Conform to all requirements of the State Fire Marshal of the State of Louisiana.

##### 1.06 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on product characteristics, performance and limitation criteria.
- C. Schedule: Provide a schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.
- D. Manufacturer's Installation Instructions: Submit preparations and installation instructions.
- E. Manufacturer's Certificate: Certify products meet or exceed applicable code requirements.
- F. Engineering Judgments: For conditions not covered by UL or WH listed designs, provide judgments by licensed professional engineer suitable for presentation to authority having jurisdiction for acceptance as meeting code fire protection requirements.
- G. AHJ Inspection Material: Provide schedule and detailed instructive cut sheets of the fire penetration sealing system used and locations to the General Contractor for subsequent submittal to the AHJ inspector.
- H. Provide sample warranty meeting the requirements (for a Warranty) of this Section.

##### 1.07 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Engage an experienced installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per the specified requirements. A manufacturers' willingness to sell its products to the General Contractor or to installer doesn't in itself confer qualification on the buyer.



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### Firestopping

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#### 1.08 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply materials when temperature of substrate material and ambient air is below 60 deg F.
- B. Maintain minimum temperature before, during and for min. 3 days after installation of materials.
- C. provide ventilation in areas to receive solvent cured materials.

#### 1.09 WARRANTY

- A. Warrant the work specified herein for two (2) years against becoming unserviceable or causing an objectionable appearance resulting from either defective or non-conforming materials and workmanship.
- B. Defects shall include, but not be limited to:
  - Use of incorrect material within the installation
  - 1. No mineral wool insulation within a system that requires it
  - 2. Use of mineral wool insulation when ceramic fiber insulation is required
  - 3. Incorrect amount of material is installed within a system
  - 4. No use of an accessory seal within a system that requires one
  - 5. Use of an incorrect system with a firestop or firesafing installation
  - 6. Failure to meet specified performance or quality assurance requirements
- C. Warranty shall be submitted in written form, and notarized.

### PART 2 – PRODUCTS

#### 2.01 FIRESTOPPING

- A. Manufacturers
  - 1. Hilti Corp.
  - 2. 3M Fire Protection Products
  - 3. Substitutions: Approved equals only.
- B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
  - 1. Silicone Firestopping Elastomeric Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
  - 2. Foam Firestopping Compounds: Single Component foam compound.
  - 3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
  - 4. Fiber Stuffing and Sealant Firestopping: Composite of ceramic fiber stuffing insulation with silicone elastomer for smoke stopping.
  - 5. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
  - 6. Firestop Pillows: Formed mineral fiber pillows.

#### 2.02 ACCESSORIES

- A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.
- B. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

### PART 3 – EXECUTION

#### 3.01 EXAMINATION

- A. Section 01 30 90 - Coordination and project conditions.
- B. Verify openings are ready to receive firestopping.

#### 3.02 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material.
- B. Remove incompatible materials which may affect bond.
- C. Install backing materials to arrest liquid material leakage.

#### 3.03 APPLICATION

- A. Install material at fire rated construction perimeters and openings which contain penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.

## Section 07 84 00

### Firestopping

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- B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.
  - C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating.
  - D. Compress fibered material to maximum 40 percent of its uncompressed size.
  - E. Place foamed material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.
  - F. Place intumescent coating in sufficient coats to achieve rating required.
  - G. Upon completion of installation of all firestopping, notify the district State Fire Marshal for inspection of all completed fire and/or smoke barrier walls before any construction is installed that would conceal such construction and prevent a proper inspection.
- 3.04 FIELD QUALITY CONTROL
- A. Inspect installed firestopping for compliance with specifications and submitted schedule; perform in accordance with ASTM E 2174; provide report (to Architect) confirming inspection and that all firestopped locations have been performed in accordance with the requirements of this Section.
  - B. Provide digital photographs to Architect of all installed applications on the project, noting where the installation is located in the building.
- 3.05 PROTECTION OF INSTALLED CONSTRUCTION
- A. Protect adjacent surfaces from damage by material installation.

**END OF SECTION**

**Section 07 84 00**

**Firestopping**

Specifications

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## Section 07 92 00

### Joint Sealers

Specifications

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#### PART 1 - GENERAL

- 1.01 SECTION INCLUDES
  - A. Preparing sealant substrate surfaces.
  - B. Sealant and joint backing.
- 1.02 SYSTEM DESCRIPTION
  - A. System performance to achieve moisture and joint seals.
- 1.03 SUBMITTALS
  - A. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and colors available.
- 1.04 QUALITY ASSURANCE
  - A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
  - B. In the event of that sealants of this section conflicts with sealants specified in other sections of these specifications, the sealant which is higher quality and expense shall be assumed to be the sealant to be used.
  - C. Provide mockup of all different types of applications for approval by Architect prior to beginning installation; approved mockup to remain in place throughout project.
- 1.05 ENVIRONMENTAL REQUIREMENTS
  - A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.
  - B. Sealants shall comply with South Coast Air Quality Management District (SCAQMD) Rule # 1168.
- 1.06 WARRANTY
  - A. 5-year full material & labor against failures in material & workmanship

#### PART 2 - PRODUCTS

- 2.01 SEALANTS
  - A. Silicone Sealant (Type A):
    - 1. Description: ASTM C920, single component, non-staining, non-bleeding, non-sagging type.
    - 2. Product/Manufacturer:
      - a. Silicone 790 manufactured by Dow Corning.
      - b. Spectrem I manufactured by Tremco.
      - c. Pecora 890.
      - d. Approved equal.
  - B. Silicone Sealant (Type B):
    - 1. Description: ASTM C920, single component, neutral curing, non-sagging, non-staining, non-bleeding; color as selected.
    - 2. Product/Manufacturer:
      - a. Silicone 795 manufactured by Dow Corning.
      - b. Spectrem 2 manufactured by Tremco
      - c. Pecora 864.
      - d. Approved equal.
  - C. Silicone Sealant (Type C):
    - 1. Description: ASTM C920, single component, fungus resistant, non-sagging, non-staining, non-bleeding; color as selected;
    - 2. Product/Manufacturer:
      - a. Parking Structure Silicone Sealant NS by Dow Corning.
      - b. Ultrapruf SCS 2300 by GE.
      - c. Pecora 301S.
      - d. Approved equal.
  - D. Silicone Acetoxy Sealant (Type D):
    - 1. Description: ASTM C920, single component, mildew resistant.
    - 2. Product/Manufacturer:
      - a. Silicone 786 manufactured by Dow Corning.
      - b. Tremsil 200 manufactured by Tremco.

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### Joint Sealers

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- c. Approved equal.
- E. Silicone Sealant (Type E):
  - 1. Description: ASTM C920, single component, paintable.
  - 2. Product/Manufacturer:
    - a. Trade Mate manufactured by Dow Corning.
    - b. Sonolac manufactured by Sonneborn.
    - c. Approved equal.

#### 2.02 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: ASTM D1056 D1565; round, closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit the specific application.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION AND PREPARATION

- A. Verify that substrate surfaces and joint openings are ready to receive work.
- B. Remove loose materials and foreign matter which might impair adhesion of sealant.
- C. Verify that joint backing and release tapes are compatible with sealant.

#### 3.02 INSTALLATION

- A. Clean and prime seal joints in accordance with manufacturer's instructions.
- B. Install sealant in accordance with manufacturer's instructions.
- C. Measure joint dimensions and size materials to achieve 2:1 width/depth ratios.
- D. Install joint backing to achieve a neck dimension no greater than 1/3 the joint width.
- E. Install bond breaker where joint backing is not used.
- F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- G. Tool joints concave; NOTE: SLOPPY APPLICATION WILL NOT BE ACCEPTED.
- H. Install sealants where shown on drawings, in addition to all gaps, crevasses, and holes located at walls, ceilings, and where may be directed by architect.
- I. Install sealant around plumbing fixtures at the joint between the fixture and the wall/ floor surface

#### 3.03 SCHEDULE

	<u>LOCATION/SURFACE</u>	<u>TYPE</u>
A.	Concrete and masonry	A
B.	Paving	C
C.	Metals	B
D.	Doors & Windows(perimeter)	B
E.	Ceramic & Porcelain Tile	D
F.	Gypsum Board (Interior)	E
G.	Plumbing Fixtures	D

**END OF SECTION**

## Section 08 11 13 Steel Doors and Frames

Specifications

08 11 13 -1

### PART 1 – GENERAL

#### 1.01 SECTION INCLUDES

- A. Steel frames, some with integral transom lite; borrow lite frame; non-rated and fire rated.
- B. Grouting of all interior frames.

#### 1.02 RELATED SECTIONS

- A. 08 21 10 – Flush Wood Doors
- B. 08 71 00 – Door Hardware

#### 1.03 REFERENCES

- A. American National Standards Institute (ANSI)
  - 1. A115.IG, Installation Guide for Doors and Hardware
  - 2. A224.1, Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors & Frames.
  - 3. A250.8, Recommended Specifications for Standard Steel Doors and Frames. (Formerly SDI-100)
  - 4. A250.11, Recommended Erection Instructions for Steel Frames (Formerly SDI-105).
  - 5. ASTM E 283 – Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- B. ASTM International (ASTM)
  - 1. A653, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
  - 2. A924, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
  - 3. A1008, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
  - 4. A1011, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
  - 5. C1363 - Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus
  - 6. E413 - Standard Classification for Rating Sound Insulation
  - 7. E2074, Standard Test Method for Fire Tests of Door Assemblies (Formerly A152)
- C. Federal Specification (Fed Spec)
  - 1. Fed Spec C578 Bead Fusion Test
- D. National Fire Protection Association (NFPA)
  - 1. 80, Fire Doors and Fire Windows
  - 2. 252, Fire Tests of Door Assemblies
- E. Steel Door Institute – Current Standards
  - 1. Technical Data Series
  - 2. Specification Series
  - 3. Construction Details
- F. Underwriters Laboratories Inc. (UL)
  - 1. Building Materials Directory
  - 2. Listing and Labeling
  - 3. 10B and 10C, Fire Tests of Door Assemblies
  - 4. 1784, Air Leakage Tests of Door Assemblies
- G. Intertek Testing, Services (Warnock Hersey, Inc. (WHI))
  - 1. Listing and Labeling

#### 1.04 SUBMITTALS

- A. Shop Drawings: Indicate door and frame elevations, internal reinforcement, cut-outs for glazing, louvers, and finish.
- B. Product Data: Indicate door and frame configurations, location of cut-outs for hardware reinforcement.

## Section 08 11 13 Steel Doors and Frames

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### 1.05 QUALITY ASSURANCE

- A. Conform to the following:
  - 1. SDI-100 - Standard Steel Doors and Frames.
  - 2. DHI- Door Hardware Institute - The Installation of Commercial Steel Doors in Wood Frames and Builder's Hardware.
  - 3. Fire Rated Door Panel and Frame Construction: ASTM E152, NFPA 252, UL 10B, NFPA 80.
  - 4. Handicapped: ANSI A117.1.
  - 5. HMMA 861 - Commercial Hollow Metal Doors and Frames.
- B. All steel doors and frames shall be by a single manufacturer, shop drawings to be submitted with manufacturer's insignia which is being supplied.
- C. Furnish steel doors and frames to meet current Steel Door Institute Data Specifications, and Construction Details.
- D. Steel Door Institute ANSI/SDI-A250.13 (2003) Testing and Rating of Sever Windstorm Resistant Components for Swing Door Assemblies.
- E. ASTM E 330-97, Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
- F. Comply with ASTM E 283 – Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

### 1.06 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies:
  - 1. Fire-Rated Door, Panel, Frame, and Fire Window Construction: Shall conform to ASTM E2074, NFPA 252, or UL 10B, as applicable, and acceptable to the code authorities having jurisdiction.
  - 2. Fire-Rated Openings: Conform to NFPA 80 for fire-rated class shown or required by code authorities having jurisdiction.
    - a. Units shall be identical to assemblies whose fire resistance characteristics have been determined in accordance with requirements specified under Paragraph C, 01, above, and shall be labeled and listed by UL, WHI, or other inspection and testing agency acceptable to the code authorities having jurisdiction.
    - b. Fire-rated steel doors, panels, frames, and fire windows shall bear permanent labels attesting to fire resistance. At stairway enclosures, provide units listed for 450 degree F maximum temperature rise rating for 30 minutes of exposure.
    - c. Oversized openings shall be constructed in accordance with all applicable requirements for labeled door construction.
    - d. Fire rated door assemblies with gaps in excess of 1/8 inch between door and frame will not comply with NFPA 80.
    - e. Locate label on hinge side of doors and frames so that when door is closed, label is not visible.
    - f. Caution shall be taken to ensure that labels are not removed, damaged or painted over.
    - g. Glass panes shall not exceed sizes allowed whether indicated or not on the drawings.

### 1.07 COORDINATION

- A. Coordinate Work of this Section with work in which hollow metal work is installed.
- B. Coordinate hardware installation with opening construction. Finish hardware is specified in Section 08 71 00.
- C. Coordinate doors, frames, windows with glazing specified in Section 08 80 00.
- D. Coordinate doors and frames with painting specified in Section 09 91 00.

### 1.08 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store products in accordance with manufacturer's instructions, and as follows:
  - 1. In manufacturer's original, labeled, undamaged containers or wrappers.
  - 2. Containers or wrappers shall list the name of the manufacturer and product.
- B. Deliver materials to allow for minimum storage time at the project site. Coordinate delivery with the scheduled time of installation.
- C. Protect products from moisture, construction traffic, and damage.
  - 1. Store under cover in clean dry place, protected from weather or abuse.

## Section 08 11 13 Steel Doors and Frames

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2. Store in a manner that will prevent rust or damage.
3. Store doors in a vertical position, spaced with blocking to permit air circulation.
4. Do not use non-vented plastic or canvas shelters.
5. Should containers or wrappers become wet, remove immediately.

### 1.09 WARRANTY

- A. Warrant the work specified herein for one (1) year against becoming unserviceable or causing an objectionable appearance resulting from either defective or non-conforming materials and workmanship.
- B. Defects shall include, but not be limited to:
  1. Use of incorrect materials in opening
  2. Incorrect labeled components installed within opening.
  3. Noisy, rough or difficult operation
  4. Failure to meet specified quality assurance requirements.

## PART 2 – PRODUCTS

### 2.01 DOORS AND FRAMES

- A. Manufacturers:
  1. CECO Corp.
  2. Republic Doors and Frames
  3. Curries
  4. SteelCraft
  5. Substitutions: 01 25 00
- B. Frame dimensions:
  1. Face: 2 inches at gyp board.
  2. Width: 5 3/4 inches at 3 5/8" stud walls. Provide width and throat dimension as required at stud walls to accommodate finish wall thickness.
  3. Head: 2 inches at gyp board; 4 inches at CMU or as appropriate to existing condition – GC shall verify and coordinate prior to Submittals.
  4. Coordinate verify requirements for dimensions with drawings and schedules.

### 2.02 MATERIALS, GENERAL

- A. Steel requirements, all frames to be manufactured of commercial quality, stretcher leveled flatness, cold rolled steel per ASTM-A1008 general requirements. Internal reinforcing manufactured of hot rolled pickled and oiled steel per ASTM A1011.
- B. Exterior frames and interior frames where shown on drawings or required in damp, moist, humid, and wet areas, i.e., toilets, locker rooms, showers, etc., to be manufactured of commercial quality, stretcher leveled flatness, cold rolled steel and galvanized to 'A-60' minimum coating weight standard per ASTM-A653 and A924, with coating weight of not less than 0.60 ounce per square foot (0.30 ounce per side).

### 2.03 FRAME FABRICATION

- A. Minimum Gauges:
  1. Interior Openings:
    - a. Less than 4 feet-0 inches in Width: 16 gauge
    - b. 4 feet-0 inches in Width and greater: 14 gauge
- B. Design and Construction:
  1. Frames shall be custom made, welded units with integral trim of sizes and shapes shown on approved shop drawings. Hinge jambs that butt adjacent 90 degree walls shall have at least four (4) inch wide frame face to assure the door trim will not strike the wall prior to the door opening at least 90 degrees. Frame profile shall match wall thickness where practical, i.e., 4-3/4 inch at 4 inch CMU, 6-3/4 inch at 6 inch CMU, and 8-3/4 inch at 8 inch CMU. At masonry wall openings, fabricate frames to suite masonry opening with 2 inch head member.
  2. Frames shall be strong and rigid, neat in appearance, square, true and free of defects, warp and buckle. Molded members shall be clean cut, straight and of uniform profile throughout their length.
  3. Jamb depths, trim, profile and backbends shall be as shown on approved shop drawings.
  4. Corner joints, including face and inside corners, shall have contact edges closed tight, with trim faces mitered and continuously welded, and stops butted. The use of gussets shall not be permitted. Face of frame shall be ground smooth. Knockdown (KD) frames are not permitted.



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5. Minimum depth of stops shall be 5/8 inch, except at fire windows where minimum depth of stops shall be 3/4 inch.
6. Frames for multiple openings shall have mullion and rail members which are closed tubular shapes having no visible seams or joints. Joints between faces of abutting members shall be securely welded and finished smooth. Mullions shall be key locked removable type. Keys shall be master keyed to a system selected by the Owner and Project Manager.
7. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inch and wider with mortise/butt type hinges only at top hinge location to deter against hinge reinforcement sag.
8. Continuous Hinge Reinforcement: Provide welded continuous 12 gage strap for continuous hinges specified in hardware sets in Finish Hardware.
9. Provide countersunk flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops; provide security head screws at exterior locations.
10. Provide A60 Galvannealed coating at frames in restrooms and locker rooms with showers/Jacuzzi, clean areas such as food service rooms.
11. Lead-lined frames: 1 mm minimum lead lining; provide at XRAY.
12. Electrical Knock Out Boxes: Factory weld 18 gage electrical knock out boxes to frame for electrical hardware preps; included but not limited to electric thru wire hinges, electrical raceways, door position switches, electric strikes, jamb mount card readers, and magnetic licks as noted in door hardware sets in Division 8 Finish Hardware.
  - a. Electrical knock out boxes are required at door position switches, electric strikes, card readers, and middle hinge locations for all exterior locations regardless of electrical hardware specified in Division 8 Finish Hardware.
  - b. Provide electrical knock out boxes with 3/4-inch knockouts.
  - c. Conduit to be coordinated and installed in field from middle hinge box and strike box to door position box.
  - d. Electrical knock out boxes to comply with NFPA requirements and fit electrical door hardware as specified in hardware sets in Division 8 Finish Hardware.
  - e. Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb.
  - f. Provide field installed conduit per Division 28 section for standardized plug connectors to accommodate up to twelve (12) wires as required for electrified door hardware specified in hardware sets in Division 8 Finish Hardware. Provide sufficient number of concealed wires to accommodate electric function of specified hardware. Wire nut connections are not acceptable.
13. Hardware Reinforcements:
  - a. Frames shall be mortised, reinforced, drilled and tapped at factory for fully template mortised hardware in accordance with approved hardware schedule and templates provided by Section 08 71 00. Where surface-mounted hardware is to be applied, frames shall have reinforcing plates only.
  - b. Min. thickness of hardware reinforcing plates shall be as follows:
    - 1) Hinge and pivot reinforcements (1-1/4 inch x 10 inch minimum size): 7 gauge
    - 2) Strike reinforcements: 12 gauge
    - 3) Flush bolt reinforcements: 12 gauge
    - 4) Closer reinforcements: 12 gauge
    - 5) Reinforcements for surface-mounted hardware, hold-open arms, surface panic devices: 12 gauge
14. Floor Anchors: Minimum 14 gauge, securely welded inside each jamb, with holes for floor anchorage.
15. Jamb Anchors:
  - a. Frames for installation in masonry walls shall be provided with adjustable jamb anchors of the T-Strap type. Anchors shall be not less than 16 gauge steel. The number of anchors provided at each jamb shall be as follows:
    - 1) Frames up to 7 feet-6 inch height - Three (3) anchors
    - 2) Frames 7 feet-6 inch to 8 feet-0-inch height - (4) anchors
    - 3) Frames over 8 feet-0 inch height - One (1) anchor for each 2 feet or fraction thereof in height.
  - b. Frames for installation in stud partitions shall be provided with steel anchors of suitable approved design, not less than 16-gauge thickness, securely welded inside each jamb as follows:

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- 1) Frames up to 7 feet-6 inch height - Four (4) anchors
  - 2) Frames 7 feet-6 inch to 8 feet-0-inch height - (5) anchors
  - 3) Frames over 8 feet-0-inch height - (4) anchors plus one (1) additional for each 2 feet over 8 feet-0 inches.
- c. Frames to be anchored to previously placed concrete, masonry or structural steel shall be provided with anchors of suitable design as shown on approved shop drawings.
16. Dust Cover Boxes: Shall be of not less than 26-gauge steel and shall be provided at all mortised hardware items.
  17. Steel Spreader: Shall be provided on all frames, temporarily attached to bottoms of both jambs for bracing during shipping and handling.
  18. Loose Glazing Stops: Shall be of cold rolled steel, not less than 20 gauge, butted at corner joints and secured to the frame with countersunk cadmium or zinc-plated screws. Loose stops at exterior frames shall be placed on the interior side of the frames.
  19. At sound rated door openings at EXAMS and OFFICES, coat inside of frame profile with corrosion resistant coating to minimum thickness of 1/16 inch.
- C. Frame Color: Field painted under Section 09 91 00 to match face of door.

### 2.04 LABELED DOORS AND FRAMES

- A. Labeled doors and frames shall be provided for openings requiring fire protection ratings as scheduled and to comply with NFPA 80. Such doors and frames shall be constructed as tested and approved by UL, WHI, or other nationally recognized testing agency having a factory inspection service and approved by code authorities having jurisdiction and shall bear the appropriate permanent label.
- B. If any door or frame scheduled to be fire-rated cannot qualify for appropriate labeling because of its size, design, hardware or other reason; the Project Manager shall be so advised before fabrication work on that item is started.

## PART 3 – EXECUTION

### 3.01 INSTALLATION

- A. Separate dissimilar metals. Protect against galvanic action.
- B. Frames:
  1. Anchorage and Connections: Secure to adjacent construction. Where practical, interior door frames shall be flush with the pull side wall to minimize or eliminate the reveal and allow full 180 degree door swing.
  2. Install frames in accordance with manufacturer's instructions and install labeled frames in accordance with NFPA 80.
  3. Frame Spreader Bars: Leave intact until frames are set perfectly square and plumb and anchors are securely attached.
  4. Remove hardware, with the exception of prime-coated items, tag box, and reinstall after finish paint work is completed. Do not remove or paint over labels on labeled frames.
  5. Grout all frame jambs for rigidity; coordinate grouting with any routing of conduit within frames.

### 3.02 ADJUST AND CLEAN

- A. Adjust doors for proper operation, free from binding or other defects.
- B. Clean and restore soiled surfaces.
- C. Remove scraps and debris, and leave site in clean condition.

**END OF SECTION**

**Section 08 11 13**  
**Steel Doors and Frames**

Specifications

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## Section 08 14 23 Molded Interior Doors

Specifications

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### PART 1 – GENERAL

- 1.01 SECTION INCLUDES:
- A. Solid-core masonite hardboard veneered doors, fire rated.
  - B. Hollow-core masonite hardboard veneered doors.
- 1.02 RELATED SECTIONS:
- A. Section 06 20 00 - Finish Carpentry
  - B. Section 08 71 00 - Finish Hardware
  - C. Section 09 90 00 – Painting – Site finishing of doors
- 1.03 SUBMITTALS:
- A. Submit schedule of doors to be provided with product data and fire rating required.
  - B. Provide manufacturer's certification that door meets AWI standards and fire rating requirements.
  - C. Contractor shall provide hardware schedules, and other relevant information to door manufacturer prior to submittals of this Section to Architect.
- 1.04 QUALITY ASSURANCE:
- A. Perform work in accordance with AWI Quality Standard Section
  - B. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- 1.05 DELIVERY, STORAGE AND PROTECTION:
- A. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.
- 1.06 HARDWARE PREPARATION:
- A. Frames shall be prepared to receive hardware as indicated per Drawings and Finish Hardware of these specifications. All hinges to match finish hardware.
- 1.07 WARRANTY:
- A. Provide manufacturer's standard one-year warranty against defects in material or workmanship.

### PART 2 – PRODUCTS

- 2.01 MANUFACTURERS:
- A. Masonite
  - B. Jeld-Wen
  - C. Carte Blanche by Marshfield
  - D. Supa Doors
  - E. Approved Equal
- 2.02 DOOR TYPES:
- A. Rated Doors: 60-minute rated, 45-minute rated, and 20-minute rated (minimum), solid core, 1-3/4 inches thick, raised panel, smooth finish.
  - B. Interior Doors: 1-3/8 inches thick, hollow core with honeycomb core, raised panel, smooth finish. Refer to specifications section 08 71 00 and drawings for schedule.
- 2.03 FABRICATION
- A. Fabricate non-rated doors in accordance with AWI Quality Standards requirements.
  - B. Fabricate fire-rated doors in accordance with AWI Quality Standards and to UL or Warnock Hersey requirements. Attach fire rating label to door.
  - C. Provide lock blocks (particleboard).
  - D. Facing: 1/8" HDF
  - E. Provide edge clearances in accordance with AWI 1600.
  - F. Provide blocking behind panels.
  - G. Machine doors for hinges. Locksets, and all other hardware prior to finishing.
  - H. Rails: 15/32" MDF at top and bottom.
- 2.04 FINISH
- A. Factory pre-finished primer.

## Section 08 14 23 Molded Interior Doors

Specifications

08 14 23 - 2

- B. To be field painted.

### **PART 3 – EXECUTION**

#### 3.01 EXAMINATION:

- A. Verify that opening sizes and tolerances are acceptable.
- B. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

#### 3.02 INSTALLATION:

- A. Install non-rated doors in accordance with AWI Custom Quality Standards requirements.
- B. Trim doors only by approval of Architect; if doors are trimmed, re-seal and stain door edges (to match factory finish) prior to installation of door.
- C. Machine cut for hardware only by approval of Architect.
- D. Coordinate installation of doors with installation of frames specified in Sections 06100 and 06200.
- E. Install fire-rated doors in accordance with AWI Quality Standard, NFPA 80, and to requirements for fire rating label by UL or Warnock Hersey.
- F. Fire rated doors: Trim door height only in accordance with fire rating requirements.

#### 3.02 INSTALLATION TOLERANCES

- A. Conform to AWI requirements for fit and clearance tolerances.
- B. Conform to AWI Section 1300 requirements for maximum diagonal distortion.

#### 3.02 ADJUST AND CLEAN:

- A. Adjust for smooth and balanced door movement.
- B. Adjust closer for full closure.

**END OF SECTION**

# Section 08 26 00 Fiberglass Doors & Frames

Specifications

08 26 00 - 1

## PART 1 - GENERAL

- 1.01 SECTION INCLUDES:
- A. Exterior Fiberglass French Doors & Frames
- 1.02 RELATED SECTIONS:
- A. Section 06 20 00 – Finish Carpentry
  - B. Section 08 71 00 – Finish Hardware
  - C. Section 09 90 00 – Painting – Site finishing of doors
- 1.03 SUBMITTALS:
- A. Submit schedule of doors to be provided with product data and fire rating required.
  - B. Provide manufacturer's certification that door meets AWI standards and fire rating requirements.
  - C. Contractor shall provide hardware schedules, and other relevant information to door manufacturer prior to submittals of this Section to Architect.
- 1.04 QUALITY ASSURANCE:
- A. Perform work in accordance with AWI Quality Standard Section
  - B. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- 1.05 DELIVERY, STORAGE AND PROTECTION:
- A. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.
- 1.06 HARDWARE PREPARATION:
- A. Frames shall be prepared to receive hardware as indicated per Drawings and Finish Hardware of these specifications. All hinges to match finish hardware.
- 1.07 WARRANTY:
- A. Provide manufacturer's standard ten-year warranty against defects in material or workmanship.

## PART 2 - PRODUCTS

- 2.01 MANUFACTURERS:
- A. Milgard
  - B. Approved Equal
- 2.02 MATERIALS
- A. Fiberglass AAMA 305 glass fiber reinforced thermoset profile.
- 2.03 PERFORMANCE REQUIREMENTS
- A. Thermal Performance: Comply with NFRC 100.
  - B. Air Leakage, Water Resistance, Structural Test: Comply with ANSI/AAMA/NWWDA 101/I.S.2.
- 2.04 DOOR TYPE(S):
- A. French Door – In-swing 3622U (folded nail fin for installation without nail fin)
    - 1. Frame: 4-9/16" deep
    - 2. Panel Frame:
      - a. Top & Bottom Rail: 1-3/4" thick
      - b. Stiles: 1-3/4" thick
    - 3. Reinforcement: Extruded aluminum profiles at corners and lock. Corner reinforcement shall engage rails minimum 4 inches and stiles minimum 10 inches.
    - 4. Structural Class: SGD-C30 (2 panel only)
    - 5. Hardware:
      - a. Lock: Inside and outside lever operated latch and two-point locking rod to head and sill, with interior thumb turn deadbolt.
      - b. Keyed exterior cylinder lock per hardware schedule.
      - c. Hinges: 2-way adjustable, finish to match lock.
    - 6. Weatherstripping: Foam filled bulb seal.
      - a. Sill Sweep: Rubber dual-fin sweep.

## Section 08 26 00 Fiberglass Doors & Frames

Specifications

08 26 00 - 2

- 2.05 GLAZING
  - A. Glazing Type: Tempered, Clear/SunCoat Low-E, argon gas-filled
  - B. Spacer Bar: Warm-edge steel spacer.
- 2.06 SIMULATED DIVIDED LITE GRIDS
  - A. SDL Vintage Grod: 1-1/8" wide profiled clear vertical grain Douglas Fir strips applied to interior glass, 5/8" wide aluminum box spacer internal grid, and 1-1/8" wide trapezoidal fiberglass bar applied to exterior glass.
- 2.07 FABRICATION
  - A. Fabricate frames and panels with milled and butted joints and mechanically joined corners. Trim and finish corners to match adjacent surfaces.
  - B. Factory exterior glaze with snap-on fiberglass glazing stops matching frame finish. Units shall be reglazeable without dismantling panel framing.
- 2.08 FINISH
  - A. Frame and Panels:
    - 1. Exterior: Factory baked-on enamel
    - 2. Interior: White baked-on enamel
  - B. Divided Lite Grids:
    - 1. Interior Wood: prime and paint
    - 2. Internal Bars: Mill finish aluminum
    - 3. Exterior Bars: Baked-on enamel, match frame and panel exterior color.

### PART 3 - EXECUTION

- 3.01 EXAMINATION:
  - A. Verify that opening sizes and tolerances are acceptable.
  - B. Verify that sill is flat and level.
  - C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.
- 3.02 INSTALLATION:
  - A. Install doors in accordance with AWI Custom Quality Standards requirements.
  - B. Install doors in framed walls in accordance with manufacturer's installation instructions.
  - C. Flash head and jambs in accordance with AAMA 2400
  - D. Coordinate installation of doors with installation of frames specified in Sections 06100 and 06200.
- 3.03 INSTALLATION TOLERANCES
  - A. Conform to AWI requirements for fit and clearance tolerances.
  - B. Conform to AWI Section 1300 requirements for maximum diagonal distortion.
- 3.04 ADJUST AND CLEAN:
  - A. Adjust operating panels and hardware for smooth operation and tight fit with weatherstripping.
  - B. Clean soiled surfaces and glass using a mild detergent and warm water solution with soft clean cloths.

**END OF SECTION**

## Section 08 56 00

### Vinyl Windows

Specifications

08 56 00-1

#### PART 1 GENERAL

- 1.1 SECTION INCLUDES
  - A. Vinyl Windows.
- 1.2 RELATED SECTIONS
  - A. Section 06 10 00: Rough Carpentry.
  - B. Section 06 20 00: Finish Carpentry.
- 1.3 REFERENCES
  - A. ANSI/AAMA/NWDA 101/I.S.2; 1997 - Voluntary Specification for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors with revisions contained in "reprinting" of 12/99.
  - B. AAMA 701/702; 2000 - Combined Voluntary Specifications for Pile Weather strip and Replaceable Fenestration Weather seals.
  - C. AAMA 902; 1999 - Voluntary Specification for Sash Balances.
  - D. ASTM E 283; 1999 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
  - E. ASTM E 330; 1997 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
  - F. ASTM E 547; 2000 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference.
  - G. ASTM E 774; 1997 - Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units.
  - H. ASTM F 588; 1997 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact.
  - I. NFRC 100-97 - Procedure for Determining Fenestration Product U-Factors.
- 1.4 SUBMITTALS
  - A. Submit under provisions of Section 01300.
  - B. Product Data: Submit the following documents for each type of window.  
Manufacturer's technical data, product descriptions and installation guides.  
Elevation for each style window specified indicating its size, glazing type, muntin type and design.  
Manufacturer's head, jamb, and sill details for each window type specified.
  - C. Selection Samples: For each finish product specified, a complete set of color chips representing manufacturer's full range of available colors.
  - D. Verification Samples: Provide operating units of each style window specified.  
Verification samples may be operating scaled-down mock-ups of actual-size units.  
Operating hardware such as balances, sash locks and weather-stripping.  
Verification samples will be returned to manufacturer's representative at project closeout.
  - E. Test Reports: Submit certified independent testing agency reports indicating window units meet or exceed specified performance requirements.
- 1.5 QUALITY ASSURANCE
  - A. Manufacturer Qualifications: Minimum ten (10) years producing vinyl (PVC) windows.
  - B. Installer Qualifications: Utilize an installer having demonstrated experience on projects of similar size.
  - C. Source Limitations: Obtain window units from one manufacturer through a single source.
  - D. Provide window units independently tested and found to be in compliance with ANSI/AAMA/NWDA 101/I.S.2-97 and performance standards listed above.
  - E. Code Compliance: Provide windows that are labeled in compliance with the jurisdiction having authority over the project.
  - F. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.  
Finish areas designated by Architect.  
Do not proceed with remaining work until workmanship and color are approved by Architect.  
Refinish mock-up area as required to produce acceptable work.
- 1.6 DELIVERY, STORAGE, AND HANDLING
  - A. Deliver windows to project site in undamaged condition; handle windows to prevent damage to components and to finishes.
  - B. Store products in manufacturer's unopened packaging, out of direct sunlight or high temperature locations, until ready for installation.
- 1.7 PROJECT CONDITIONS



## Section 08 56 00

### Vinyl Windows

Specifications

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- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

#### 1.8 WARRANTY

- A. Submit manufacturer's standard warranty against defects in workmanship and materials.  
Limited Lifetime Limited Transferable warranty on extruded solid vinyl member and component parts.

Insulated glass is warranted against material obstruction of transparency resulting from film formation or dust collection on the interior glass surfaces for a period of twenty (20) years. Consult warranty for complete details.

The warranty period for commercial project work such as apartments, housing authorities, and other buildings not used by individual homeowners is 10 years, covering all vinyl, glass and component parts. Consult warranty for complete details.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Jeld-Wen: Builders Vinyl series
- B. Requests for substitutions: considered in accordance with provisions of Section 01 60 00.
- C. Substitutions must be submitted to Architect two weeks prior to bid opening.

### 2.2 MATERIALS:

- A. Window Types: Single-hung, Picture, Radius
- B. Frame: Minimum 3-1/4 inch (83 mm) deep, multi-chambered vinyl profile.
- C. Sash: Minimum 1-1/4 inch (32mm) deep, multi-chambered vinyl profile. Includes vent stops located in fixed sash.
- D. Color: Frame & sash colors: white or tan, as selected by architect.
- E. Muntins: external applied vinyl muntins, configurations per drawings.
- F. Glazing: 7/8 inch (22mm) Nominal thickness insulated glass units secured to sash frame using a silicone sealant and glazing bead. Complies with ASTM E 774.
  - 1. Clear.
  - 2. Obscured.
  - 3. Obscured Tempered.
  - 4. Tempered Low-E.
  - 5. Tempered Low-E with Argon.
  - 6. Low-E.
  - 7. ENERGYSTAR rated Low-E with argon gas.
  - 8. Double Strength.
- G. Sash Balances: Factory calibrated block and tackle, spring and block pulley system.
- H. Screens: Charcoal colored fiberglass mesh.
- I. Weatherstripping: Fin seal polypropylene pile.
- J. Performance.

Air Infiltration: Maximum 0.10 cfm/sq. ft. at 1.57 psf (25 mph) in accordance with ASTM E 283.

Water Resistance: No leakage when tested at 5.25 psf in accordance with ASTM E 547.

Uniform structural test pressure at 45.0 psf positive and negative in accordance with ASTM E 330.

Structural Rating: H-R30 - Test Size: 46 inches x 60 inches (1168mm x 1524mm) in accordance with ANSI/AAMA/NWDA 101/I.S.2.

Forced Entry: Type B, Grade 10 in accordance with ASTM F 588-97.

Thermal Transmittance: The following values are in accordance with NFRC 100-97.

- 1. Clear / Tempered / Obscured/ Double Strength: U-Factor 0.50/R Value = 2.0.
- 2. Low-E: U Factor 0.37/R Value = 2.7.
- 3. Low-E/ Argon: U-Factor 0.33/R Value = 3.0.
- 4. Tempered Low-E: U-Factor 0.41/R Value = 2.4.
- 5. Tempered Low-E/ Argon: U-Factor 0.38/R Value = 2.6.
- 6. Double Strength.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify rough opening size is of sufficient size to receive window unit and complies with manufacturer's requirements for opening clearances.
- B. Verify that sill plate is level.
- C. Notify Architect of unacceptable conditions before proceeding with installation.

## Section 08 56 00

### Vinyl Windows

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#### 3.2 INSTALLATION

- A. Install window unit in accordance with manufacturer's printed instructions.
- B. Apply sealant around perimeter of window unit between nail fin and exterior sheathing of wall. Refer to Division 7 Section "Joint Sealants".
- C. Install window unit level and plumb. Center window unit in opening and secure window unit by nailing through nail fin and screw through jambs as indicated in manufacturer's instructions.
- D. Flash window in accordance with AAMA's "Standard Practice for Installation of Windows with a Mounting Flange in Stud Frame Construction".
- E. Insulate between window frame and rough opening with insulation. Refer to Division 7 Section "Building Insulation".

#### 3.3 ADJUSTING

- A. Adjust units for smooth operation without binding or racking.
- B. Adjust sash locks and screens for smooth operation.

#### 3.4 CLEANING

- A. Clean soiled surfaces and glass prior to substantial completion.

#### 3.5 PROTECTION

- A. Protect window unit from damage until substantial completion. Repair or replace damaged units.

**END OF SECTION**

# Section 08 71 00

## Door Hardware Schedule

Specifications

08 71 00-1

### PART 1 - GENERAL

- 1.01 GENERAL REQUIREMENTS
  - A. Any door shown on the drawings and not specifically referenced in the hardware sets shall be provided with identical hardware as specified on other similar openings and shall be included in the finish hardware suppliers bid.
  - B. All doors that are fire rated shall be provided with fire rated hardware to comply with the local code requirements whether specified that way or not as a part of the hardware supplier's base bid.
  - C. Hardware supplier shall notify the Architect in writing of any discrepancies no less than five (5) working days prior to the bid date that could result in hardware being supplied that is non-functional, that will not meet local codes, or any door that is not covered in this specification.
  
- 1.02 RELATED DOCUMENTS
  - A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
  
- 1.03 SUMMARY
  - A. This Section includes the following:
    - 1. Commercial door hardware for the following:
    - 2. Swinging doors.
      - a. Other doors to the extent indicated.
  - B. Related Sections:
    - 1. Division 08 Section "Hollow Metal Doors and Frames" for astragals furnished as part of fire-rated labeled assemblies.
    - 2. Division 08 Section "Flush Wood Doors" for astragals as part of fire-rated labeled assemblies.
  - C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.
  
- 1.04 SUBMITTALS
  - A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.
    - 1. Informational Submittals: LEED (Leadership in Energy and Environmental Design) product information and applicable program credits that are available to contribute towards a LEED Platinum Level project certification.
    - 2. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
    - 3. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
    - 4. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.
    - 5. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
    - 6. Content: Include the following information:
      - 7. Type, style, function, size, label, hand, and finish of each door hardware item.
      - 8. Manufacturer of each item.
      - 9. Fastenings and other pertinent information.
      - 10. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
      - 11. Explanation of abbreviations, symbols, and codes contained in schedule.
      - 12. Mounting locations for door hardware.
      - 13. Door and frame sizes and materials.
      - 14. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction

## Section 08 71 00 Door Hardware Schedule

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schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

15. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.
16. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 1. Upon completion of construction and building turnover, furnish two (2) complete maintenance manuals to the owner. Manuals to include the following items:
  17. Approved hardware schedule, catalog cuts and keying schedule.
  18. Furnish keying biting list in paper and electronic format by registered mail directly to facility manager owner.
  19. Hardware installation and adjustment instructions.
  20. Manufacturer's written warranty information.

### 1.05 QUALITY ASSURANCE

- A. PLEASE BE ADVISED HARDWARE SUPPLIER AND INSTALLER MUST OBTAIN A LICENSE WITH THE OFFICE OF STATE FIRE MARSHAL IN ACCORDANCE TO LRS 40:1646 & 40:1664. WITHOUT THIS LICENSE SUPPLIER AND INSTALLER WILL NOT MEET SPECIFICATION
- B. Door Hardware Installer Qualifications: An experienced and factory trained Installer who has completed installations similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Door Hardware Supplier Qualifications: Door hardware supplier who employs a qualified Architectural Hardware Consultant or equivalent experience available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying. Supplier recognized by manufacturers to be a direct factory-authorized distributor of the specified hardware products. Supplier is required to be available for onsite meetings with one days notice regarding issues that arise with opening functions, installation, keying, on-site warehousing, trouble shooting of products, and final punch out related issues.
- D. Scheduling Responsibility: Preparation of door hardware and keying schedules.
- E. Architectural Hardware Consultant Qualifications: A person who is currently certified by the Door and Hardware Institute as an Architectural Hardware Consultant (AHC) and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
- F. Source Limitations: Obtain each type and variety of aluminum, steel and wood door hardware from the same single source manufacturer and supplier, unless otherwise indicated.
- G. Furnish exterior door hardware from the same manufactures as the interior door hardware, no deviations will be allowed.
- H. Regulatory Requirements: Comply with provisions of the following:
  - I. Where indicated to comply with accessibility requirements, comply with "Americans with Disabilities Act" (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117 as follows:
  - J. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
  - K. Door Closers: Comply with the following maximum opening-force requirements indicated:
    - L. Interior Hinged Doors: 5 lbf applied perpendicular to door.
    - M. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
    - N. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.NFPA 101: Comply with the following for means of egress doors:
      - O. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
      - P. Thresholds: Not more than 1/2 inch high.
      - Q. International Building Code (2006).

## Section 08 71 00 Door Hardware Schedule

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- R. Fire-Rated Door Assemblies: Furnish door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252 (neutral pressure at 40" above sill) or UL-10C.
  - S. Test Pressure: Positive pressure labeling.
- 1.06 DELIVERY, STORAGE, AND HANDLING
- A. One complete shipment of door hardware as detailed in approved Door Hardware Schedule Shop Drawings to be inventoried on site and upon receipt of material is secure in lock-up room furnished with shelving for door hardware.
  - B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
  - C. Deliver permanent keys, cylinders, cores, access control credentials, loaded bitting and key records per cylinder, and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference". Hardware Supplier must be a regional supplier to address owner questions and concerns relating to keying issues that arise as project close-out.
- 1.07 COORDINATION
- A. Templates: Door Hardware Supplier to furnish and distribute to the parties involved for templating for doors, frames, and other work specified to be factory prepared for installing standard door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
  - B. Keying Conference: Door Hardware Supplier to conduct keying conference to comply with requirements in Division 1 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document prior to any material being ordered:
    - 1. Function of building, purpose of each area and degree of security required.
    - 2. Plans for existing and future key system expansion.
    - 3. Review all lock and exit device functions when reviewing keying requirements.
    - 4. Requirements for key control system.
    - 5. Installation of permanent keys and cylinder cores.
    - 6. Address the requirements for delivery of keys.
    - 7. Address keying and cylinder stamping (identification) as required by owner or owner representative.
    - 8. Establish method of submitting electronic format of keying systems and diagram and to be produced and furnished by Hardware Supplier.
  - C. Pre-Installation Conference: Hardware Supplier to conduct conference at Project site attended by representatives of Door Hardware Manufacturers, Hardware Installers, Owner Representative and General Contractor to review proper hardware installation methods and the procedures for receiving and handling hardware. On site training should not be less than four hours of on-site training by qualified Hardware Supplier and Manufactures. At completion of installation and final walk through, furnish written certification that hardware items were applied according to conference recommendations and to finish hardware specifications.
- 1.08 WARRANTY
- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
  - B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of standard hardware that fails in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
    - 1. Structural failures including excessive deflection, cracking, or breakage.
    - 2. Faulty operation of the hardware.
    - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - C. Warranty Period: Two year from date of Substantial Completion, unless otherwise indicated.

**Section 08 71 00**  
**Door Hardware Schedule**

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- D. Special Warranty Periods:
  - 1. Five years for mortise locksets.
  - 2. Five years for exit devices.
  - 3. Ten years for manual door closers.
  - 4. Five years for Thresholds, Door Sweeps, Gasketing, Perimeter Weatherstripping.

1.09 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Maintenance Service: Beginning at Substantial Completion, furnish six months' full maintenance by skilled employees of door hardware and integrated access control systems suppliers and installers. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Furnish parts and supplies as used in the manufacture and installation of original products.

**PART 2 - PRODUCTS**

2.01 SCHEDULED DOOR HARDWARE

- A. General: Furnish door hardware for each door to comply with requirements in this Section and the Door Hardware Schedule at the end of Part 3.
  - 1. Door Hardware Sets: Furnish quantity, item, size, finish or color indicated for named products listed in Hardware Sets.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Schedule at the end of Part 3. Products are identified by using door hardware designations, as follows:
  - 1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule. **All requests for substitution to be made seven (7) days prior to bid in accordance with Division 1, by use of formal CSI format pre-bid substitution request forms with literature and testing information provided to prove compliance and equality to specifications.**

2.02 HINGES AND PIVOTS

- A. Manufacturers: Subject to compliance with requirements, furnish products by one of the following:
  - 1. Hinges:
    - a. Hager Companies (HA).
    - b. McKinney Products (MC).
    - c. Ives (IV).
  - 2. Standards: BHMA Certified products complying with the following:
    - a. Butts and Hinges: BHMA A156.1.
    - b. Continuous Geared Hinges: BHMA A156.26.
    - c. Template Hinge Dimensions: BHMA A156.7.
  - 3. Quantity: Furnish the following, unless otherwise indicated:
    - a. Two Hinges: For doors with heights up to 60 inches.
    - b. Three Hinges: For doors with heights 61 to 90 inches.
    - c. Four Hinges: For doors with heights 91 to 120 inches.
    - d. For doors with heights more than 120 inches, furnish 4 hinges, plus 1 hinge for every 30 inches (of door height greater than 120 inches).
  - 4. Hinge Size: Furnish the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

Maximum Door Size (inches)	Hinge Height (inches)	Metal Thickness (inches)	
		Standard Weight	Heavy Weight
36-in by 86-in by 1-3/4	4-1/2	0.134	0.180
< 36-in by 120-in by 1-3/4	5	0.146	0.190

## Section 08 71 00 Door Hardware Schedule

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5. Hinge Weight and Base Material: Unless otherwise indicated, furnish the following:
6. Exterior Doors: Heavy weight, non-ferrous, ball bearing hinges.
7. Interior Doors: Heavy weight, ball bearing hinges unless Hardware Sets indicate standard weight.
8. Standard weight hinges can be used at Mechanical, Electrical, IDF, Data, and Offices without closers openings, regardless of specified hinge weight in hardware sets.
9. Hinge Height Clarifications: Where uneven door leafs occur, the widest door leaf in the pair determines the height and weight of the hinges on the inactive and active door leafs; to ensure equal size hinges on opening.
10. Hinge Weight Clarification: If heavy weight hinges are specified in hardware sets for interior aluminum frames then standard weight hinges can be used. If aluminum frame opening has a door over 42 inches or greater than an additional hinge in lieu of heavy weight or 5 inch hinges.
11. Hinge Options: Comply with the following where indicated in the Door Hardware Schedule or on Drawings:
12. Non-removable Pins: Furnish set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:
  - a. Out-swinging exterior doors.
  - b. Out-swinging access controlled doors.

### 2.03 LOCKS AND LATCHES

- A. Manufacturers: Subject to compliance with requirements, furnish products by one of the following:
  1. Mechanical Mortise Locks and Latches:
    - a. Sargent Manufacturing (SA) - 8200 Series.
    - b. Standards: Comply with the following:
      - i. Mortise Locks and Latches: BHMA A156.13.
  2. Mortise Locks: BHMA Certified Grade 1, Series 1000.
  3. Lock Trim: Match the following design style:
  4. Levers:
    - a. Sargent (SA) – Designer Trim: CRY
  5. Lock Functions: Function numbers and descriptions indicated in the Door Hardware Schedule comply with the following:
  6. Mortise Locks: BHMA A156.13.
  7. Lock Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:
  8. Mortise Locks: Minimum 3/4-inch latchbolt throw, with stainless steel bolt.
    - a. All mortise locks to have stainless steel latchbolts and deadbolts. Brass bolts are not considered heavy duty and will not be accepted.
    - b. For ease of maintenance, all mortise locks to be easily field reversible without the need to open the lock case.
    - c. Office function mortise locks to have inside thumbturn.
    - d. Backset: 2-3/4 inches unless otherwise indicated.
  9. Cylindrical Locksets, Grade 2 (Light Commercial Duty): ANSI/BHMA A156.2, Series 4000, Grade 2 economical cylindrical locksets designed to fit ANSI standard 161 door prep without additional through-bolts. Locksets to fit in 1 3/8" or 1 3/4" thickness doors, and available with 2 3/8" standard backset adjustable to 2 3/4".
  10. Acceptable Manufacturers:
    - a. Sargent Manufacturing (SA) - 3-Line GX Series.
  11. Levers:
    - a. Sargent (SA) – Designer Trim: OY

## Section 08 71 00 Door Hardware Schedule

Specifications

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- 2.04 CYLINDERS AND KEYING
- A. Manufacturers: Subject to compliance with requirements, furnish products by one of the following:
  - B. Cylinders: Medeco (ME) – M3
  - C. Key all locks as directed by the owner during the keying conference.
  - D. Standards: Comply with the following:
    - 1. Cylinders: BHMA A156.5.
    - 2. Key Control System: BHMA A156.5.
  - E. Cylinder Grade: BHMA Certified Grade 1.
  - F. Construction Keying: Comply with the following:
    - 1. Construction Master keying: Provide temporary construction master keyed cores to maintain adequate security for the building during the construction period.
    - 2. Temporary construction master keys only will be issued to the General Contractor during the construction period.
    - 3. At the completion of the project, the hardware supplier will install the permanent cores as directed, unless otherwise directed at the keying meeting by the owner.
  - G. Keying System: Unless otherwise indicated, provide for a keying system complying with the following requirements:
    - 1. Master Key System: Cylinders shall be key operated by a change key, master key, and a grand master key. Conduct keying meeting with End User to define and document keying system instructions and requirements.
  - H. Keys: Provide nickel-silver keys complying with the following:
    - 1. Stamping: Permanently inscribe each key with a visual key control number and as directed by Owner.
    - 2. Quantity: Provide the following:
      - a. Cylinder Change Keys (Per Key Set): Three.
      - b. Master Keys (Per Level): Ten.
      - c. Grand Master Keys: Ten.
      - d. Construction keys: Ten.
- 2.05 STRIKES
- A. Manufacturers: Subject to compliance with requirements, furnish products by one of the following:
  - B. Standards: Comply with the following:
    - 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
    - 2. Dustproof Strikes: BHMA A156.16.
  - C. Strikes: Furnish manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
    - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
    - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
    - 3. Aluminum-Frame Strike Box: Furnish manufacturer's special strike box fabricated for aluminum framing.
- 2.06 EXIT DEVICES
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1. Exit Devices:
      - a. Sargent (SA) – 80 Series
  - B. Standard: BHMA A156.3.
  - C. Exit Devices: BHMA Certified Grade 1.
  - D. Latchbolt: High-grade, heat-treated, corrosion-resistant nickel steel alloy. Slide-action deadbolt with positive deadlocking by auxiliary bolt.
  - E. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
  - F. Through Bolt Installation: For exit devices and trim as required for fire rated wood doors. Where through bolts are used, coordinate the color of bolt on opposite of device with BHMA finish color similar to the color of door finish surface.



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- 2.07 INTEGRATED WIEGAND OUTPUT ACCESS CONTROL EXIT DEVICES
- A. Wiegand Output Integrated Card Reader Exit Hardware: Wiegand output ANSI 156.3 Grade 1 rim, mortise, and vertical rod exit device hardware with integrated proximity card reader, latchbolt and touchbar monitoring, and request-to-exit signaling, in one complete unit. Hard wired, solenoid driven locking/unlocking control of the lever handle exit trim with 3/4" throw latch bolt. U.L listed and labeled for either panic or "fire exit hardware" for use on up to 3 hour fire rated openings.
1. Sargent Manufacturing (SA) - Harmony - H1/H2 80 Series.
- 2.08 CLOSERS
- A. Manufacturers: Subject to compliance with requirements, furnish products by one the following:
1. Surface-Mounted Closers (Heavy Duty): BHMA Certified Grade 1 (to be used at exterior, cross corridor and high frequency use openings):
    - a. Sargent Manufacturing (SA) – 1431:Approved Arms: O, P10, PS, PSH, CPS, CPSH
    - b. Standards: Comply with the following:
    - c. Closers: BHMA A156.4.
- B. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Furnish non-handed, factory-sized closers adjustable to meet field conditions and requirements for opening force.
- C. Closer Options: As indicated in hardware sets, furnish door closer options including: delayed action, hold open arms, extra duty cast or forged parallel arms, positive stop/hold open arms, compression stop/hold open arms, special mounting brackets, spacers and drop plates. Through bolt type mounting is required as indicated in the door hardware sets. Where through bolts are used, coordinate the color of bolt on opposite of device with BHMA finish color similar to the color of door finish surface. Bent steel or threaded rod arms are not acceptable unless clearly specified in the Hardware Sets.
- 2.09 OPERATING and PROTECTIVE TRIM UNITS
- A. Manufacturers: Subject to compliance with requirements, furnish products by one of the following:
1. Metal Protective Trim Units:
    - a. McKinney Products (MC).
    - b. Rockwood Manufacturing (RO).
    - c. Hager Companies (HA).
- B. Standard: Comply with BHMA A156.6.
- C. Materials: Fabricate protection plates from the following:
1. Brass/Bronze and Stainless Steel: .050 inches thick, beveled four sides (B4E) with countersunk screw holes.
- D. Push-Pull Design: 1" Round with 12" Centers. Furnish 90 degree offset pulls at exterior openings.
- E. Fasteners: Furnish manufacturer's designated fastener type as indicated in door hardware sets.
- F. Furnish protection plates sized 2 inches less than door width (LDW) on push side and 1 inch less door width on pull side by height specified in door hardware sets.
- G. Coordinate stainless steel hinges, door edges, kickplates and armor plates with less than .09375 inches between meeting edges, regardless of specified sizes in hardware sets.
- 2.10 STOPS AND HOLDERS
- A. Manufacturers: Subject to compliance with requirements, furnish products by one of the following:
1. Stops and Holders:
    - a. McKinney Products (MC).
    - b. Rockwood Manufacturing (RO).
    - c. Hager Companies (HA).
- B. Standards: Comply with the following:
1. Stops and Bumpers: BHMA A156.16.

## Section 08 71 00 Door Hardware Schedule

Specifications

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2. Combination Overhead Holders and Stops: BHMA A156.8.
  3. Door Silencers: BHMA A156.16.
  - C. Stops and Bumpers: BHMA Certified Grade 1.
  - D. Provide Overhead Concealed stops at public spaces such as conference, corridors, and office spaces where wall or floor stops are not applicable condition.
  - E. Provide Overhead Surface stops at non-public spaces such as mechanical, electrical, storage spaces.
  - F. Floor Stops: For doors, unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic.
    1. Where floor or wall stops are not appropriate, furnish overhead stops.
  - G. Silencers for Metal Door Frames: BHMA Grade 1; neoprene or rubber, minimum diameter 1/2 inch fabricated for drilled-in application to frame. Furnish (3) per single door and (2) per paired door frame if applied gasketing is not specified in Hardware Sets.
- 2.11 DOOR THRESHOLDS, WEATHERSTRIPPING AND GASKETING
- A. Manufacturers: Subject to compliance with requirements, furnish products by one of the following:
    1. Door Thresholds, Weatherstripping and Gasket Seals:
      - a. McKinney Weatherstripping Products (MW).
      - b. Hager Companies (HA).
      - c. Pemko Manufacturing (PE).
  - B. Standard: Comply with BHMA A156.22.
  - C. General: Furnish continuous weatherstrip seal on exterior doors and smoke, light, or sound gasketing on interior doors where specified. Furnish non-corrosive fasteners for exterior applications.
    1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame. Install header seal before mounting door closer arms.
    2. Meeting Stile Astragals: Fasten to meeting stiles, forming seal when doors are closed.
    3. Door Sweep: Apply to bottom of door, forming seal with threshold when door is closed.
  - D. Furnish thresholds to meet ADA compliance height, coordinate threshold height with floor pivots, finish floor thickness and door undercut. Extended spindles on pivots may be required due to construction detail and final installation; coordination requirements by door and hardware supplier is required prior to ordering material.
- 2.12 FABRICATION
- A. Fasteners: Furnish door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Furnish screws according to manufacturers recognized installation standards for application intended.
    1. Furnish manufactures templated and approved stainless steel screws and fasteners for stainless steel hardware specified in the hardware sets.
  - B. Mounting Accessories: Furnish drop plates, filler brackets, extended length screws, through bolts, and accessories for complete mounting with door, frame, light kits, applied molding and special applications as part of the base bid with complete installation per manufactures recommendations.
- 2.13 FINISHES
- A. Standard: Comply with BHMA A156.18.
  - B. Furnish quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.
  - C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable and temporary protective covering before shipping to jobsite.
  - D. BHMA Designations: Comply with base material and finish requirements indicated by the following:
    1. BHMA 600: Primed for painting, over steel base metal.
    2. BHMA 626: Satin chromium plated over nickel, over brass or bronze base metal.
    3. BHMA 628: Satin aluminum, clear anodized, over aluminum base metal.
    4. BHMA 630: Satin stainless steel, over stainless-steel base metal.
    5. BHMA 652: Satin chromium plated over nickel, over steel base metal.

## Section 08 71 00 Door Hardware Schedule

Specifications

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6. BHMA 689: Aluminum painted, over any base metal.

### PART 3 – EXECUTION

#### 3.01 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

#### 3.02 PREPARATION

- A. Steel Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

#### 3.03 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
  1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
  2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
  3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- C. Furnish and coordinate concealed wood blocking for wall mount stops as detailed in Door Hardware Schedule.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

#### 3.04 FIELD QUALITY CONTROL

- A. The Contractor shall comply with AIA A201 1997 section 3.3.1 which reads as follows: "The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the contract Documents give other specific instructions concerning these matters."
  1. Field Inspection: Supplier and Door Hardware Manufacturer will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

#### 3.05 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
  1. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.
  2. Six-Month Adjustment: Approximately six months after date of Substantial Completion, Installer shall perform the following:
    - a. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
    - b. Consult with and instruct Owner's personnel on recommended maintenance procedures.

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**Door Hardware Schedule**

Specifications

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- c. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

3.06 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
  - 1. Clean operating items as necessary to restore proper finish. Furnish final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.07 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.

3.08 DOOR HARDWARE SETS

- A. The hardware sets listed below represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections.
- B. Manufacturer's Abbreviations:
  - 1. MK - McKinney
  - 2. 00 - Other
  - 3. RO - Rockwood
  - 4. SA - Sargent
  - 5. AD - Adams Rite
  - 6. MC - Medeco
  - 7. SU - Securitron
  - 8. RF - Rixson
  - 9. PE - Pemko

**Hardware Schedule**

**Set: 1.0**

Doors: D-1A, D-1B, D-2A, D-2B

Description: Unit Entry

3 Hinge	FT-TA714 4-1/2" x 4-1/2"	US26D x US26D	MK
1 Front Door Lock	8247 CRY LC	US26D	SA
1 Cylinder	10T0200	26	MC
1 Door Closer	1431 O	EN	SA
1 Door Stop	441	US26D	RO
1 Gasketing	S88D		PE
1 Sweep	315CN		PE
1 Viewer (Only at D-1A & D-1B)	622	US26D	RO
1 Protection Plate	605	US26D	RO
1 Door Guard	603	CRM	RO

**Set: 2.0**

Doors: 2A, 2B, 6, 6A, 6B

Description: Closet

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3	Hinges furnished by	prehung door supplier	US26D	00
1	Passage Set	3U15 OY	US26D	SA
1	Door Stop	528	NP	RO

**Set: 3.0**

Doors: 1A, 1B

Description: Unit Bathroom, Bedroom

3	Hinges furnished by	prehung door supplier	US26D	00
1	Privacy Set	3U65 OY	US26D	SA
1	Door Stop	528	NP	RO

**Set: 4.0**

Doors: 5

Description: Bifold Set

1	Single Dummy Trim	3U93 OY	US26D	SA
1	Sliding Door Hdwe	HF2/100A/6		PE

**Set: 5.0**

Doors: D-3

Description: Rated-storage

3	Hinge	FT-TA714 4-1/2" x 4-1/2"	US26D x US26D	MK
1	Classroom Lock	8237 CRY LC	US26D	SA
1	Cylinder	10T0200	26	MC
1	Door Closer	1431 O	EN	SA
1	Kickplate	K1050 8" x 2"LDW 4BE CSK	US32D	RO
1	Door Stop	441	US26D	RO
1	Gasketing	S88D		PE

**Set: 6.0**

Doors: 3A, 3B, 4A, 4B

Description: HCAV, HWH

3	Hinge	FT-T714 4-1/2" x 4-1/2"	US26D x US26D	MK
1	Storeroom Lock	8204 CRY LC	US26D	SA

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1	Cylinder	10T0200	26	MC
1	Wall Stop	406	US32D	RO
3	Silencer	608		RO

**END OF SECTION**

**Section 08 71 00**  
**Door Hardware Schedule**  
Specifications

08 71 00-13

# Section 09 21 16

## Gypsum Board Systems

Specifications

09 21 16-1

### PART 1 - GENERAL

- 1.01 SECTION INCLUDES
  - A. Gypsum board and sheathing.
  - B. Taped and sanded joint treatment, curved beads, and metal trim/edges.
  - C. Orange peel finish.
  - D. Metal resilient channels at ceilings where required in drawings.
- 1.02 QUALITY ASSURANCE
  - A. Perform Work in accordance with GA-201, GA-216 and GA-600.
- 1.03 QUALIFICATIONS
  - A. Applicator: minimum five years documented experience.

### PART 2 - PRODUCTS

- 2.01 MANUFACTURERS
  - A. Use only those products made by manufacturers noted in drawings in the Wall and Floor Type illustrations.
- 2.02 GYPSUM BOARD MATERIALS
  - A. Standard Gypsum Board: ASTM C36; 5/8-inch-thick, maximum permissible length; ends square cut, tapered edges.
  - B. Fiberglass-Mat Faced Mold and Moisture Resistant Gypsum Board: ASTM C630 and ASTM C1658 Type C; 5/8-inch-thick, maximum permissible length; ends square cut, tapered edges. "Dens Armor Plus" by Georgia-Pacific or Approved Equal.
  - C. Fire Rated Gypsum Board: Type X or C, 5/8-inch-thick, maximum permissible length; ends square cut, tapered edges. Refer to drawings for type.
  - E. Joint Materials: Reinforcing tape, joint compound, adhesive, and water.
  - F. Fasteners: USG 1 1/4-inch type with bugle head.
  - G. Edge Trim: GA-216, type LC bead and USG "J-type" mould.
  - H. Corner Beads: Metal.
  - I. Textured Finish Materials: Latex based texturing material, orange peel.
  - J. Glass-Mat Gypsum Exterior Sheathing Board: "Dens Glass "Gold" by Georgia-Pacific or Approved Equal. ASTM C 1177/C 1177M; 1/2" thick, maximum permissible length; ends square cut.
- 2.03 FRAMING MATERIALS
  - A. Resilient Channels: 1/2 in. deep by 2-5/8 in. wide at the base and 1 1/2" in. wide at the face, formed of 21 MIL galvanized steel.
  - B. Manufacturer: Clark Dietrich
  - C. Model: RC Deluxe (RCSD) (No Substitutions)
- 2.04 SUSPENDED CEILING SYSTEM MATERIALS
  - A. Cold-rolled Channels: 16 ga., 1-1/2" thick.
  - B. Furring Channels: 26 ga., roll-formed, hat-shaped.
  - C. Furring Channel Clips: to attach furring channels to 1-1/2-inch channels in ceilings.
  - D. Hanger wire: 8 ga.
  - E. Tie wire: 16 ga.
  - F. Lateral bracing: as required by code.

### PART 3 - EXECUTION

- 3.01 ACOUSTICAL ACCESSORIES INSTALLATION
  - A. Place acoustical insulation in partitions and/or ceilings tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions, and tight to items passing through partitions.
  - B. Install acoustical sealant at gypsum board perimeter at:
    - 1. Base Layer.
    - 2. Caulk all penetrations of partitions by conduit, pipe, duct work, boxes, etc.



## Section 09 21 16 Gypsum Board Systems

Specifications

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- 3.02 GYPSUM BOARD WALL BOARD INSTALLATION
- A. Install gypsum board in accordance with manufacturer's instructions.
  - B. Erect single layer standard gypsum board in most economical direction, with ends and edges occurring over firm bearing.
  - C. Erect single layer fire rated gypsum board vertically
  - D. Use screws when fastening gypsum board to framing.
  - E. Place second layer perpendicular to first layer.
  - F. Place control joints consistent with lines of building spaces as indicated.
  - G. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.
  - H. Install moisture resistant gypsum board at "wet areas".
- 3.03 SUSPENDED GYPSUM BOARD CEILING INSTALLATION
- A. Install 8 ga. hangers not over 4'-0" in the direction of the 1-1/2" cold-rolled main runner channels and within 6" of the ends of main runner runs, and of boundary walls, girders, or similar interruptions of ceiling continuity. Coordinate location of hangers with other work.
  - B. Place cold-rolled channels not over 4'-0" o.c., properly positioned, leveled, and saddle tie hangers along runner.
  - C. Do not let main runners into nor bring in contact with abutting walls. Locate runner channels within 6" of the walls to support the ends of the furring channels.
  - D. Install furring channels 16" o.c. and securely clip with furring channel clips or saddle tie with two strands of 16 ga. tie wire to main runners or main support members. Do not let into or bring into contact with abutting walls. Provide end splices by nesting channels or studs no less than 8" and securely wire tying.
  - E. Install metal furring channel clips on alternate sides of the main runner channel. Wire tie metal furring channel to 1-1/2" channel when clips cannot be alternated and to main support members.
  - F. At light troffers or any openings that interrupt the main runner channels, install additional cross-bracing. Reinforce openings in ceiling suspension system which interrupt main carrying channels or furring channels, with lateral channel bracing. Extend bracing minimum 24 inches past each end of openings.
  - G. Laterally brace entire system.
  - H. Independently support heavy concentrated loads. Suspended ceiling system is designed to support only the dead load of itself.
  - I. Install gypsum board in accordance with manufacturer's instructions.
- 3.04 JOINT TREATMENT
- A. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface
  - B. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.
- 3.05 TOLERANCES
- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 in any direction.

**END OF SECTION**

## Section 09 31 00

### Tile

Specifications

09 31 00-1

#### PART 1 – GENERAL

- 1.01 SECTION INCLUDES
  - A. Porcelain tile wall, floor, and base using the thin set application method.
  - B. Threshold at termination by corridor.
- 1.02 QUALITY ASSURANCE
  - A. Perform work in accordance with TCA Handbook for ceramic tile installation.
- 1.03 SUBMITTALS
  - A. Provide manufacturer's product data, with actual chip selection board for both mosaic tile and grout color.
- 1.04 QUALIFICATIONS
  - A. Applicator: Company specializing in performing the work of this section with minimum three years documented experience.

#### PART 2 – PRODUCTS

- 2.01 MANUFACTURER
  - A. Porcelain Tile:
    - 1. DalTile or approved equal.
  - B. Thin set Mortar/Adhesive:
    - 1. C-Cure or approved equal.
  - C. Grout:
    - 1. C-Cure or approved equal.
- 2.02 TILE COMPONENTS (T-1 thru T-3)
  - A. Porcelain Floor Tile (T-1):
    - 1. Manufacturer: DalTile
    - 2. Pattern: Koncrete
    - 3. Color: To Be Selected
    - 4. Size: 12" x 24" x 3/8"
    - 5. Shall conform to requirements of ANSI A 137.1
    - 6. Unglazed surface finish for added slip resistance
- 2.03 SPECIFICATIONS & PERFORMANCE (T-1)
  - A. Water Absorption: ASTM# C373 <0.5%
  - B. Breaking Strength: ASTM# C648 >450 lbs
  - C. Scratch Hardness: ASTM# MOH'S 8.0
  - D. Chemical Resistance: ASTM# C650 Resistant
  - E. Coefficient of Friction: ASTM# C1028 Wet: ≥0.60 Dry: ≥0.70
  - F. Threshold: Marble, 3/8" maximum height by length required, compliant with ADAAG. Longest possible solid length; color to be selected by Architect.
- 2.03 SETTING MATERIALS
  - A. Epoxy Adhesive: ANSI A 118.3, thin set bond type, at floors.
  - B. Thin set Mortar Materials: ANSI A 118.1 Dry Set and water, at base.
  - C. Polymer Fortified Fiber Reinforced Mortar.
- 2.04 GROUT MATERIALS
  - A. ANSI A118.3, ceramic tile grout and adhesive, three component system.
  - B. Epoxy resin type, with numerous color choices.
- 2.05 ACCESSORIES
  - A. Flashing: Waterproof membrane for use at base and floor drains, as recommended by manufacturer.
  - B. Float: As recommended by tile and adhesive manufacturers.
- 2.06 MORTAR AND GROUT MIX
  - A. Mix and proportion pre-mix mortar and grout materials in accordance with manufacturer's instructions.

#### PART 3 – EXECUTION

## Section 09 31 00

### Tile

Specifications

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- 3.01 EXAMINATION AND PREPARATION
  - A. Seal substrate surface cracks with filler. Use latex float at dips as required for level installation. Contractor shall be responsible for visiting site to observe obvious areas requiring floating.
- 3.02 INSTALLATION
  - A. Install adhesive, tile, base, and grout in accordance with manufacturer's instructions.
  - B. Use special pieces at internal corners, base termination, etc.
- 3.03 INSTALLATION - TILE
  - A. Install tile when the surface is hard enough to walk on (typically overnight).
  - B. Mortar will be ready for foot traffic in 12 to 24 hours.
  - C. Joint width to be 1/16 to 1/8 inches; install tile with latex thin set mortar or adhesive.
  - D. Mix grout in accordance with manufacturer's instructions.
  - E. Apply and work grout into joints; reapply as necessary before initial application has begun to set-up.
- 3.04 CLEANING
  - A. Clean tile work with water while mortar is fresh.
- 3.05 PROTECTION OF WORK
  - A. Do not allow foot traffic for period of time recommended by grout and mortar manufacturer(s).
  - B. Do not cover tile for curing time as required by grout and mortar manufacturer(s).
  - C. Cover work as recommended by manufacturer and protect from other trades.

**END OF SECTION**

# Section 09 65 00 Resilient Flooring

Specifications

09 65 00-1

## PART 1 GENERAL

- 1.01 SECTION INCLUDES
- A. Resilient tile flooring.
  - B. Work shall include floating as required for complete installation of work indicated in plans and as noted in site; bidders shall allow for additional amount of floating that may be necessary.
- 1.02 RELATED SECTIONS
- A. Section 03 54 00 – Gypsum Cement Underlayment
- 1.03 REFERENCES
- A. ASTM F1700 – Solid Vinyl Floor Tile.
  - B. FS L-F-475 - Floor Covering, Vinyl Surface (Tile), with Backing.
- 1.04 SUBMITTALS
- A. Shop Drawings: Indicate seaming plan and edge/transition details.
  - B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.
  - C. Samples: Submit two samples of floor tile, 18 x 18 inch in size, and one chain of rubber base, illustrating color and pattern for each floor material for each color specified.
  - D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and five year warranty.
- 1.05 REGULATORY REQUIREMENTS
- A. Conform to applicable code for flame/smoke rating requirements in accordance with ASTM E84.
- 1.06 DELIVERY, STORAGE, AND HANDLING
- A. Deliver, store, protect and handle products to site under provisions of Section 01 60 00.
- 1.07 ENVIRONMENTAL REQUIREMENTS
- A. Store materials for three days prior to installation in area of installation to achieve temperature stability.
  - B. Maintain ambient temperature required by adhesive manufacturer three days prior to, during, and 24 hours after installation of materials.
- 1.08 MAINTENANCE DATA
- A. Submit under provisions of Section 01 70 00.
  - B. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

## PART 2 PRODUCTS

- 2.01 MATERIALS – TILE FLOORING
- A. Luxury Vinyl Tile: ASTM F1700:
    - 1. Size: 6 x 36 inch
    - 2. Thickness: 1/8 inch
    - 3. Manufacturers:
      - a. Mannington/Amtico: Style: Spacia - Wood (Basis of Design)
      - b. Armstrong
      - c. Substitutions 01 25 00
    - 4. Color:
      - a. TBD
      - c. All color selection to be approved by Architect via submitted samples.
    - 5. Layout. See drawings.
- 2.03 ACCESSORIES
- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
  - B. Primers and Adhesives: Waterproof; types recommended by flooring and base manufacturer. Adhesives shall comply with (SCAQMD) Rule # 1168.
  - C. Surface applied vapor reduction: Contractor to apply as necessary if new and existing moisture substrate conditions do not meet flooring manufacturer's moisture requirements to accept flooring

## Section 09 65 00 Resilient Flooring

Specifications

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installation within construction schedule.

1. Aquafin SG3
  2. Laticrete Drytek.
- D. Edge Strips: Flooring material manufactured by floor manufacturer.
- E. Sealer and Wax: Types recommended by flooring manufacturer.

### 2.04 EXTRA STOCK

- A. Deliver to the Owner:
1. Four (4) present or one (1) unopened carton of each color and pattern of tile selected, whichever is greater.
  2. Four (4) percent or one (1) unopened carton of each color, type, and size base, and rubber stair treads and landings selected, whichever is greater.
  3. One (1) gallon container of each type adhesive used for flooring, base

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify concrete floors are dry to a maximum moisture content required by flooring manufacturer, and exhibit negative alkalinity, carbonization, or dusting.
- B. Verify floor and lower wall surfaces are free of substances that may impair adhesion of new adhesive.
- C. Test concrete floor as required for moisture content. Verify compliance with adhesive manufacturer's installation instructions.

### 3.02 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- B. Prohibit traffic until filler is cured; vacuum clean substrate.
- C. Prime surfaces recommended by manufacturer appropriate for subfloor of subject installation.
- D. Provide any floor preparation as may be necessary to accommodate possible high RH of existing concrete slab, such that proper adhesion is achieved. Refer to Article 2.03.C of this Section.

### 3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Mix tile from container to ensure shade variations are consistent when tile is placed.
- C. Spread only enough adhesive to permit installation of materials before initial set.
- D. Set flooring in place, press with heavy roller to attain full adhesion.
- E. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern.
- F. Install tile to basket weave pattern. Allow minimum 1/2 full size tile width at room or area perimeter.
- G. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar.
- H. Install edge and transition strips at unprotected or exposed edges, and where flooring terminates.
- I. Scribe flooring to walls, cabinets, floor outlets, and other appurtenances to produce tight joints; at crevasse exists between floor tile and material, provide and install appropriate (sealant with matching color to flooring) at crevasse.
- J. Install flooring in or on floor access covers, cleanouts, etc. Maintain floor pattern.
- K. Install rubber base at toe kicks and exposed sides of laminate clad casework.
- L. Use only premolded pieces at external and internal corners.

### 3.04 CLEANING

- A. Clean work under provisions of 01 70 00 and in accordance with manufacturer's instructions.
- B. Remove access adhesive from floor, base, and wall surfaces without damage.
- C. Clean, seal, and wax floor and base surfaces in accordance with manufacturer's instructions; provide minimum (3) coats.

### 3.05 PROTECTION OF FINISHED WORK

- A. Protect finished Work.
- B. Prohibit traffic on floor finish for 48 hours after installation.

**END OF SECTION**

## Section 09 90 00

### Painting

Specifications

09 90 00-1

#### PART 1 – GENERAL

##### 1.01 SECTION INCLUDES

- A. Surface preparation (sanding, priming, etc.) of new surfaces/items and field application of paints and coatings where indicated in room finish schedule and drawings
- B. Paint finish at CMU/brick walls, steel doors and hollow metal frames.
- C. Paint at interior and exterior steel fabrications.
- D. Stain at all new millwork items and doors.
- E. Paint at interior and all exterior steel fabrications.

##### 1.02 SUBMITTALS

- A. Product Data: Provide data on all finishing products.
- B. Samples: Submit complete color tear-out chip catalogues of manufacturer's system.

##### 1.03 ENVIRONMENTAL REQUIREMENTS

- A. Store and apply materials in environmental conditions required by manufacturer.
- B. Maintain MSDS sheets on site during construction in three ring binder
- C. Finish Materials: Conform to applicable code for environmental requirements.
- D. Finish Materials: Comply with South Coast Air Quality Management District (SCAQMD) Rule # 1113, Green Seal Standard GS-11 and GC-03 (anti-corrosive).

#### PART 2 – PRODUCTS

##### 2.01 MATERIALS

- A. Manufacturers:
  - 1. Sherwin Williams.
  - 2. Devoe.
  - 3. Minwax
  - 4. Behr
  - 5. Cabots
  - 6. Approved equals.
- B. Coatings: Ready mixed except field catalyzed coatings of good flow and brushing properties, capable of drying or curing free of streaks or sags.
- C. Accessory Materials: Materials required to achieve the finishes specified.

##### 2.02 FINISHES

- A. Schedule at end of section based upon Sherwin Williams product numbers.

#### PART 3 – EXECUTION

##### 3.01 EXAMINATION AND PREPARATION

- A. Verify that substrate conditions are ready to receive work.
- B. Measure moisture content of porous surfaces using an electronic moisture meter. Do not apply finishes unless moisture content is less than 12 percent.
- C. Correct minor defects and clean surfaces which affect work of this Section.
- D. Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- E. Gypsum Board Surfaces: Fill minor defects with latex compounds. Spot prime defects after repair.
- F. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- G. Uncoated Ferrous Surfaces: Remove scale by wire brushing, sandblasting, clean by washing with solvent. Apply treatment of phosphoric acid. Prime paint after repairs.
- H. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust, hand clean, and clean surfaces with solvent. Prime bare steel surfaces.
- I. Interior Wood Items Scheduled to Receive Paint Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.
- J. Interior Wood Items Scheduled to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats.

## Section 09 90 00

### Painting

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- K. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

#### 3.02 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.
- B. Upon completion of existing surface preparation (not priming), Architect shall visit site for approval to proceed. Contractor shall not proceed until Architect has visited the site and approved the surfaces ready to receive the paint finish.
- C. Sand transparent finishes lightly between coats to achieve required finish.
- D. Where clear finishes are required, tint fillers to match wood.
- E. Back prime interior and exterior wood work scheduled to receive paint finish with sealer. Backpriming sealer shall not lap onto exposed finish surfaces.
- F. Back prime interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25% with mineral spirits.
- G. Dull existing painted surfaces (if allowed to remain by Architect).
- H. Paint all edges of wood doors (top, bottom, and side edges. Paint edges and surfaces of all millwork, including those not readily visible to view.
- I. Miscellaneous items and surfaces to be painted: Paint existing and new exposed plumbing piping, conduit and electrical boxes to match adjacent wall surface; change color of paint when surface color changes.

#### 3.03 CLEANING

- A. As work proceeds, promptly remove finishes where spilled, splashed, or spattered.

#### 3.04 SCHEDULE - EXTERIOR SURFACES

- A. Steel - Shop Primed:
  - 1. Spot Prime: B66W00310 - Pro Industrial Pro-Cryl® Universal Primer Off White
  - 2. Two coats of Pro Industrial 0 VOC Acrylic Coating - Semi-Gloss, B66W00651
- B. Concrete/Asphalt:
  - 1. Traffic Paint: two coats of Promar Alkyd Zone Marking Paint, white and blue, B29W1.

#### 3.05 SCHEDULE - INTERIOR SURFACES

- A. Wood - Painted:
  - 1. One coat of Multi-Purpose Latex Primer White, B51W08020
  - 2. Two coats of PROCL XP ALK, Semi-gloss, B34W08551
- B. Wood - Stained:
  - 1. One coat of Wood Classic 250 voc Stain, A49W00801, color to be selected.
  - 2. Two coats of Wood Classics Waterborne polyurethane varnish hand rubbed satin, clear A68F00090
- C. Steel - Unprimed (non-humid or moist conditions):
  - 1. One coat of Pro Industrial Pro-Cryl® Universal Primer Off White, B66W00310.
  - 2. Two coats of PROCL XP ALK Semi-gloss, B34W08551
- D. Steel - Unprimed (humid, moist, or exterior conditions):
  - 1. Two coats: Macropoxy® 646-100 Fast Cure Epoxy, B58V00620
- E. Steel - Shop Primed:
  - 1. Touch-up with Pro Industrial Pro-Cryl® Universal Primer Off White, B66W00310
  - 2. Two coats of Pro Industrial 0 VOC Acrylic Coating - Semi-Gloss, B66W00651
- F. Gypsum Board/Plaster
  - 1. One coat of ProMar 200 Zero VOC Interior Latex Primer White, 1328W2600
  - 2. Two coats of ProMar 200 Acrylic Latex Semi-Gloss, B31-2600
- G. Concrete Masonry
  - 1. One coat of Heavy Duty Block Filler, B42W46
  - 2. Two coats of Water-Based Catalyzed Epoxy, B70W00211.
- H. High temperature pipe or equipment
  - 1. One coat of Ken Hi-Temp 500 Primer (1.3 mils)
  - 2. One coat of Kem Hi-Temp 500 Topcoat (1.3 mils)

**END OF SECTION**

## Section 10 14 00

### Signage

Specifications

10 14 00-1

#### PART 1 – GENERAL

##### 1.01 SECTION INCLUDES

- A. Interior integrated modular signage system for informational signage.

##### 1.02 RELATED SECTIONS

- A. Section 09 21 16 – Gypsum Board Systems.
- B. Section 09 90 00 – Painting.

##### 1.03 REFERENCES

- A. ANSI A117.1: Providing Accessibility and Usability for Physically Handicap People, 1986 edition.
- B. Department of Justice, Office of the Attorney General, "Americans with Disabilities Act", Public Law 101-336, (ADA).
- C. 2010 Standards for Accessible Design (SAD): The updated ADAAG (ADA Accessibility Guidelines), effective on March 15, 2011 and made mandatory on March 16, 2012.

##### 1.04 SYSTEM DESCRIPTION

- A. Signage under this section is intended to include items for identification, direction, control, and information of building where installed as complete integrated system from a single manufacturer.
- B. ADA design requirements:
  - 1. Provide signage that conforms to the requirements of all regulatory agencies holding jurisdiction.
  - 2. Comply with all applicable provisions of the 2010 Standards for Accessible Design (the updated ADA Accessibility Guidelines, ADAAG), effective in March 2011. Requirements include, but are not limited to the following:
    - a. Tactile copy must be all upper case and raised at least 1/32". Tactile characters must be sans serif, not italic, not oblique, script or highly decorative.
    - b. The stroke width of the upper case "I" has to be 15% of the letter height or less. The character width of the uppercase "O" must be between 55% and 100% of the height of the corresponding uppercase "I".
    - c. The copy height for tactile information must be between 5/8" and 2". If separate visual characters are provided, raised characters can be 1/2" and need not contrast with the background.
    - d. The distance between characters on tactile copy must be a minimum of 1/8" and a maximum of 4 times the character stroke width. These distances are measured between the closest points of adjacent characters.
    - e. Spacing between lines of tactile copy needs to be a minimum of 135% and a maximum of 170% of the corresponding upper case "I" height (measured from baseline to baseline).
    - f. Braille must be Grade II and positioned directly below the corresponding raised characters. If text is multi-lined, Braille is placed below the entire body of text and separated 3/8" from any other tactile characters and 3/8" minimum from raised borders and decorative elements.
    - g. Visual characters and symbols, and their background, are to have a non-glare finish. The color of raised characters must contrast as much as possible with their background to make sure signs are more legible for persons with low vision.
    - h. Pictograms, selected from International Standards, are to be located within a 6" vertical void and accompanying text descriptions are to be located directly below the pictogram.

##### 1.05 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Manufacturer's product literature indicating units and designs selected.
  - 2. Evidence of manufacturer's computerized data retrieval program for tracking of project for sign typography, message strip requirements and other pertinent data from schedule input to final computerized typography on finished product.
  - 3. Preparation instructions and recommendations.
  - 4. Storage and handling requirements and recommendations.
  - 5. Installation methods.



## Section 10 14 00

### Signage

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- C. Samples: One full size sign sample illustrating the design, construction, colors, typestyles, mounting method and other details as specified. Provide sample in small size sign.
    - 1. Samples will not be returned for use in Project.
  - D. Shop Drawings:
    - 1. Indicate materials, sizes, configurations, and applicable substrate mountings.
    - 2. Typography sample for message strips and headers copy.
  - E. Signage Schedule: Complete with location of each sign and the required copy/text.
  - F. Sign Program Maintenance Plan:
    - 1. Manufacturer shall provide details of software and system of color coated, pre-perforated paper sign inserts allowing client to update and maintain signage graphics in-house.
    - 2. Manufacturer shall provide details of an Online Reordering & Maintenance Application whereby the client can submit sign reorders online and store relevant project information such as sign type drawings, message schedules and product instructions.
  - G. Contract close out:
    - 1. Furnish appropriate checklist for aiding in reordering after Date of Substantial Completion. Maintain computer schedule program for five years for ordering new signage required by Owner.
    - 2. Maintenance data and cleaning requirements for exterior surfaces.
    - 3. Furnish one complete software package in Owner selected format for PC type computer.
- 1.06 QUALITY ASSURANCE
- A. Manufacturer Qualifications:
    - 1. Work required under this section from manufacturer regularly engaged in work of this type and scope for a minimum of 5 years.
    - 2. Maintain computer link between schedule input and computerized typography production.
  - B. Installer Qualifications: Trained and authorized by manufacturer for installations of required scope and product.
  - C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
    - 1. Finish areas designated by Architect.
    - 2. Do not proceed with remaining work until workmanship, graphics, and installation are approved by Architect.
    - 3. Refinish mock-up as required to produce acceptable work.
- 1.07 DELIVERY, STORAGE, AND HANDLING
- A. Package signs to prevent damage during shipment, handling, storage and installation. Products are to remain in their original packaging (unless otherwise specified) until removal is necessary for installation.
  - B. If installation site is not ready for signage upon delivery, store signs in a dry, air-conditioned environment.
  - C. Handle signage in accordance with manufacturer's instructions.
  - D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
- 1.08 PROJECT CONDITIONS
- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- 1.09 SEQUENCING AND SCHEDULING
- A. Schedule system installation after room finishes and fixtures have been completed.
- 1.10 WARRANTY
- A. Product Warranty: Provide manufacturer's warranty against defects in materials and workmanship for a period of one year.

## PART 2 – PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. APCO Signs

Construction Documents

Specifications

## Section 10 14 00

### Signage

Specifications

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2. 2/90 Sign Systems
3. ASI Sign Systems

#### 2.02 ACCEPTABLE PRODUCTS

- A. Basis of Design: Accord15 Modular Sign System as manufactured by APCO Signs.
- B. Substitutions: Approved manufacturers shall submit specific products for approval in accordance with Section 01 25 00.

#### 2.03 SYSTEM REQUIREMENTS

- A. General:
  1. Sign system shall feature solutions for all required sign types, including but not limited to wall mounted primary room identification, regulatory and information signs. All signs within the system must feature the same family of components and convey a uniform look throughout.
- B. Features:
  1. Updatibility: Signs shall allow for updating of message inserts without the need to replace the entire sign assembly. System shall offer a solution for in-house updating of laser printed sign inserts for all sign types.
  2. Mounting: Signs shall accommodate installation via fully concealed mechanical fasteners.
- C. Graphics and Typography: As selected from manufacturer's standards.
- D. Colors and Finishes: As selected from manufacturer's standards.
- E. ADA Compliance: Sign system shall comply with all applicable provisions of the 2010 Standards for Accessible Design (the updated ADA Accessibility Guidelines, ADAAG), effective in March 2011. This includes requirements regarding which sign types require Braille/tactile features, character heights, raised character spacing, raised character stroke width, color contrast and installation locations and mounting heights within the facility.
- F. Materials and Construction:
  1. Frames/holders: Sign frame/holder assemblies shall feature extruded aluminum edge profiles with an option of low-profile injection molded plastic edge profiles for small signs. Aluminum extrusions shall be alloy 6063-T6. Optional plastic edge profiles shall be integrally colored injection molded UV and impact resistant ASA (Acrylonitrile Styrene Acrylate) for durability and product longevity. Sign frames shall feature an overall depth of 5/8" or less and must accommodate updatable message panels and inserts.
  2. Braille / Tactile Components: PETG-backed photopolymer with raised characters and Braille of minimum 1/32 inch (0.8 mm) depth/thickness. Adhesive applied tactile characters and applied Braille dots will not be acceptable.
  3. Fasteners: Signs shall be able to accommodate fully concealed mechanical fasteners.

#### 2.04 SIGN SYSTEM COMPONENTS

- A. TYPE A SIGNS – ROOM IDENTIFICATION. Reference signage schedule for sign text.
  1. Injection Molded EndClip Shape
    - a. Square (SBEC-S)
  2. Injection Molded EndClip Finish
    - a. Integral Color: Selected from manufacturer's standards.
  3. Frame Sizes shall be as follows:
    - a. 6" x 6"
  4. Insert/Display Components to include:
    - a. .080" PETG-Backed Photopolymer ADA Plaque (SB080-A) - 2" x 6"
    - b. Aluminum SignBoard InsertSlots (SBIS) with SignWord Paper Insert with Protective Non-Glare Overlay – 4" x 6"
  5. Mounting/installation Types to Include:
    - a. Surface Wall Mount – Vinyl Tape (VT)
- B. TYPE B SIGNS – STAIR SIGN. Reference signage schedule for sign text.
  1. Injection Molded EndClip Shape
    - a. Square (SBEC-S)
  2. Injection Molded EndClip Finish
    - a. Integral Color: Selected from manufacturer's standards.
  3. Frame Sizes shall be as follows:
    - a. 8" x 8"
  4. Insert/Display Components to include:
    - a. .080" PETG-Backed Photopolymer ADA Plaque (SB080-A) - 8" x 8"

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### Signage

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5. Mounting/installation Types to Include: Surface Wall Mount – Vinyl Tape (VT)

#### 2.05 FABRICATION

- A. Shop assembly:
  1. Fabricate units to configurations indicated on reviewed shop drawings.
  2. Provide copy on inserts, and covers required on reviewed shop drawings and in accord with ADA requirements.
  3. Provide additional blank paper as specified.
  4. Include instruction sheets for removal and replacement inserts and installation.

### PART 3 – EXECUTION

#### 3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

#### 3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

#### 3.03 INSTALLATION

- A. Install products in accordance with manufacturer's instructions, in locations and with mounting methods as specified in sign and location drawings.
- B. Square, plumb and level all installed products.
- C. Install all signage in accordance with the CURRENT VERSION of the 2010 Standard for Accessible Design (SAD), and any applicable local regulations and/or codes.
- D. Upon completion of the work, sign installer shall remove any unused products, materials, packaging and debris from the installation site.

#### 3.04 CLEANING

- A. Clean all exposed surface not more than 48 hours prior to Date of Substantial Completion in accordance with manufacturer's written cleaning instructions.

#### 3.05 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

#### 3.06 SIGN SCHEDULES

- A. SIGN TYPE A (All Messages Integral Tactile Lettering, Room Numbers also in Braille); QTY 18
  1. MESSAGE: Unit “#”
- B. SIGN TYPE B (All Messages Integral Tactile Lettering, Room Numbers also in Braille); QTY 9
  1. MESSAGE: STAIRS - Standard Symbol S48

**END OF SECTION**

## Section 10 28 00 Toilet and Bath Accessories

Specifications

10 28 00-1

### PART 1 – GENERAL

- 1.01 SECTION INCLUDES
  - A. Stainless steel mirrors, electric hand dryers, grab bars, paper towel dispensers and /waste receptacles, soap dispensers, toilet paper holders.
  - B. Attachment hardware.
- 1.02 RELATED SECTIONS
  - A. Section 09 21 16 – Gypsum Board System.
- 1.03 REFERENCES
  - A. ADAAG - American with Disabilities Act Accessibility Guidelines.
- 1.04 SUBMITTALS
  - A. Submit under provisions of Section 01 30 00.
  - B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.
  - C. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
  - D. Conform to ADAAG code for access for the handicapped.
- 1.05 COORDINATION
  - A. Coordinate the work with the placement of internal wall reinforcement to receive anchor attachments.

### PART 2 – PRODUCTS

- 2.01 MANUFACTURERS
  - A. ADA Accessories
    - 1. Bradley Corporation
    - 2. Other acceptable manufacturers offering equivalent products.
      - a. Bobrick Washroom Equipment, Inc.
      - b. ASI.
    - 3. Substitutions: Under provisions of Section 01 25 00.
    - 4. All Toilet accessories shall match existing accessories in brand, style, grade, and material.
  - B. Living Units
    - 1. Taymor
    - 2. Approved Equal
- 2.02 MATERIALS
  - A. Sheet Steel: ASTM A366.
  - B. Stainless Steel Sheet: ASTM A167 Type 304.
  - C. Tubing: ASTM A269 stainless steel.
  - D. Fasteners, Screws, and Bolts: Hot dip galvanized steel, tamper-proof.
  - E. Expansion Shields: Fiber, lead or rubber as recommended by accessory manufacturer for component and substrate.
- 2.03 FABRICATION
  - A. Weld and grind joints of fabricated components smooth.
  - B. Form exposed surfaces from single sheet of stock, free of joints. Form surfaces flat without distortion. Maintain surfaces without scratches or dents.
  - C. Fabricate grab bars of tubing, free of visible joints, return to wall with end attachment flanges. Form bar with 1 1/2 inches clear of wall surface.
  - D. Shop assemble components and package with anchors and fittings.
  - E. Provide steel anchor plates, adapters, and anchor components for installation.
- 2.04 FINISHES
  - A. Stainless Steel: Brushed finish at grab bars.
  - B. Back paint components where contact is made with building finishes to prevent electrolysis.

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- C. Grab bars to have peened grip, with concealed fasteners.
- D. Mirrors to have channel-framed perimeter with 14-gauge, 304 satin finish with concealed mounting hardware. Mirror face to be 20-gauge type 304 stainless steel with no. 8 mirror polish finish.

### 2.05 SIZES/PRODUCT STYLES

- A. ADA Accessories
  - 1. Grab Bars: Model 812, Re: drawings for lengths.
- B. Living Units
  - 1. Mirror, towel bar, towel ring, toilet paper holder, and robe hook.
  - 2. Finish: Satin Nickel

## PART 3 – EXECUTION

### 3.01 EXAMINATION

- A. Verify that site conditions are ready to receive work and dimensions are as indicated on shop drawings.
- B. Verify exact location of accessories for installation.

### 3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

### 3.03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions and ADAAG.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. See drawings for product numbers and locations.

### 3.04 SCHEDULE

- A. Public Restroom
  - 1. Grab Bars: (1) 36" and 42" at each HC stall and each toilet room
- B. Living Units
  - 1. Mirrors: (1) at each bathroom
  - 2. Towel Bar: (1) at each bathroom
  - 3. Towel Ring: (1) at each bathroom
  - 4. Toilet Paper Holder: (1) at each bathroom
  - 5. Robe Hook: (1) at each bathroom

**END OF SECTION**

# Section 10 44 00 Fire Extinguishers and Cabinets

Specifications

10 44 00- 1

## PART 1 - GENERAL

- 1.01 SECTION INCLUDES
- A. Work this section includes the furnishing of all labor, material, tools and services necessary for the complete installation of fire extinguishers and cabinets as shown on the plans and as described in these specifications.
- 1.02 QUALITY ASSURANCE
- A. All materials to conform to requirements of NFPA 10 for portable fire extinguishers.
- 1.03 REFERENCES
- A. NFPA 10 - Portable Fire Extinguishers.
  - B. ADAAG - American with Disabilities Act Accessibility Guidelines.
  - C. ASTM E-814 - Fire Rated Cabinet
- 1.04 SUBMITTALS
- A. Submit under provisions of Section 01 30 00.
  - B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.
  - C. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
  - D. Conform to ADAAG code for access for the handicapped.

## PART 2 - PRODUCTS

- 2.01 MANUFACTURERS
- A. JL Industries: Cosmopolitan.
  - B. Larsen's; Architectural Series.
  - C. Approved equal.
- 2.02 MATERIALS
- A. EXTINGUISHERS
    1. One 10# dry chemical, 4A, 80 BC minimum at each corridor location.
    2. One 5# dry chemical extinguisher in compliance with NFPA 10 at each living unit, installed under kitchen sink within cabinet.
  - B. CABINETS
    1. Semi-recessed with ADA-compliant rolled edge.
    2. Solid door with black vertical die-cut lettering.
    3. One hour fire rated cabinet at Fire Rated Walls; non-rated at all others.
    4. Provide at each corridor location.
- 2.03 FINISH
- A. CABINETS  
Flush stainless steel door, steel cabinet with white baked enamel finish.

## PART 3 - EXECUTION

- 3.01 INSPECTION
- A. Verify rough opening sizes in walls and sufficient blocking for installation of cabinets.
- 3.02 INSTALLATION
- A. Install cabinets in strict accordance with manufacturer's written directions. Install tight and anchor securely to walls. Leave cabinet in clean condition. Extinguisher to have inspection tag attached. See plans for location.
  - B. Install so that perimeter rolled edge is tightly against surface of wall; caulk perimeter only if necessary and if directed by Architect to eliminate any crevasses at perimeter.

**END OF SECTION**

## **Section 10 55 00 Postal Specialties**

Specifications

10 55 00-1

### **PART 1 - GENERAL**

- 1.01 The General Conditions and Division 1 - General Requirements, as appropriate, shall pertain to and govern all work under this section.
- 1.02 Substitutions of materials, products, and/or equipment for those specified herein shall be in compliance with Section 01 63 00.
- 1.03 Scope of the Section: Furnish and install Mailbox Units as shown on the drawings and specified herein.
- 1.04 Submissions: Submit drawings and manufacturer's data to the Architect for review.

### **PART 2 - PRODUCTS**

- 2.01 Horizontal Box Unit: Manufactured by Bommer, Auth Florence or approved equal;
  - A. Model: 9040 Series (Bommer, Basis of Design);
  - B. Number of Mailboxes: One per building
  - C. Number of Compartments per Mailbox: 5
  - D. Provide aluminum tab black number ID's for each box
  - E. Finish shall be baked-on aluminum powder coat from full color selection options
  - F. Provide with appropriate anchors for installation/location.
  - G. Provide three keys for each box, along with three master door keys.

### **PART 3 - INSTALLATION**

- 3.01 Install unit in strict accordance with manufacturer's printed instructions and as shown on the Drawings; all units shall be so mounted so as to comply with ADAAG and ANSI requirements.
- 3.02 Guarantee: Materials and workmanship shall be guaranteed for a period of one year from the date of acceptance as evidenced by the Owner's Final Acceptance.

**END OF SECTION**

**Section 10 55 00**  
**Postal Specialties**

Specifications

10 55 00-2



# Section 10 73 16

## Aluminum Canopies

Specifications

10 73 16 - 1

### PART 1 – GENERAL

- 1.01 Description of Work
- A. Work in this section includes furnishing and installation of aluminum overhead hanger rod style canopies.
  - B. Related Items and Considerations
    1. Flashing of various designs may be required. Supplied by the installer.
    2. Determine wall construction, make-up and thickness.
    3. Ensure adequate wall condition to carry canopy loads where required.
    4. Consider water drainage away from canopy where necessary.
    5. Any necessary removal or relocation of existing structures, obstructions or materials.
- 1.02 SUBMITTALS
- A. Shop Drawings: Submit detailed drawings
  - B. Product Data: Submit manufacturer's product data, specifications, component performance data and installation instructions.
  - C. Calculations: Provide signed and sealed structural calculations for the proposed walkway cover, by a professional engineer registered in the state of Louisiana, who professes his discipline to be structural engineering
- 1.03 QUALITY ASSURANCE
- A. Codes and Standards: Comply with provisions of the following except as otherwise indicated:
    1. IBC, currently enforced edition with local amendments specific to project location.
    2. AWS (American Welding Society) standards for structural aluminum welding.
  - B. Shop Assembly: Preassemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
  - C. Coordination: Coordinate work of this section with work of other sections which interface with covered walkway system.
- 1.04 PERFORMANCE REQUIREMENTS
- A. System performance: Provide aluminum canopy system that has been designed, produced, fabricated and installed to withstand normal temperature changes as well as live loading, dead loading and wind loading in compliance with Standard Building Code requirements for geographic area in which work is located and as follows:
    1. Live Load: 30 p.s.f. minimum
    2. Structural design for wind forces: Comply with ANSI A58.1-1982
    3. Design Wind Velocity: 150 m.p.h.
    4. Importance Factor: 1.1
    5. Stability Criteria: IBC, Currently Enforced Edition
  - B. Sizes shown on drawings are to be considered minimum
  - C. Structure shall be capable of sustaining icing, hail, hurricane force winds and supporting occasional concentrated load

### PART 2 – PRODUCT

- 2.01 MANUFACTURERS:
- A. Mapes Industries, Inc. (Basis of Design)  
Lincoln, NE 68504  
Phone: 888 273 1132
    1. Model: Mapes SuperShade Cantillever Canopy, Super Lumideck flat soffit
  - B. AvaDeck.  
Houston, TX Phone: 713-944-0988
  - C. Perfection Architectural Systems
- 2.02 Materials
- A. Canopy depth: 8"
  - B. Decking and fascia shall be extruded aluminum, alloy 6063-T6, in profile and thickness as standard for manufacturer for specified series.

## **Section 10 73 16**

### **Aluminum Canopies**

Specifications

10 73 16 - 2

- 2.03 Finishes
  - A. Custom Powder Coat by manufacturer.
- 2.04 Fabrication
  - A. All connections shall be mechanically assembled utilizing 3/16" fasteners with a minimum shear stress of 350 lb. Pre-welded or factory-welded connections are not acceptable.
  - B. Decking shall be designed with interlocking extruded aluminum members with mechanical fasteners field applied to provide structural integrity for the completed assembly.
  - C. Concealed drainage. Water shall drain from covered surfaces into scupper drain at front of canopy.

### **PART 3 – EXECUTION**

- 3.01 INSTALLATION
  - A. Erection: Set anchors securely through finish wall materials and into substrate; install anchor receptors prior to veneer installation if necessary.
  - B. Install roof deck sections, accessories and related flashings in accordance with manufacturer's instructions. Provide roof slope for rain drainage without ponding water. Align and anchor roof deck units to structural support frames.
- 3.02 FLASHING
  - A. Flashings: Flashings required between and within canopy system and adjoining structures are work of this section.

**END OF SECTION**

## Section 11 30 00 Residential Appliances

Specifications

11 30 00 - 1

### PART 1 – GENERAL

#### 1.01 SUMMARY

- A. Section includes residential equipment; connection to utilities; and service fittings and outlets.

#### 1.02 COORDINATION

- A. Leave building openings of sufficient size to permit transport of equipment to final position.
- B. Coordinate cabinet sizes/cutouts and building wall locations to accommodate equipment.
- C. Coordinate utility requirements to provide a complete and functioning installation.

### PART 2 – PRODUCTS

#### 2.01 RESIDENTIAL EQUIPMENT

- A. Equipment to be provided and installed by Contractor:
  - 1. Refrigerator
  - 2. Electric range
  - 3. Recirculating Kitchen Hood
  - 4. Dishwasher
  - 5. Garbage Disposal
  - 6. Washer / Dryer
- B. All equipment shall be electrically powered.

#### 2.02 COMPONENTS

- A. Equipment: Scheduled at end of section.
- B. Rough-in: Frames, anchors, supports, accessories and closure trim necessary for complete installation shall be provided and installed by the Contractor; appropriate to scheduled equipment.

#### 2.03 UTILITY CONNECTIONS

- A. Provide particular venting, valves, receptacles, adapters, etc. that are necessary for a complete and operational installation of the equipment.
- B. Provide correct electrical voltage, and provide direct wiring where required.
- C. Coordinate utility locations with equipment requirements.

### PART 3 – EXECUTION

#### 3.01 PREPARATION

- A. Provide rough-in frame and anchors for placement.

#### 3.02 INSTALLATION

- A. Install in accordance with standards required by authority having jurisdiction, in full compliance of all local and state health department codes.
- B. Anchor equipment securely in place.
- C. Sequence installation to ensure utility connections are achieved orderly and expeditiously.
- D. Touch-up minor damaged surfaces caused during installation shall not be accepted unless written permission is given by Owner. Replace damaged equipment. Do not replace damaged components of equipment unless approved by Owner in writing.

#### 3.03 ADJUSTING

- A. Adjust operating equipment to efficient operation.

#### 3.04 SCHEDULE

- A. Refrigerator for Standard units and ADA compliant units:
  - 1. Frigidaire, Model FFHT1513L W
  - 2. Features: 15 cu. ft. top mount, icemaker, Energy Star Rated, ADA Compliant.
  - 3. Utility Requirements: 120 volt, 15 Amps, 1/4 inch cold water line.
- B. Range:
  - 1. Frigidaire, Model FFEF3015L W

**Section 11 30 00**  
**Residential Appliances**

Specifications

11 30 00 - 2

2. Features: 30 inch wide electric range,
3. Utility Requirements: 240 V / 208 V
- C. Range for ADA compliant units:
  1. Frigidaire, Model FFEF3010L W
  2. Features: 30 inch wide electric range
  3. Utility Requirements: 240 V / 208 V
- D. Microwave with Kitchen Hood:
  1. Frigidaire, Model FFMV1745TS (29 7/8" W x 15 1/4" D x 16 13/32" H
  2. Features: Stainless steel, 2-speed fan, 1.7 cu. Ft. 10000W
  3. Utility Requirements: 120 V
- E. Recirculating Kitchen Hood for ADA compliant units:
  1. GE, Model JYM1441SH
  2. Features: Stainless steel, 2-speed fan
  3. All controls to be hard wired to ADA compliant heights at adjacent wall.
- F. Dishwasher:
  1. Frigidaire, Model FFBD2407L W
  2. Features: Energy Star Rated
  3. Utility Requirements: 120 V
- G. Dishwasher for ADA compliant units:
  1. Frigidaire, Model FFBD2410HI W
  2. Features: Energy Star Rated, ADA Compliant.
  3. Utility Requirements: 120 V
- H. Washer / Dryer Combination:
  1. Frigidaire, Model FFLE1011MW
  2. Features: Energy Star Rated
  3. Utility Requirements:
- I. Washer & Dryer for ADA compliant units:
  1. Washer: GE, Model WCVH4800KWW
    - a. Features: 2.2 Cu.Ft. Capacity Electric Washer, Energy Star Rated, ADA Compliant.
    - b. Utility Requirements: 120 V
  2. Dryer: GE, Model DCVH480EKWW
    - a. Features: 4.0 Cu.Ft. Capacity Electric Dryer, ADA Compliant.
    - b. Utility Requirements: 240/208 V
- J. Garbage Disposal:
  1. Waste King, Legend, Model 111
  2. Features: 1/3 horsepower
  3. Utility Requirements:

**END OF SECTION**

## Section 12 21 13 Horizontal Louver Blinds

Specifications

12 21 13-1

### PART 1 – GENERAL

- 1.01 SECTION INCLUDES
  - A. Section includes horizontal metal slat louver blinds and operating hardware.
  - B. Related Sections:
    - 1. Section 08 56 00 – Vinyl Windows.
- 1.02 SUBMITTALS
  - A. Section 01 33 00 - Submittals: Submittal procedures.
  - B. Product Data: Submit data indicating physical and dimensional characteristics, operating features, method of mounting/attachment, and color selector.
  - C. Samples: Submit two samples, illustrating slat materials and finish, and color.
- 1.03 FIELD MEASUREMENTS
  - A. Verify field measurements prior to fabrication.
- 1.04 COORDINATION
  - A. Section 01 30 90 - Administrative Requirements: Coordination and project conditions.
  - B. Coordinate the Work with window installation.

### PART 2 – PRODUCTS

- 2.01 HORIZONTAL LOUVER BLINDS
  - A. Manufacturers:
    - 1. Hunter Douglas Window Fashions, Model CL62.
    - 2. Levolor Contract, Model Mark 1 DustGuard.
    - 3. SWF Contract; Trade Name: BALL; Model NO.: Customizer
    - 4. Substitutions: Approved equal.
- 2.02 COMPONENTS
  - A. Blinds: Horizontal slat louvers hung from full-width headrail with full-width bottom rail; manual control of raising and lowering by cord with full range locking; blade angle adjustable by control wand.
  - B. Metal Slats: Spring tempered pre-finished aluminum; radiused slat corners, with manufacturing burrs removed.
    - 1. Color: As selected from FULL color range.
    - 2. Slat Support: Ladder configuration.
  - C. Headrail: Pre-finished, formed aluminum box, with end caps; internally fitted with hardware, pulleys, and bearings for operation; same depth as width of slats [; height.
    - 1. Color: Same as slats.
  - D. Bottom Rail: Pre-finished, formed aluminum with top side shaped to match slat curvature; with end caps.
    - 1. Color: Same as headrail.
  - E. Lift Cord: Nylon; continuous loop; free end cap.
    - 1. Color: Match slats.
  - F. Control Wand: Manufacturer's standard.
  - G. Headrail Attachment: Wall brackets.
  - H. Angled Window Accessory Hardware: Type recommended by blind manufacturer for support at angled windows.
- 2.03 FABRICATION
  - A. Fabricate blinds to fit within openings with uniform edge clearance 1/2 inch to jamb.

## Section 12 21 13 Horizontal Louver Blinds

Specifications

12 21 13-2

### PART 3 – EXECUTION

#### 3.01 EXAMINATION

- A. Coordination and project conditions.
- B. Verify that openings are ready to receive the work.
- C. Ensure wall surface is able to accept attachment hardware.

#### 3.02 INSTALLATION

- A. Install blinds.
- B. Secure in place with fasteners.
- C. Place intermediate head supports as if recommended by manufacturer.

#### 3.03 ERECTION TOLERANCES

- A. Section 01 40 00 - Quality Control: Tolerances.
- B. Maximum Variation of Gap at Window Opening Perimeter: 1/4 inch.
- C. Maximum Offset From Level: 1/8 inch.

#### 3.04 ADJUSTING

- A. Adjust blinds for smooth operation.

#### 3.05 CLEANING

- A. Section 01 70 00- Contract Closeout: Final cleaning.
- B. Clean blind surfaces just prior to occupancy.

**END OF SECTION**

## Section 21 05 00 Fire Protection General Provisions

Specifications

21 05 00-1

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Except as modified in this Section, General Conditions, Supplementary Conditions, applicable provisions of the General Requirements, and other provisions and requirements of the contract documents apply to work of Division 21 Fire Sprinkler Systems.

#### 1.02 CODE REQUIREMENTS AND FEES

- A. Perform work in accordance with applicable statutes, ordinances, codes and regulations of governmental authorities having jurisdiction.
- B. Work shall comply with applicable inspection services:
  - 1. Underwriters Laboratories
  - 2. National Fire Protection Association
  - 3. State Health Department
  - 4. Local Municipal Building Inspection Department
- C. Resolve any code violations discovered in contract documents with the Engineer prior to award of the contract. After Contract award, any correction or additions necessary for compliance with applicable codes shall be made at no additional cost to the Owner.
- D. Obtain all permits required.

#### 1.03 CONTRACT DRAWINGS

- A. Contract drawings are diagrammatic only and do not give fully dimensioned locations of various elements of work. Determine exact locations from field measurements.

#### 1.04 PROJECT RECORD DOCUMENTS

- A. Maintain at the job site a separate set of white prints (blue line or black line) of the contract drawings for the sole purpose of recording the "as-built" changes and diagrams of those portions of work in which actual construction is at variance with the contract drawings. Mark the drawings with a colored pencil. Prepare, as the work progresses and upon completion of work, reproducible drawings clearly indicating locations of various lines, valves, ductwork, traps, equipment, and other pertinent items, as installed. Include flow-line elevation of sewer lines. Record existing and new underground and under slab piping with dimensioned locations and elevations of such piping.
- B. As-Built drawings should indicate the following information as a minimum:
  - 1. Indicate all addendum changes to documents.
  - 2. Remove Engineer's seal, name, address and logo from drawings.
  - 3. Mark documents RECORD DRAWINGS.
  - 4. Clearly indicate: DOCUMENT PRODUCED BY
  - 5. Indicate all changes to construction during construction. Indicate actual routing of all piping, etc. that were deviated from construction drawings.
  - 6. Correct schedules to reflect (actual) equipment furnished and manufacturer.
  - 7. During the execution of work, maintain a complete set of drawings and specifications upon which all locations of equipment, piping, devices, and all deviations and changes from the construction documents in the work shall be recorded.
  - 8. Fire Protection System documents revised to indicate exact location of all sprinkler heads and zone valves.
  - 9. Exact location of all roof mounted equipment, wall, roof and floor penetrations.
  - 10. Cloud all changes.

#### 1.05 SPACE REQUIREMENTS

- A. Consider space limitations imposed by contiguous work in selection and location of equipment and material. Do not provide equipment or material that is not suitable in this respect.

## Section 21 05 00 Fire Protection General Provisions

Specifications

21 05 00-2

### 1.06 RELATION WITH OTHER TRADES

- A. Carefully study all matters and conditions concerning the project. Submit notification of conflict in ample time to prevent unwarranted changes in any work. Review other Divisions of these specifications to determine their requirements.
- B. Because of the complicated relationship of this work to the total project, conscientiously study the relation and cooperate as necessary to accomplish the full intent of the documents.
- C. Provide sleeves and inserts in forms as required for the work. Stub up and protect open ends of pipe before any concrete is placed. Furnish sizes of required equipment pads. Furnish and locate bolts and fittings required to be cast in them.
- D. Locate and size openings required for installation of work specified in this Division in sufficient time to prevent delay in the work.
- E. Refer to other Divisions of the specifications for the scope of required connections to equipment furnished under that Division. Determine from the Contractor for the various trades, the Owner, and by direction from the Architect/Engineer, the exact location of all items.

### 1.07 CONCEALED AND EXPOSED WORK

- A. When the word "concealed" is used in connection with insulating, painting, piping, and the like, the work is understood to mean hidden from sight as in chases, furred spaces or above ceilings. "Exposed" is understood to mean open to view.

### 1.08 GUARANTEE

- A. Guarantee work for one (1) year from the date of substantial completion of the project. During that period make good any faults or imperfections that may arise due to defects or omissions in material, equipment or workmanship. At the Owner's option, replacement of failed parts or equipment shall be provided.

### 1.09 MATERIAL AND EQUIPMENT

- A. Furnish new and unused materials and equipment meeting the requirements of the paragraph specifying acceptable manufacturers.

### 1.10 NOISE AND VIBRATION

- A. Select equipment to operate with minimum noise and vibration. If objectionable noise or vibration is produced or transmitted to or through the building structure by equipment, piping, ducts or other parts of work, rectify such conditions at no additional cost. If the item of equipment is judged to produce objectionable noise or vibration, demonstrate at no additional cost that equipment performs within designated limits on a vibration chart.

### 1.11 ACCEPTABLE MANUFACTURERS

- A. Manufacturers names and catalog number specified under sections of Division 21 are used to establish standards of design, performance, quality and serviceability and not to limit competition. Equipment of similar design, equal to that specified, manufactured by a named manufacturer will be acceptable on approval.

### 1.12 OPERATING TESTS

- A. After all plumbing systems have been completed and put into operation, subject each system to an operating test under design conditions to ensure proper sequencing and operation throughout the range of operation. Tests shall be made in the presence of the Architect/Engineer. Make adjustments as required to ensure proper functioning of all systems. Special tests on individual systems are specified under individual sections.



## Section 21 05 00 Fire Protection General Provisions

Specifications

21 05 00-3

### 1.13 WARRANTIES

- A. Submit all warranties and guarantees for systems, equipment, devices and materials. These shall be included in the Operating and Maintenance Manuals.

### 1.14 BUILDING CONSTRUCTION

- A. It shall be the responsibility of each sub-contractor to consult the Architectural and Engineering drawings, details, and specifications and thoroughly familiarize himself with the project and all job related requirements. Each sub-contractor shall cooperate with the General Contractor to verify that all piping and other items are placed in the walls, furred spaces, chases, etc., so there will be no delays in the job.

## **PART 2 - PRODUCTS – (Not Used)**

## **PART 3 - EXECUTION**

### 3.01 OPENINGS

- A. Framed, cast or masonry openings for equipment or piping are specified under other divisions. Drawings and layout work for exact size and location of all openings are included under this division.

### 3.02 INSTRUCTION OF OWNER'S PERSONNEL

- A. Prior to final inspection, conduct an on-site training program to instruct the Owner's operating personnel in the operation and maintenance of the plumbing systems.
  - 1. Provide the training during the Owner's regular working day.
  - 2. The Instructors shall each be experienced in their phase of operation and maintenance of building plumbing systems and with the project.

### 3.03 OBSTRUCTIONS

- A. The drawings indicate certain information pertaining to surface and subsurface obstructions which has been taken from available drawings. Such information is not guaranteed, however, as to accuracy of location or complete information.
  - 1. Before any cutting or trenching operations are begun, verify with Owner's representative, utility companies, municipalities, and other interested parties that all available information has been provided.
  - 2. Should obstruction be encountered, whether shown or not, alter routing of new work, reroute existing lines, remove obstruction where permitted, or otherwise perform whatever work is necessary to satisfy the purpose of the new work and leave existing services and structures in a satisfactory and serviceable condition.
- B. Assume total responsibility for and repair any damage to existing utilities or construction, whether or not such existing facilities are shown.

### 3.04 PROTECTION

- A. Protect work, equipment, fixtures, and materials. At work completion, work must be clean and in original manufacturer's condition.

**END OF SECTION**

**Section 21 05 00**  
**Fire Protection General Provisions**  
Specifications

21 05 00-4

## Section 21 10 00 NFPA 13R Fire Sprinkler Systems

Specifications

21 10 00-1

### PART 1 - GENERAL

#### 1.01 WORK INCLUDED

- A. Design coordination of sprinkler work with the installations of other trades as shown on their drawings; all mechanical, electrical, plumbing and sprinkler work must fit the space requirements. The sprinkler work shall comply with other Sections of this specification; and fit the structure finishes. The Sprinkler Contractor will comply with all the codes and underwriter authorities, and the requirements for the installation of inside and outside piping; including sprinkler heads, valves, tamper switches, flow switches, hangers and supports, sleeves, fire department connections, inspector test connections, main drain and accessories, signs and any other component parts reasonably incidental to providing a complete protection system. Provide 100 percent coverage for the entire building.
- B. A wet system shall be installed in heated areas, a dry pipe system shall be installed in areas subject to freezing.
- C. Furnish all articles of a completed sprinkler system including all materials, labor, tools, equipment, transportation services and supervision fees.
- D. The plans provide a riser assembly location at water entry into building for flow switch locations, valve locations (with tamper switches), fire department test assemblies and fire department Siamese connections. These are a guide for subsequent preparation of the Contractor's detailed installation drawings of the complete fire protection sprinkler system which shall be submitted to the Architect / Engineer for review.
- E. The installation of the entire Sprinkler Systems shall comply with all rules and regulations of the National Board of Fire Underwriters, the Local Building Code, Local Fire Marshall, and Requirements of NFPA Pamphlet 13R, and other local authorities exercising jurisdiction.
- F. Study the general, structural, electrical and mechanical drawings and specifications, in order to become familiar with the building and details as they apply to the work of this Section. Cooperate with all Trades so that there will be no conflict of space. Plumbing flow lines, large ductwork HVAC piping and electrical service feeders shall take precedence over Fire Protection work, except where it is absolutely necessary to maintain coverage protection.

#### 1.02 QUALITY ASSURANCE

- A. Sprinkler equipment and installation to be in accordance with recommendations of and approved by local, state and federal fire authorities.
- B. Equipment and installation to meet requirements of NFPA No. 13R, 14, 20, 25, 70 and 72.
- C. Use materials and equipment that are new and of unused, approved by NFPA and as listed in the UL list of "Inspected Fire Protection Equipment and Materials."
- D. Installer Qualifications: Contractor Training Certificates for Chlorinated Polyvinyl Chloride (CPVC) Fire Sprinkler Systems. The Contractor Training Certificates shall be specific to the manufacturer of the pipe and fittings. Personnel's training certificates must be current and have been updated within the past two (2) years.

#### 1.03 SHOP DRAWINGS

- A. Make complete shop drawings and working drawings of equipment furnished, including detailed drawings of piping and sprinkler head locations.
- B. The Architect's approval of shop drawings shall not relieve the responsibility of correctly figured dimensions or any errors that may be contained in these drawings. The omission of any material shown on the contract drawings, or specified from the shop drawings, even though approved, shall not relieve the responsibility to furnish and erect them.

## Section 21 10 00 NFPA 13R Fire Sprinkler Systems

Specifications

21 10 00-2

### 1.04 PIPE AND FITTINGS

- A. Pipe shall meet or exceed the requirements of ASTM F442 in standard dimension ratio (SDR) 13.5.
- B. Fittings shall meet or exceed the requirements of ASTM F437 (schedule 80 threaded), ASTM F438 (schedule 40 socket) and ASTM F439 (schedule 80 socket).
- C. Both pipe and fittings shall be Listed by Underwriters Laboratories for use in wet automatic fire sprinkler systems and shall bear the logo of the Listing Agency. Refer to UL Fire Protection Equipment Directory, categories VIWT and HFYH.
- D. CPVC pipe and fittings shall be Listed by Underwriters Laboratories (UL 1821 Standard) and approved by Factory Mutual Global (FM). Refer to UL Fire Protection Equipment Directory, categories VIWT and HFYH. FM approval shall also include approved for use with prefabricated metallic fire resistant barriers.
- E. CPVC compounds used to manufacture the CPVC pipe and fittings shall be listed by Underwriters Laboratories (UL) according to the standards set forth by UL under category code QORR2, Polymeric Materials for use in Pipe and Fittings in Sprinkler Piping – Component.
- F. CPVC compounds used to manufacture the CPVC pipe and fittings shall be produced by the same compound manufacturer. Fire sprinkler system pipe and fittings shall not be cross-mixed by various CPVC compound manufacturers.
- G. CPVC compound shall be certified by NSF International.
- H. CPVC compound shall meet cell class 23547 for piping and cell class 24447 for fittings as defined by ASTM D1784.
- I. CPVC pipe and fittings shall be manufactured from CPVC compounds which have been pressure rated by the Plastics Pipe Institute (PPI). That CPVC compound shall be listed in PPI's most current document entitled "TR-4, Listed Materials, PPI Listing of Hydrostatic Design Basis (HDB), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe".
- J. CPVC manufacturer shall conduct a program that lists those fire stops, thread sealants, and leak detectors that are chemically compatible with their CPVC pipe and fittings. This compatibility program shall be administered by an independent third party testing agency. Only the materials listed in this program shall be used with the CPVC.

## PART 2 - PRODUCTS

### 2.01 PIPING AND FITTINGS

- A. CPVC resin (base CPVC material) and the CPVC compound (CPVC material used to manufacture pipe and fittings) must be manufactured in the United States of America and by a company with headquarters in the United States of America.
- B. CPVC compound shall be produced from an ISO certified manufacturer.
- C. CPVC pipe shall exceed the requirements of ASTM F442 and manufactured in Standard Dimension Ratio (SDR) 13.5 dimensions. Manufacturer of CPVC pipe shall be able to provide pipe sizes from  $\frac{3}{4}$ " inches up to and including 3" inches.
- D. CPVC fittings shall meet or EXCEED the requirements of ASTM F437 (schedule 80 threaded), ASTM F438 (schedule 40 socket) and ASTM F439 (schedule 80 socket).

### 2.02 SOLVENT CEMENT

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- A. All socket type joints shall be made up employing solvent cements that meet or exceed the requirements of ASTM F493. The standard practice for safe handling of solvent cements shall be in accordance with ASTM F402. Solvent cement shall be listed by NSF International for use with potable water, and approved by the CPVC manufacturers. The solvent cements shall be compatible with their CPVC pipe and fittings.
- B. Follow CPVC manufacturer's instructions for set and cure times for solvent cement joints. Avoid significant stresses during set and cure times. Do not apply any stress that will disturb an undried joint. Sprinkler fittings shall be allowed to cure in accordance with the manufacturer's guidelines and the contractor shall assure the outlets are clear of any excess cement prior to installing sprinklers.

### 2.03 MATERIALS

- A. The piping systems (pipe and fittings) shall be constructed from materials extruded/molded by manufacturers using the same compound manufacturer (i.e. Noveon BlazeMaster® CPVC compound).

### 2.04 SPRINKLER HEAD

- A. All sprinklers shall comply with the latest requirements of NFPA 13R with respect to orifice size.
- B. All sprinkler heads located in ceilings shall be [recessed with cover plates] [semi-recessed] [pendant type]. Verify with architect.

## PART 3 - EXECUTION

### 3.01 DESIGN

- A. Design, spacing of sprinkler heads and selection sizes shall conform to the requirements of NFPA 13R for the indicated occupancy.
- B. Design and install the system so that no part will interfere with doors, windows, heating, mechanical, lighting or electrical equipment. Do not locate sprinkler heads closer than 3 feet to lighting fixtures or other obstructions.

### 3.02 INSTALLATION

- A. Run piping concealed above furred ceilings and in joists to minimize obstructions. Expose only heads.
- B. Protect sprinkler heads against mechanical injury with standard guards.
- C. Locate system drains and inspector's test connections in utility rooms, mechanical rooms or other readily accessible areas not requiring access through ceiling. Coordinate sprinkler system drain flow rates with plumbing system drainage capacities.

### 3.03 SECURING AND SUPPORTING

- A. Support piping to maintain line and grade, with provision for expansion and contraction. Use approved clevis-type or trapeze-type hangers connected to structural members of the building. Single pipe runs to be supported by approved clevis type hangers. Multiple pipe runs to be supported by approved trapeze type hangers. Do not support piping from other piping or structural joist bridging.

### 3.04 CLEANING OF PIPING SYSTEMS

- A. General cleaning of piping systems. Purge pipe of construction debris and contamination before placing the systems in service. Provide and install temporary connections as required to clean, purge and circulate.

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**NFPA 13R Fire Sprinkler Systems**

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3.05 TESTING AND ACCEPTANCE

- A. Prior to connecting to the overhead sprinkler piping, flush the underground main. Secure required approvals of the flushing operations.
- B. Upon completion of the fire sprinkler system installation, test and retest the complete installation and make corrections as necessary to obtain acceptance by the Fire Marshall and/or any other authority having jurisdiction. Furnish test equipment and personnel required.

3.06 TRAINING

- A. At a time mutually agreed upon, provide instruction to the Owner's designated personnel on the operation and maintenance of the automatic sprinkler system and associated equipment. Owner's Operation and Maintenance Manual prepared for this project shall be used during the instruction.

**END OF SECTION**

**Section 21 10 00**  
**NFPA 13R Fire Sprinkler Systems**  
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## Section 22 05 00 Plumbing General Provisions

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### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Except as modified in this Section, General Conditions, Supplementary Conditions, applicable provisions of the General Requirements, and other provisions and requirements of the contract documents apply to work of Division 22 Plumbing.
- B. Applicable provisions of this section apply to all sections of Division 22, Plumbing.

#### 1.02 CODE REQUIREMENTS AND FEES

- A. Perform work in accordance with applicable statutes, ordinances, codes and regulations of governmental authorities having jurisdiction.
- B. Plumbing work shall comply with applicable inspection services:
  - 1. Underwriters Laboratories
  - 2. National Fire Protection Association
  - 3. State Health Department
  - 4. Local Municipal Building Inspection Department
- C. Resolve any code violations discovered in contract documents with the Engineer prior to award of the contract. After Contract award, any correction or additions necessary for compliance with applicable codes shall be made at no additional cost to the Owner.
- D. This Contractor shall be responsible for being aware of and complying with asbestos NESHAP regulations, as well as all other applicable codes, laws and regulations.
- E. Obtain all permits required.

#### 1.03 CONTRACTOR'S QUALIFICATIONS

- A. An approved contractor for the work under this division shall be:
  - 1. A licensed specialist in this field and have the personnel, experience, training, skill, and organization to provide a practical working system.
  - 2. Able to furnish evidence of having contracted for and installed not less than three (3) systems of comparable size and type that has served their Owners satisfactorily for not less than three (3) years.

#### 1.04 REFERENCE SPECIFICATIONS AND STANDARDS

- A. Materials which are specified by reference to Federal Specifications; ASTM, ASME, ANSI, or AWWA Specifications; Federal Standards; or other standard specifications must comply with latest editions, revisions, amendments or supplements in effect on date bids are received. Requirements in reference specifications and standards are minimums for all equipment, material, and work. In instances where specified capacities, size, or other features of equipment, devices, or materials exceed these minimums, meet specified capacities.

#### 1.05 CONTRACT DRAWINGS

- A. Contract drawings are diagrammatic only and do not give fully dimensioned locations of various elements of work. Determine exact locations from field measurements.

#### 1.06 PROJECT RECORD DOCUMENTS

- A. Maintain at the job site a separate set of white prints (blue line or black line) of the contract drawings for the sole purpose of recording the "as-built" changes and diagrams of those portions of work in which actual construction is at variance with the contract drawings. Mark the drawings with a colored pencil. Prepare, as the work progresses and upon completion of work, reproducible drawings clearly indicating locations of various lines, valves, ductwork, traps, equipment, and other pertinent items, as installed. Include flow-line elevation of sewer lines. Record existing and new underground and under slab piping

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## Section 22 05 00 Plumbing General Provisions

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with dimensioned locations and elevations of such piping.

- B. As-Built drawings should indicate the following information as a minimum:
1. Indicate all addendum changes to documents.
  2. Indicate all changes to construction during construction. Indicate actual routing of all piping, ductwork, etc. that were deviated from construction drawings.
  3. Indicate exact location of all underground plumbing and flow line elevation.
  4. Indicate exact location of all underground plumbing piping and elevation.
  5. Indicate exact location of all underground electrical raceways and elevations.
  6. Correct schedules to reflect (actual) equipment furnished and manufacturer.
  7. During the execution of work, maintain a complete set of drawings and specifications upon which all locations of equipment, ductwork, piping, devices, and all deviations and changes from the construction documents in the work shall be recorded.
  8. Location and size of all ductwork and mechanical piping above ceiling including exact location of isolation of domestic and plumbing valves.
  9. Exact location of all electrical equipment in and outside of the building.
  10. Fire Protection System documents revised to indicate exact location of all sprinkler heads and zone valves.
  11. Exact location of all roof mounted equipment, wall, roof and floor penetrations.
  12. Cloud all changes.

### 1.07 SPACE REQUIREMENTS

- A. Consider space limitations imposed by contiguous work in selection and location of equipment and material. Do not provide equipment or material that is not suitable in this respect.

### 1.08 RELATION WITH OTHER TRADES

- A. Carefully study all matters and conditions concerning the project. Submit notification of conflict in ample time to prevent unwarranted changes in any work. Review other Divisions of these specifications to determine their requirements.
- B. Because of the complicated relationship of this work to the total project, conscientiously study the relation and cooperate as necessary to accomplish the full intent of the documents.
- C. Provide sleeves and inserts in forms as required for the work. Stub up and protect open ends of pipe before any concrete is placed. Furnish sizes of required equipment pads. Furnish and locate bolts and fittings required to be cast in them.
- D. Locate and size openings required for installation of work specified in this Division in sufficient time to prevent delay in the work.
- E. Refer to other Divisions of the specifications for the scope of required connections to equipment furnished under that Division. Determine from the Contractor for the various trades, the Owner, and by direction from the Architect/Engineer, the exact location of all items.

### 1.09 CONCEALED AND EXPOSED WORK

- A. When the word "concealed" is used in connection with insulating, painting, piping, ducts and the like, the work is understood to mean hidden from sight as in chases, furred spaces or above ceilings. "Exposed" is understood to mean open to view.

### 1.10 GUARANTEE

- A. Guarantee work for one (1) year from the date of substantial completion of the project. During that period make good any faults or imperfections that may arise due to defects or omissions in material, equipment or workmanship. At the Owner's option, replacement of failed parts or equipment shall be provided.

### 1.11 MATERIAL AND EQUIPMENT

- A. Furnish new and unused materials and equipment meeting the requirements of the paragraph

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## Section 22 05 00 Plumbing General Provisions

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specifying acceptable manufacturers. Where two or more units of the same type or class of equipment are required, provide units of a single manufacturer.

### 1.12 NOISE AND VIBRATION

- A. Select equipment to operate with minimum noise and vibration. If objectionable noise or vibration is produced or transmitted to or through the building structure by equipment, piping, ducts or other parts of work, rectify such conditions at no additional cost. If the item of equipment is judged to produce objectionable noise or vibration, demonstrate at no additional cost that equipment performs within designated limits on a vibration chart.

### 1.13 ACCEPTABLE MANUFACTURERS

- A. Manufacturers names and catalog number specified under sections of Division 22 are used to establish standards of design, performance, quality and serviceability and not to limit competition. Equipment of similar design, equal to that specified, manufactured by a named manufacturer will be acceptable on approval. A request for prior approval of equipment not listed must be submitted ten (10) days before bid due date. Submit complete design and performance data to the Engineer.

### 1.14 OPERATING TESTS

- A. After all plumbing systems have been completed and put into operation, subject each system to an operating test under design conditions to ensure proper sequencing and operation throughout the range of operation. Tests shall be made in the presence of the Architect/Engineer. Make adjustments as required to ensure proper functioning of all systems. Special tests on individual systems are specified under individual sections. Submit all certifications and test reports adequately in advance of completion of the work to allow for remedial action as required to correct deficiencies discovered in equipment and systems.

### 1.15 WARRANTIES

- A. Submit all warranties and guarantees for systems, equipment, devices and materials. These shall be included in the Operating and Maintenance Manuals.

### 1.16 BUILDING CONSTRUCTION

- A. It shall be the responsibility of each sub-contractor to consult the Architectural and Engineering drawings, details, and specifications and thoroughly familiarize himself with the project and all job related requirements. Each sub-contractor shall cooperate with the General Contractor to verify that all piping and other items are placed in the walls, furred spaces, chases, etc., so there will be no delays in the job.

### 1.17 WORKMANSHIP

- A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.
- B. Perform work by persons qualified to produce workmanship of specified quality.
- C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking. Under no conditions shall material or equipment be suspended from structural bridging.
- D. Provide finishes to match approved samples. All exposed finishes shall be approved by the Architect. Submit color samples as required.

### 1.18 MANUFACTURER'S INSTRUCTIONS

- A. Comply with instructions in full detail, including each step in sequence.
- B. Should instruction conflict with Contract Documents, request clarification from Architect / Engineer before proceeding.

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## Section 22 05 00 Plumbing General Provisions

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- C. Submit Manufacturer's instructions for storage, preparation, assembly, installation, start-up, adjusting, calibrating, balancing and finishing.
- 1.19 MANUFACTURER'S CERTIFICATES
- A. When required in individual Specification Sections, submit manufacturer's certificate in duplicate, certifying that products meet or exceed specified requirements.
- 1.20 MANUFACTURER'S FIELD SERVICES
- A. When required in individual Specification Sections, manufacturer shall provide qualified personnel to observe:
    - 1. Field conditions.
    - 2. Condition of installation.
    - 3. Quality of workmanship.
    - 4. Start-up of equipment.
    - 5. Testing, adjusting, and balancing of equipment.
  - B. Representative shall make written report of observations and recommendations to Architect / Engineer.
- 1.21 BUILDING CONSTRUCTION
- A. It shall be the responsibility of each sub-contractor to consult the Architectural and Engineering drawings, details, and specifications and thoroughly familiarize himself with the project and all job related requirements. Each sub-contractor shall cooperate with the General Contractor to verify that all piping and other items are placed in the walls, furred spaces, chases, etc., so there will be no delays in the job.
- 1.22 ELECTRICAL PROVISIONS OF PLUMBING WORK
- A. Electrical provisions to be provided as mechanical work are indicated in other Division 22 sections, on drawings, and as specified.
  - B. Types of work normally recognized as electrical but provided as plumbing, specified or partially specified in this Section, include but are not necessarily limited to the following:
    - 1. Motors for plumbing equipment.
    - 2. Starters for motors of plumbing equipment, but only where specifically indicated to be furnished integrally with equipment.
    - 3. Wiring from motors to disconnect switches or junction boxes for motors of plumbing equipment, but only where specifically indicated to be furnished integrally with equipment.
    - 4. Wiring of field-mounted float control switches, flow control switches, and similar mechanical-electrical devices provided for plumbing systems, to equipment control panels.
  - C. Refer to Division 26 sections for motor starters and controls not furnished integrally with mechanical equipment, junction boxes and disconnect switches required for motors and other electrical units of mechanical equipment.
  - D. Verify voltage on electrical plans.
- 1.23 PRODUCT DATA AND INSTALLATION INSTRUCTION
- A. Submit only pages which are pertinent to the project. Show reference standards, performance characteristics and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions and required clearances
  - B. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information not applicable.

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- C. Provide a separate transmittal for each submittal item. Transmittals shall indicate product by specification section name and number. Separate all submittals into appropriate specification section number. Do not combine specification sections.

### 1.24 CONTRACTOR SUBMITTAL AND SHOP DRAWING RESPONSIBILITIES

- A. Review submittals prior to transmittal.
- B. Determine and verify:
  - 1. Field measurements.
  - 2. Field construction criteria.
  - 3. Manufacturer's catalog numbers.
  - 4. Conformance with requirements of Contract Documents.
- C. Coordinate submittals with requirements of the work and of the Contract Documents.
- D. Notify the Architect/Engineer in writing at time of submission of any deviations in the submittals from requirements of the Contract Documents.
- E. Do not fabricate products, or begin work for which submittals are specified, until such submittals have been produced and bear contractor's stamp. Do not fabricate products or begin work scheduled to have submittals reviewed until return of reviewed submittals with Architect / Engineer's acceptance.
- F. Contractor's responsibility for errors and omissions in submittals is not relieved whether Architect / Engineer reviews submittals or not.
- G. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved whether Architect/Engineer reviews submittals or not, unless Architect / Engineer gives written acceptance of the specific deviations on reviewed documents.
- H. Submittals shall show sufficient data to indicate complete compliance with Contract Documents:
  - 1. Proper sizes and capacities.
  - 2. That the item will fit in the available space in a manner that will allow proper service.
  - 3. Construction methods, materials and finishes.
- I. Schedule submissions at least 15 days before date reviewed submittals will be needed.

### PART 2 - PRODUCTS – (Not Used)

### PART 3 - EXECUTION

#### 3.01 OPENINGS

- A. Framed, cast or masonry openings for ductwork, equipment or piping are specified under other divisions. Drawings and layout work for exact size and location of all openings are included under this division.

#### 3.02 HOUSEKEEPING PADS

- A. Provide equipment housekeeping pads under all floor mounted and ground mounted plumbing equipment, and as shown on the drawings.
- B. Concrete work as specified in Division 3.
- C. Concrete pads:
  - 1. Four-inch high, rounded edges, minimum 2500 psi unless otherwise indicated on the drawings.
  - 2. Chamfer strips at edges and corner of forms.
  - 3. Smooth steel trowel finish.
  - 4. Doweled to existing slab.

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- D. Install concrete curbs around multiple pipe penetrations.

### 3.03 VANDAL RESISTANT DEVICES

- A. Provide a handle for each loose keyed operated valve and hose bibb on the project.
- B. Where vandal resistant screws or bolts are employed on the project, deliver to the Owner two (2) suitable tools for use with each type of fastener used.
- C. Proof of delivery of these items to the Owner shall be included in the Operating and Maintenance Manuals.

### 3.04 INSTRUCTION OF OWNER'S PERSONNEL

- A. Prior to final inspection, conduct an on-site training program to instruct the Owner's operating personnel in the operation and maintenance of the plumbing systems.
  - 1. Provide the training during the Owner's regular working day.
  - 2. The Instructors shall each be experienced in their phase of operation and maintenance of building plumbing systems and with the project.
- B. Use the operation and maintenance manuals as the basis of instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
- C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shut down of each item of equipment.
- D. Demonstrate equipment functions (both individually and as part of the total integrated system).

### 3.05 EQUIPMENT IDENTIFICATION

- A. Provide a laminated engraved plastic nameplate on each piece of equipment and starter.
  - 1. Designation approved by Architect/Engineer.
  - 2. Equipment includes, but is not limited to, water heaters, pumps, boilers and utility controllers.
  - 3. Submit schedule of equipment to be included and designations.
- B. Provide nameplates with ½-inch high letters and fastened with epoxy or screws.

### 3.06 OBSTRUCTIONS

- A. The drawings indicate certain information pertaining to surface and subsurface obstructions which has been taken from available drawings. Such information is not guaranteed, however, as to accuracy of location or complete information.
  - 1. Before any cutting or trenching operations are begun, verify with Owner's representative, utility companies, municipalities, and other interested parties that all available information has been provided.
  - 2. Should obstruction be encountered, whether shown or not, alter routing of new work, reroute existing lines, remove obstruction where permitted, or otherwise perform whatever work is necessary to satisfy the purpose of the new work and leave existing services and structures in a satisfactory and serviceable condition.
- B. Assume total responsibility for and repair any damage to existing utilities or construction, whether or not such existing facilities are shown.

### 3.07 PROTECTION

- A. Protect work, equipment, fixtures, and materials. At work completion, work must be clean and in original manufacturer's condition.

### 3.08 OPERATION AND MAINTENANCE MANUAL

- A. Content of Manual:

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## Section 22 05 00 Plumbing General Provisions

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1. Neatly typewritten Table of Contents for each volume arranged in systematic order as outlined in the specifications.
  - a. Contractor, name of responsible principal, address and telephone number.
  - b. A list of each product required to be included, indexed to content of the volume.
  - c. List with each product, name, address and telephone number of:
    - 1) Subcontractor or installer.
    - 2) Maintenance contractor as appropriate.
    - 3) Identify area of responsibility of each.
    - 4) Local source of supply for parts and replacement.
  - d. Identify each product by product name and other identifying symbols as set forth in Contract Documents.
2. Product Data:
  - a. Include those sheets pertinent to the specific product.
    - 1) equipment shall be marked out indicated in some manner.

**END OF SECTION**

**Section 22 05 00**  
**Plumbing General Provisions**  
Specifications

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# Section 22 10 00 Plumbing Piping & Fixtures

Specifications

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## PART 1 - GENERAL

### 1.01 WORK INCLUDED

- A. Furnish and install plumbing piping in buildings and site. Insulate hot domestic water piping above grade. All domestic water products including, but not limited to, pipe, fittings, and fixtures shall be 'Lead Free'
- B. Furnish and install water closets, showers, bathtubs, lavatories, sinks, all other specified plumbing fixtures and their associated plumbing appurtenances.

### 1.02 JOB REQUIREMENTS

- A. Furnish plumbing fixtures and trim as shown and specified. Provide faucets, fittings, supply stops and similar devices of a single manufacturer. Furnish faucets and supply stops with renewable seats.

## PART 2 - PRODUCTS

### 2.01 DOMESTIC WATER PIPING AND FITTINGS

- A. Below Slab on Grade Piping for Water Entries: provide ASTM B88 and ANSI/NSF Standard 61 Type L annealed tempered (soft) seamless copper water tube. No joints below slab entries.
- B. Above Slab Piping. PEX system must be listed ASTM F876/F877. Tubing shall be listed PEX 5006 for chlorine resistance for continuous usage up to 140°F. All tubing installed in return air plenums shall be listed ASTM E84. The listing may be for the tubing itself or for the tubing including insulation to achieve the listing. The fittings shall be of the same manufacturer as the tubing and the installation instructions of the manufacturer shall be strictly adhered to. Viega PureFlow or Uponor Systems only.
- C. Air Chambers. Provide a minimum 18-inch long air chamber, of the same size and connecting pipe material at each single lavatory, sink, drinking fountain or fixture that does not have a quick-closing valve or electrical, pneumatic, spring loaded type, or flush valve. Air chambers to be used for remote fixtures and not mixed with water hammer arrestors at group toilets.
- D. Insulation. Provide a minimum Elastomeric Insulation with an R-3 value. Provide with a factory applied pressure sensitive tape closure system and matching butt strips.

### 2.02 SANITARY SEWER PIPE AND FITTINGS

- A. Provide Schedule 40 PVC plastic pipe and DWV fittings with solvent welded joints..
- B. Provide piping in return air ceiling plenums with Flame/Smoke rated plenum wrap.

### 2.03 SANITARY VENT PIPE AND FITTINGS

- A. Provide Schedule 40 PVC plastic pipe and DWV fittings with solvent welded joints..
- B. Provide piping in return air ceiling plenums with Flame/Smoke rated plenum wrap.

### 2.04 ACCEPTABLE FIXTURE MANUFACTURERS

- A. Vitreous China:
  - 1. American Standard.
  - 2. Crane
  - 3. Mansfield
  - 4. Kohler.
  - 5. Toto
  - 6. Zurn



## Section 22 10 00 Plumbing Piping & Fixtures

Specifications

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- B. Plumbing Faucets:
  - 1. American Standard.
  - 2. Chicago.
  - 3. T&S Brass.
  - 4. Zurn.
  - 5. Symmons.
  - 6. Speakman
  - 7. Moen
  - 8. Delta
  - 9. Price Pfister
  
- C. Supports and Carriers:
  - 1. Zurn.
  - 2. J.R. Smith.
  - 3. Wade.
  - 4. Josam.
  - 5. Watts
  - 6. MIFAB
  
- D. Flush Valves:
  - 1. Sloan
  - 2. Zurn
  - 3. Moen Commercial
  
- E. Supplies, Stops and Chrome Plated Tubular Brass:
  - 1. McGuire
  - 2. Kohler
  - 3. Chicago
  - 4. Zurn
  - 5. Brasscraft
  - 6. Mainline
  
- F. Water Closet Seats:
  - 1. Beneke
  - 2. Church
  - 3. Olsonite
  - 4. Bemis
  - 5. Centoco
  - 6. Water Closet Manufacturer
  
- G. Electric Drinking Fountains:
  - 1. Halsey Taylor
  - 2. Elkay
  - 3. Oasis
  - 4. Haws
  - 5. Acorn Aqua
  
- H. Floor Drains:
  - 1. Zurn
  - 2. J.R. Smith
  - 3. Josam
  - 4. Wade
  - 5. Watts
  - 6. Sioux Chief
  - 7. MIFAB
  
- I. Cleanouts:
  - 1. Zurn
  - 2. J.R. Smith
  - 3. Josam
  - 4. Wade

## Section 22 10 00 Plumbing Piping & Fixtures

Specifications

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- 5. Watts
- 6. MIFAB
  
- J. Stainless Steel Sinks:
  - 1. Elkay
  - 2. Just
  - 3. Griffin
  - 4. Moen Commercial
  - 5. Amtekco Industries
  
- K. Mop Sinks:
  - 1. Crane Fiat
  - 2. Stern Williams
  - 3. Acorn
  - 4. CECO
  
- L. Thermostatic Mixing Valves
  - 1. Lawler
  - 2. Symmons
  - 3. Leonard
  - 4. Powers
  - 5. Holby
  - 6. Bradley
  - 7. Acorn
  
- M. Shock Arrestors:
  - 1. Precision Products
  - 2. Sioux Chief
  - 3. MIFAB
  
- N. Backflow Preventors
  - 1. Watts
  - 2. Febco
  - 3. Wilkins
  
- O. Hose Bibbs
  - 1. Chicago
  - 2. Josam
  - 3. Woodford
  - 4. Zurn
  - 5. J.R. Smith
  - 6. Wade
  - 7. MIFAB
  
- P. Wall Hydrants
  - 1. Woodford
  - 2. MIFAB
  - 3. Zurn
  - 4. J.R. Smith
  - 5. Josam
  - 6. Wade

### PART 3 – EXECUTION

#### 3.01 SANITARY INSTALLATION

- A. Give horizontal pipe grade of  $\frac{1}{4}$ -inch per foot where possible, but not less than  $\frac{1}{8}$  inch per foot unless otherwise shown.
  
- B. Above ground installation in the horizontal position shall be supported at every hub. Hangers to be placed within 18" of hub or coupling. Every branch opening or change of direction, braces, blocks,

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## Section 22 10 00 Plumbing Piping & Fixtures

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rodding or other suitable method shall be used to prevent movement. Riser clamps to be used for each floor, not to exceed 15'-0".

- C. All above and below slab PVC sanitary waste and vent piping installation methods shall be in accordance with IAPMO Installation Standard 18-9 for Schedule 40 PVC-DWV, per manufacturer's recommendations and applicable standards.
- D. All PVC underground shall be installed in accordance with ASTM D2321.
- E. Offsets and Fittings.
  - 1. Use reduction fittings to connect two pipes of different diameter.
  - 2. Change directions by appropriate use of 45-degree wyes, long-sweep quarter-bends, and sixth-, eights-, and sixteenth-bends. Sanitary tees can be used on vertical stacks. Use long sweeps at the base of risers.
  - 3. Provide a separate trap at each fixture, unless a trap is built into the fixture. Provide a deep seal trap at each floor drain and hub drain. Place traps so that the discharge from any fixture will pass through only one trap before reaching a building drain.
- F. Hub Drains. Install hub drains where indicated, with the top of the hub 1/2 above the finished floor, unless otherwise indicated on the drawings.
- G. Cleanouts. Install cleanouts the same size as the soil waste lines in which the cleanouts are placed; however, no cleanout should be larger than 4 inches in diameter.
  - 1. Where cleanouts occur in pipe chases, bring the cleanouts through the walls and install covers. Where cleanouts occur in floor slabs, set flush. Reference drawing schedule.
  - 2. Provide cleanouts where soil lines change direction, every 50 foot on long runs, or as shown on the drawings, at the end of each horizontal waste line, and at the base of each riser (and at each increase in pipe size).
  - 3. Cleanouts shall occur at the end of each battery of water closets, urinals, lavatories, sinks, and single water closets. Cleanouts shall be installed so as to access the main sanitary or soil line. Extend and offset above flood rim of fixture.
  - 4. Double sanitary tees and double quarter bends do not allow for easy access to main lines, therefore these types of fittings are not allowed.
- H. Floor Drains. Locate floor drains 1/2-inch below finish floor elevation unless otherwise shown.
- I. Make vent connections to vent stacks with inverted wye fittings. Extend full-size vents through the roof to at least 6 inches above the roof.
- J. Flash the roof penetration with not less than 3 pounds per sq. ft. or 1.2 mm thick lead flashing approximately 24 inches square. Flange the flashing to the lead sleeve. Extend the flashing up and around the vent pipe. Turn the flashing down inside the pipe at least 2 inches to make a watertight joint. Flashing shall comply with the roofing manufacturer's requirements. Reference the Architectural Drawings for exact requirements.
- K. Locate vent piping through roof a minimum horizontal distance of not less than 20 feet from any air intake opening or supply fan

### 3.02 DOMESTIC WATER PIPE INSTALLATION

- A. Make piping layout and installation in the most advantageous manner possible with respect to headroom, valve access, opening and equipment clearance, and clearance for other work. Give particular attention to piping in the vicinity of equipment. Preserve the required minimum access clearances to various equipment parts, as recommended by the equipment manufacturer, for maintenance.
- B. Support piping to maintain line and grade, with provision for expansion and contraction. Use approved clevis-type or trapeze-type hangers connected to structural members of the building. Single pipe runs to be supported by approved clevis type hangers. Multiple pipe runs to be supported by approved trapeze type hangers. Do not support piping from other piping or structural joist bridging.

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- C. Install water piping systems with uniform horizontal grade of 1/8 inch per 10 foot, minimum, to low points to provide complete system drainage. Where constant pitch cannot be maintained for long runs, establish intermediate low points and rise to new level. Grade branches to drain to mains or risers. Unless otherwise indicated, terminate low points of risers with drain valve piped to nearest hub or floor drain.

- D. Cover all domestic hot water piping with insulation.

### 3.03 UNDERGROUND WATER PIPING SYSTEM PROCEDURES

- A. Lay sewer and water lines in separate trenches, separated by 10 foot of undisturbed or compacted soil.

### 3.04 SANITARY SEWER TESTING

- A. Below Slab on Grade and All Floors in Multi-Story Buildings:
  1. Test pipe below slab on grade before backfilling and connecting to city sewers.
  2. Maintain not less than 10 foot of hydrostatic head for 1 hour without a leak.
  3. Before acceptance of the work the contractor must ensure the piping is in working order before and after the slab is poured. To ensure this the contractor must test completed systems in the presence of the Architect, Engineer and authorities having jurisdiction after installation is complete.
  4. Maintain the test on the system till after the slab is poured. Provide an accessible connection that may be reviewed by Architect, Engineer and authorities having jurisdiction prior to and after the slab is poured.
  5. Test drainage piping systems in accordance with governing codes and the requirements specified. Provide equipment and materials and make test connections required to execute tests.

### 3.05 DOMESTIC WATER TESTING

- A. Test under a cold water hydrostatic pressure per the State Plumbing Code and carefully check for leaks. Repair leaks and retest system until proven watertight and maintained for 6 hours.
- B. Use only potable water for the test.
- C. Perform the test before fixtures, faucets, trim or final connections are made to equipment.
- D. If the system is tested in sections, the entire domestic water piping system shall be submitted to a final test, employing the specified procedure.
- E. Do not insulate or conceal piping systems until tests are satisfactorily complete.
- F. If any leaks or other defects are observed, suspend the test and correct the condition at once. Repeat testing until leaks are eliminated and the full test period is achieved.
- G. The satisfactory completion of testing does not relieve the Contractor of responsibility for ultimate proper and satisfactory operation of piping systems and their accessories.

### 3.06 COPPER PIPE CORROSION PROTECTION

- A. Provide plasti-sleeve 0.006 thick corrosion protection on the copper tube piping systems in the building slab, beneath the building slab, and/or buried. Route plasti-sleeve the entire length of below slab on grade copper tubing.
- B. Extend the corrosion protection 6 inches above concrete slab on grade.

### 3.07 PLUMBING FIXTURE INSTALLATION

- A. Installation shall be in accordance with the manufacturer's instructions.

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## Section 22 10 00 Plumbing Piping & Fixtures

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- B. Make rough-in and final connection of service to each fixture provided under this Section and other Sections or Architectural or Plumbing Drawings.
- C. Provide necessary stops, valves, traps, unions, vents, cold water, hot water, sanitary, etc. for a complete installation.
- D. Provide isolation valves in domestic water lines to isolate all equipment, restrooms, hose bibs, and where shown on drawings.
- E. Remove piping and services roughed-in incorrectly and install correctly, without cost.
- F. Exposed piping, fittings and appurtenances shall be chrome-plated brass.
- G. Coordinate with the Contractor for locations and service required for each plumbing fixture.
- H. All floor drains and floor sinks shall have trap primer connections. Provide trap primer valves and 1/2-inch water line to each floor drain connection. Trap primer supply line shall have ball valve and Y strainer on inlet side of trap primer valve to facilitate cleaning.
- I. All floor drains and floor sink locations are to be coordinated with all equipment. Locate drains in mechanical equipment spaces to conform to drain locations of equipment furnished. Coordinate drain location with food service equipment and Architectural Drawings.

### 3.08 STERILIZATION

- A. Sterilize the water system with solution containing not less than 50PPM available chlorine. Allow chlorinating solution to remain in system for period of 8 hours (minimum). Have valves and faucets opened and closed several times during the period. After sterilization, flush the solution from the system with clean water until residual chlorine content is less than 0.2 parts per million.

**END OF SECTION**

**Section 22 10 00**  
**Plumbing Piping & Fixtures**  
Specifications

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## Section 22 33 30 Electric Water Heater

Specifications

22 33 30 - 1

### PART 1 - GENERAL

#### 1.01 WORK INCLUDED

- A. Electric water heaters for domestic water systems.

#### 1.02 RELATED WORK

- A. Division 15 Mechanical:
  - 1. Domestic Water Piping.
  - 2. Mechanical Piping Insulation.
  - 3. Division 16 Electrical.

### PART 2 - PRODUCTS

#### 2.01 ACCEPTABLE MANUFACTURERS

- A. Lochinvar
- B. State.
- C. Rheem/Ruud
- D. A. O. Smith

#### 2.02 PRODUCTS

- A. Provide electric water heaters with kilowatt, recovery ratings, and storage capacities as scheduled on drawings.
- B. Provide a tank designed for 150 psig working pressure. Furnish glass-lined tank. Lining shall be corrosion-resistant.
- C. Furnish factory-assembled, integral units equipped as follows:
  - 1. Dip tube.
  - 2. Individually mounted thermostat at each element with a high temperature cutoff.
  - 3. Glass lined tank.
  - 4. Minimum R-16 insulation.
  - 5. UL rated.
  - 6. Heavy-duty, tank mounted, screw-in anode rod.
- D. Provide low watt density elements having zinc-plated, copper sheathing and prewired leads.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Provide at each heater an automatic temperature and pressure relief valve with rating matching or exceeding the energy input rate.
- B. Pipe the discharge port to a point of visible and safe disposal required by codes and the drawings.
- C. Contractor shall provide a temperature gauge at heater.
- D. Install water heater in galvanized drain pan piped to floor drain or exterior. Provide ¾" outlet connection.

**END OF SECTION**

**Section 22 33 30**  
**Electric Water Heater**  
Specifications



# Section 22 63 11

## Gas Piping & Appurtenances

Specifications

22 63 11-1

### PART 1 - GENERAL

#### 1.01 WORK INCLUDED

- A. Furnish and install steel gas pipe inside buildings, including the supply line from the meter, service lines to gas equipment and appliances, termination of the service line with a plug valve, drip leg, and final connection to equipment and appliances with unions.
- B. Coordinate service line from utility main and extend to meter. Coordinate installation of the service line and meter with Gas Company.
- C. Extend steel gas piping from meter to inside the building to all fixtures, appliances and equipment requiring gas.

#### 1.02 RELATED WORK

- A. Division 15 Mechanical.
  - 1. Pipe and Pipe Fittings.
  - 2. Valves, Strainers and Vents.

#### 1.03 UTILITY CONNECTIONS

- A. Make arrangements for and pay all fees and connection charges for obtaining service to the building.

### PART 2 - PRODUCTS

#### 2.01 PIPE AND FITTINGS - ABOVE GRADE

- A. Pipe 2 inch and Smaller:
  - 1. Schedule 40 ASTM A 53 black steel pipe
  - 2. Factory fabricated socket weld fittings.
- B. Pipe Larger than 2 inch:
  - 1. Schedule 40 ASTM A 53 black steel pipe.
  - 2. Factory fabricated butt weld fittings for welded steel pipes shall conform to ASTM A-234 WPB (seamless weld fittings).
- C. Unions:
  - 1. Standard 150 lb. (300 lb. water, oil or gas) malleable iron.
  - 2. Ground joint unions, with bronze seat.
  - 3. Flange joints for pipe larger than 2 inch in diameter.
- D. Flanges:
  - 1. Steel flanges. ANSI B16.5 and ASTM A-105.

#### 2.02 PIPE AND FITTINGS - BELOW GRADE OUTSIDE BUILDING

- A. Polyethylene pipe shall be ASTM D3350 Grade PE24 cell classification and ASTM D1248 Class B material classification.
- B. Pipe shall be medium density polyethylene PE 2406 and PE 2708 manufactured by Poly Pipe Industries, Inc. or Performance Pipe.
- C. Polyethylene yellow molded butt fittings for use with medium density polyethylene pipe shall meet

## Section 22 63 11 Gas Piping & Appurtenances

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testing requirements of ASTM D2513 and resin material listing of ASTM D3350 with PPI designation of PE 2406 as manufactured by Central Plastics Co.

- D. Identification Conductor: Spiral A #12 AWG insulated copper conductor the full length of the thermoplastic piping system. Fasten to the pipe at 3 foot intervals with plastic tie wraps.
  - 1. Terminate at each end in a 12 inch x 12 inch x 4 inch FRP junction box set in concrete pad. Box shall have a bolted gasketed cover with stainless steel screws with screw type terminal strip and legend on cover "gas pipe identification conductor."

### 2.03 GAS PRESSURE REGULATOR

- A. Size the gas pressure regulator in accordance with the manufacturer's recommendations for flow quantities and reduced pressure as required for all equipment. Coordinate final equipment gas pressure requirements prior to ordering regulators. Provide American Meter Company regulators or approved equal, suitable for outdoor installation. Regulators outside exposed to weather shall be installed with vent in vertical down position.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Installation Standards: Install gas piping in accordance with recommendations of the National Fire Protection Association.
- B. Drip Legs: Install a capped drip leg 6 inches long at the base of each vertical rise.
- C. Coating and Wrapping. Coat and wrap underground piping in accordance with the service utility company standards.
- D. Sleeves.
  - 1. Encase gas piping running in or through solid partitions with thin wall metal conduit. Sleeve piping and fittings shall be two pipe sizes, but not less than 1 inch larger than encased gas piping.
  - 2. Encase gas piping running below slab in Schedule 40 PVC, minimum size two pipe sizes larger than gas pipe. Vent PVC sleeve to atmosphere with a 1-1/2 inch vent with 1-1/2 inch return bend above building roof. Seal ends of sleeve with UL fire rated caulk.
- E. Do not install gas piping exposed to view inside public area, or occupied spaces, without prior written approval.
- F. Weld all gas piping above grade inside the building.
- G. Provide test ports and isolation valves to enable proper testing of system in the future.
- H. Provide isolation valve and unions across regulators for proper removal.
- I. Provide transition risers where below grade polyethylene pipe changes to steel pipe above grade.
- J. Coordinate routing of underground gas piping with the owner prior to install. Contractor shall mark the proposed pathway on the site prior to coordination meeting.
- K. Gas Pressure Regulators / Vents:
  - 1. Piping shall be sized in accordance with the regulator manufacturer's instructions. Where there is more than one regulator at a location, each regulator shall have a separate vent to the roof / outdoors.
  - 2. Install vent piping from regulators to location to prevent gas smells from entering building.

Specifications

## Section 22 63 11 Gas Piping & Appurtenances

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3. Install double elbows and insect screen at end of piping to prevent moisture and insects from entering.
4. When regulators are installed inside building route vents horizontally and terminate through building sidewall. Vents terminating through roof must have prior approval from Architect before installation. Through roof penetrations shall be minimized.
5. Regulators installed outside or on roof top: Install regulator vent turned downward with insect screen over vent opening. The vent shall be designed to prevent the entry of water, insects, or other foreign materials that could cause blockage.

### 3.02 TESTING GAS PIPING

- A. Preliminary gas test as required by Code, but minimum test pressure of 50 PSI held for not less than eight hours without noticeable drop.
- B. Test joints with a soap solution while lines are under pressure.
- C. Repair leaks.
- D. Final gas test shall be with a 24 inch column of mercury or a diaphragm gauge with a minimum dial size of 3-1/2 inches with a set hand and a pressure range not to exceed twenty (20) psig with 2/10-pound increments. The minimum test pressure shall not be less than ten (10) psi and the maximum test pressure shall not exceed twelve (12) psig. This test will be observed for no less than (30) thirty minutes with no drop in pressure.
- E. Provide copy of gas pressure test reports in Operations & Maintenance Manual.

### 3.03 PAINT EXPOSED OUTSIDE GAS PIPE

- A. Interior and exterior gas pipe shall be protected from rusting.
- B. Paint pipe with a flat alkyd coating, clean pipe prior to painting by preparing surface by hand tool cleaning per SSPC-SP2-82, applying one coat of Glidden Y-590 Rustmaster Metal Primer White and top coat of Yellow Alkyd Flat Enamel.

**END OF SECTION**

**Section 22 63 11**  
**Gas Piping & Appurtenances**  
Specifications

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## Section 23 05 00 Mechanical General Provisions

Specifications

23 05 00-1

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Except as modified in this Section, General Conditions, Supplementary Conditions, applicable provisions of the General Requirements, and other provisions and requirements of the contract documents apply to work of Division 23 Mechanical.
- B. Applicable provisions of this section apply to all sections of Division 23, Mechanical.

#### 1.02 CODE REQUIREMENTS AND FEES

- A. Perform work in accordance with applicable statutes, ordinances, codes and regulations of governmental authorities having jurisdiction.
- B. Mechanical work shall comply with applicable inspection services:
  - 1. Underwriters Laboratories
  - 2. National Fire Protection Association
  - 3. State Health Department
- C. Resolve any code violations discovered in contract documents with the Engineer prior to award of the contract. After Contract award, any correction or additions necessary for compliance with applicable codes shall be made at no additional cost to the Owner.
- D. This Contractor shall be responsible for being aware of and complying with asbestos NESHAP regulations, as well as all other applicable codes, laws and regulations.
- E. Obtain all permits required.

#### 1.03 CONTRACTOR'S QUALIFICATIONS

- A. An approved contractor for the work under this division shall be:
  - 1. A specialist in this field and have the personnel, experience, training, skill, and organization to provide a practical working system.
  - 2. Able to furnish evidence of having contracted for and installed not less than three (3) systems of comparable size and type that has served their Owners satisfactorily for not less than three (3) years.

#### 1.04 REFERENCE SPECIFICATIONS AND STANDARDS

- A. Materials which are specified by reference to Federal Specifications; ASTM, ASME, ANSI, or AWWA Specifications; Federal Standards; or other standard specifications must comply with latest editions, revisions, amendments or supplements in effect on date bids are received. Requirements in reference specifications and standards are minimums for all equipment, material, and work. In instances where specified capacities, size, or other features of equipment, devices, or materials exceed these minimums, meet specified capacities.

#### 1.05 CONTRACT DRAWINGS

- A. Contract drawings are diagrammatic only and do not give fully dimensioned locations of various elements of work. Determine exact locations from field measurements.

#### 1.06 PROJECT RECORD DOCUMENTS

- A. Maintain at the job site a separate set of white prints (black line) of the contract drawings for the sole purpose of recording the "as-built" changes and diagrams of those portions of work in which actual construction is at variance with the contract drawings. Mark the drawings with a colored pencil. Prepare, as the work progresses and upon completion of work, reproducible drawings clearly indicating locations of various lines, valves, ductwork, traps, equipment, and other pertinent items, as installed. Include flow-line elevation of sewer lines. Record existing and new underground and under slab piping with dimensioned locations and elevations of such piping.

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- B. As-Built drawings should indicate the following information as a minimum:
  - 1. Indicate all addendum changes to documents.
  - 2. Indicate all changes to construction during construction. Indicate actual routing of all piping, ductwork, etc. that were deviated from construction drawings.
  - 3. Indicate exact location of all underground mechanical piping and elevation.
  - 4. Indicate exact location of all underground electrical raceways and elevations.
  - 5. Correct schedules to reflect (actual) equipment furnished and manufacturer.
  - 6. Location and size of all ductwork and mechanical piping above ceiling including exact location of isolation of domestic and mechanical valves.
  - 7. Exact location of all electrical equipment in and outside of the building.
  - 8. Exact location of all roof mounted equipment, wall, roof and floor penetrations.
  - 9. Cloud all changes.

### 1.07 SPACE REQUIREMENTS

- A. Consider space limitations imposed by contiguous work in selection and location of equipment and material. Do not provide equipment or material that is not suitable in this respect.

### 1.08 RELATION WITH OTHER TRADES

- A. Carefully study all matters and conditions concerning the project. Submit notification of conflict in ample time to prevent unwarranted changes in any work. Review other Divisions of these specifications to determine their requirements.
- B. Because of the complicated relationship of this work to the total project, conscientiously study the relation and cooperate as necessary to accomplish the full intent of the documents.
- C. Provide sleeves and inserts in forms as required for the work. Stub up and protect open ends of pipe before any concrete is placed. Furnish sizes of required equipment pads. Furnish and locate bolts and fittings required to be cast in them.
- D. Locate and size openings required for installation of work specified in this Division in sufficient time to prevent delay in the work.
- E. Refer to other Divisions of the specifications for the scope of required connections to equipment furnished under that Division. Determine from the Contractor for the various trades, the Owner, and by direction from the Architect/Engineer, the exact location of all items.

### 1.09 CONCEALED AND EXPOSED WORK

- A. When the word "concealed" is used in connection with insulating, painting, piping, ducts and the like, the work is understood to mean hidden from sight as in chases, furred spaces or above ceilings. "Exposed" is understood to mean open to view.

### 1.10 GUARANTEE

- A. Guarantee work for one (1) year from the date of substantial completion of the project. During that period make good any faults or imperfections that may arise due to defects or omissions in material, equipment or workmanship. At the Owner's option, replacement of failed parts or equipment shall be provided.

### 1.11 MATERIAL AND EQUIPMENT

- A. Furnish new and unused materials and equipment meeting the requirements of the paragraph specifying acceptable manufacturers. Where two (2) or more units of the same type or class of equipment are required, provide units of a single manufacturer.

### 1.12 NOISE AND VIBRATION

- A. Select equipment to operate with minimum noise and vibration. If objectionable noise or vibration is produced or transmitted to or through the building structure by equipment, piping, ducts or other

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parts of work, rectify such conditions at no additional cost. If the item of equipment is judged to produce objectionable noise or vibration, demonstrate at no additional cost that equipment performs within designated limits on a vibration chart.

### 1.13 ACCEPTABLE MANUFACTURERS

- A. Manufacturers names and catalog number specified under sections of Division 23 are used to establish standards of design, performance, quality and serviceability and not to limit competition. Equipment of similar design, equal to that specified, manufactured by a named manufacturer will be acceptable on approval. A request for prior approval of equipment not listed must be submitted ten (10) days before bid due date. Submit complete design and performance data to the Engineer.

### 1.14 OPERATING TESTS

- A. After all mechanical systems have been completed and put into operation, subject each system to an operating test under design conditions to ensure proper sequencing and operation throughout the range of operation. Tests shall be made in the presence of the Architect/Engineer. Make adjustments as required to ensure proper functioning of all systems. Special tests on individual systems are specified under individual sections. Submit three (3) copies of all certifications and test reports adequately in advance of completion of the work to allow for remedial action as required to correct deficiencies discovered in equipment and systems.

### 1.15 WARRANTIES

- A. Submit three (3) copies of all warranties and guarantees for systems, equipment, devices and materials. These shall be included in the Operating and Maintenance Manuals.

### 1.16 WORKMANSHIP

- A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.
- B. Perform work by persons qualified to produce workmanship of specified quality.
- C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking. Under no conditions shall material or equipment be suspended from structural bridging.
- D. Provide finishes to match approved samples. All exposed finishes shall be approved by the Architect. Submit color samples as required.

### 1.17 MANUFACTURER'S INSTRUCTIONS

- A. Comply with instructions in full detail, including each step in sequence.
- B. Should instruction conflict with Contract Documents, request clarification from Architect / Engineer before proceeding.
- C. Submit Manufacturer's instructions for storage, preparation, assembly, installation, start-up, adjusting, calibrating, balancing and finishing.

### 1.18 MANUFACTURER'S CERTIFICATES

- A. When required in individual Specification Sections, submit manufacturer's certificate in duplicate, certifying that products meet or exceed specified requirements.

### 1.19 MANUFACTURER'S FIELD SERVICES

- A. When required in individual Specification Sections, manufacturer shall provide qualified personnel to observe:
  1. Field conditions.
  2. Condition of installation.

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3. Quality of workmanship.
4. Start-up of equipment.
5. Testing, adjusting, and balancing of equipment.

- B. Representative shall make written report of observations and recommendations to Architect / Engineer.

### 1.20 BUILDING CONSTRUCTION

- A. It shall be the responsibility of each sub-contractor to consult the Architectural and Engineering drawings, details, and specifications and thoroughly familiarize himself with the project and all job related requirements. Each sub-contractor shall cooperate with the General Contractor to verify that all piping and other items are placed in the walls, furred spaces, chases, etc., so there will be no delays in the job.

### 1.21 ELECTRICAL PROVISIONS OF HVAC WORK

- A. Electrical provisions to be provided as mechanical work are indicated in other Division 23 sections, on drawings, and as specified.
- B. Types of work normally recognized as electrical but provided as mechanical, specified or partially specified in this Section, include but are not necessarily limited to the following:
  1. Motors for mechanical equipment.
  2. Starters for motors of mechanical equipment, but only where specifically indicated to be furnished integrally with equipment.
  3. Wiring from motors to disconnect switches or junction boxes for motors of mechanical equipment, but only where specifically indicated to be furnished integrally with equipment.
  4. Wiring of field-mounted float control switches, flow control switches, and similar mechanical-electrical devices provided for mechanical systems, to equipment control panels.
  5. Wiring of all related circulating water system chemical treatment devices.
    - a. Low voltage electric contacting water meter
    - b. Solenoid valve/blow-down assembly
- C. Refer to Division 23 Controls sections for related control system wiring.
- D. Refer to Division 26 sections for motor starters and controls not furnished integrally with mechanical equipment, junction boxes and disconnect switches required for motors and other electrical units of mechanical equipment.
- E. Verify voltage on electrical plans.

### 1.22 PRODUCT DATA AND INSTALLATION INSTRUCTION

- A. Submit only pages which are pertinent to the project. Show reference standards, performance characteristics and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions and required clearances
- B. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information not applicable.
- C. Mark up a copy of the specifications for the product. Indicate in the margin of each paragraph the following: COMPLY, DO NOT COMPLY, or NOT APPLICABLE. Explain all DO NOT COMPLY statements.
- D. Provide a separate transmittal for each submittal item. Transmittals shall indicate product by specification section name and number. Separate all submittals into appropriate specification section number. Do not combine specification sections.



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### 1.23 CONTRACTOR SUBMITTAL AND SHOP DRAWING RESPONSIBILITIES

1. Review submittals prior to transmittal.
2. Determine and verify:
  - a. Field measurements
  - b. Field construction criteria
  - c. Manufacturer's catalog numbers
  - d. Conformance with requirements of Contract Documents
3. Coordinate submittals with requirements of the work and of the Contract Documents.
4. Notify the Architect/Engineer in writing at time of submission of any deviations in the submittals from requirements of the Contract Documents.
5. Do not fabricate products, or begin work for which submittals are specified, until such submittals have been produced and bear contractor's stamp. Do not fabricate products or begin work scheduled to have submittals reviewed until return of reviewed submittals with Architect / Engineer's acceptance.
6. Contractor's responsibility for errors and omissions in submittals is not relieved whether Architect / Engineer reviews submittals or not.
7. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved whether Architect/Engineer reviews submittals or not, unless Architect / Engineer gives written acceptance of the specific deviations on reviewed documents.
8. Submittals shall show sufficient data to indicate complete compliance with Contract Documents:
  - a. Proper sizes and capacities
  - b. That the item will fit in the available space in a manner that will allow proper service
  - c. Construction methods, materials and finishes
9. Schedule submissions at least 15 days before date reviewed submittals will be needed.

### **PART 2 – PRODUCTS - (Not Used)**

### **PART 3 - EXECUTION**

#### 3.01 OPENINGS

- A. Framed, cast or masonry openings for ductwork, equipment or piping are specified under other divisions. Drawings and layout work for exact size and location of all openings are included under this division.

#### 3.02 AIR FILTERS AND PIPE STRAINERS

- A. Immediately prior to substantial completion of the project, inspect, clean and service air filters and strainers. Replace air filters.

#### 3.03 LUBRICATION, REFRIGERANT AND OIL

- A. Provide a complete charge of correct lubricant for each item of equipment requiring lubrication.
- B. Provide a complete and working charge of proper refrigerant, free of contaminants, into each refrigerant system. After each system has been in operation long enough to ensure completely balanced conditions, check the charge and modify for proper operation as required.
- C. Provide a complete charge of special oil for refrigeration use, suitable for operation with refrigerant, in each system.

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### 3.04 HOUSEKEEPING PADS

- A. Provide equipment housekeeping pads under all floor mounted and ground mounted HVAC equipment, and as shown on the drawings.
- B. Concrete work as specified in Division 3.
- C. Concrete pads:
  - 1. Four-inch high, rounded edges, minimum 2500 psi unless otherwise indicated on the drawings.
  - 2. Chamfer strips at edges and corner of forms.
  - 3. Smooth steel trowel finish.
  - 4. Doweled to existing slab.
- D. Install concrete curbs around duct penetrations or multiple pipe penetrations.

### 3.05 INSTRUCTION OF OWNER'S PERSONNEL

- A. Prior to final inspection, conduct an on-site training program to instruct the Owner's operating personnel in the operation and maintenance of the mechanical systems.
  - 1. Provide the training during the Owner's regular working day.
  - 2. The Instructors shall each be experienced in their phase of operation and maintenance of building mechanical systems and with the project.
- B. Time to be allocated for instructions.
  - 1. Minimum of 12 hours dedicated instructor time.
  - 2. 6 hours on each of 2 days.
- C. Before proceeding with the on-site training program, submit the program syllabus; proposed time and dates; and other pertinent information for review and approval.
  - 1. One copy to the Owner.
  - 2. One copy to the Architect/Engineer.
- D. The Owner will provide a list of personnel to receive instructions, and will coordinate their attendance at the agreed upon times.
- E. Use the operation and maintenance manuals as the basis of instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
- F. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shut down of each item of equipment.
- G. Demonstrate equipment functions (both individually and as part of the total integrated system).
- H. Prepare and insert additional data in the operating and maintenance manuals when the need for additional data becomes apparent during instructions.
- I. Submit a report within one week after completion of the training program that instructions have been satisfactorily completed. Give time and date of each demonstration and hours devoted to the demonstration, with a list of people present.
- J. At the conclusion of the on-site training program, have the person designated by the Owner sign a certificate to certify that he/she has a proper understanding of the system, that the demonstrations and instructions have been satisfactorily completed, and the scope and content of the operating and maintenance manuals used for the training program are satisfactory.
- K. Provide a copy of the report and the certificate in an appropriately tabbed section of each Operating and Maintenance Manual.

### 3.06 EQUIPMENT IDENTIFICATION

Specifications

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- A. Provide a laminated engraved plastic nameplate on each piece of equipment and starter.
  - 1. Designation approved by Architect/Engineer.
  - 2. Equipment includes, but is not limited to, air handling units, fan coil units, variable volume boxes, fans, pumps, boilers and chillers.
  - 3. Submit schedule of equipment to be included and designations.
- B. Provide nameplates with ½-inch high letters and fastened with epoxy or screws.

### 3.07 OBSTRUCTIONS

- A. The drawings indicate certain information pertaining to surface and subsurface obstructions which has been taken from available drawings. Such information is not guaranteed, however, as to accuracy of location or complete information.
  - 1. Before any cutting or trenching operations are begun, verify with Owner's representative, utility companies, municipalities, and other interested parties that all available information has been provided.
  - 2. Should obstruction be encountered, whether shown or not, alter routing of new work, reroute existing lines, remove obstruction where permitted, or otherwise perform whatever work is necessary to satisfy the purpose of the new work and leave existing services and structures in a satisfactory and serviceable condition.
- B. Assume total responsibility for and repair any damage to existing utilities or construction, whether or not such existing facilities are shown.

### 3.08 PROTECTION

- A. Protect work, equipment, fixtures, and materials. At work completion, work must be clean and in original manufacturer's condition.

### 3.09 INDOOR AIR QUALITY

- A. All equipment and ductwork shall be installed to allow sufficient space for testing, maintenance, and commissioning functions. Access doors or panels shall be installed in ventilation equipment, ductwork, and plenum enclosures for inspection and cleaning of outdoor air intakes, mixing plenums, up and downstream of coils, filters, drain pans and fans.
- B. Practice source control and eliminate potential contaminants in material selection, installation, and maintenance.
- C. Provide installation and disposal instructions for all materials and chemicals that are potential contaminants.
- D. Obtain and conform to the requirements of the Material Safety Data Sheets (MSDSs) in the use of materials.
- E. Utilize manufacturer's recommendations and provide installation instructions for all chemicals, compounds, and potential contaminants including pre-installation degassing if required.
- F. Ventilate completed building prior to final completion using no less than design outside air for at least 48 hours before occupancy.
- G. Make provisions for controls to prevent the entry of air contaminants into the HVAC air distribution system.
- H. Steps shall be taken to ensure that the HVAC system continues to function effectively and are not damaged or contaminated during construction activities.

### 3.10 OPERATION AND MAINTENANCE MANUAL

- A. Content of Manual:
  - 1. Neatly typewritten Table of Contents for each volume arranged in systematic order as outlined in the specifications.

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## Section 23 05 00 Mechanical General Provisions

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- a. Contractor, name of responsible principal, address and telephone number.
  - b. A list of each product required to be included, indexed to content of the volume.
  - c. List with each product, name, address and telephone number of:
    - 1) Subcontractor or installer.
    - 2) Maintenance contractor as appropriate.
    - 3) Identify area of responsibility of each.
    - 4) Local source of supply for parts and replacement.
  - d. Identify each product by product name and other identifying symbols as set forth in Contract Documents.
2. Product Data:
- a. Include those sheets pertinent to the specific product.
  - b. Annotate each sheet to:
    - 1) Identify specific product or part installed.
    - 2) Identify data applicable to installation.
    - 3) Delete references to inapplicable information. (All options not supplied with equipment shall be marked out indicated in some manner.
3. Drawings:
- a. Supplement product data with drawings as necessary to illustrate:
    - 1) Relations of component parts of equipment and systems.
    - 2) Control and flow diagrams.
  - b. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
  - c. Do not use Project Record Documents as maintenance drawings.
4. Copy of each warranty, bond, and service contract issued.
- a. Provide information sheet for Owner's personnel, giving:
    - 1) Proper procedures in the event of failure
    - 2) Instances that might affect validity of warranties or bonds.
5. Shop drawings and product data as specified.
- B. Sections for Equipment and Systems:
1. Content for each unit of equipment and system as appropriate:
    - a. Description of unit and component parts.
      - 1) Function, normal operating characteristics, and limiting conditions.
      - 2) Performance curves, engineering data and tests.
      - 3) Complete nomenclature and commercial number of replaceable parts.
    - b. Operating procedures:
      - 1) Start up, break-in, routine and normal operating instructions.
      - 2) Regulation, control, stopping, shut down and emergency instructions.
      - 3) Summer and winter operating instructions.
      - 4) Special operating instructions.
    - c. Maintenance procedures:
      - 1) Routine operations
      - 2) Guide to trouble-shooting.
      - 3) Disassembly, repair and reassembly.
      - 4) Alignment, adjusting and checking.
      - 5) Routine service based on operating hours.
    - d. Servicing and lubrication schedule. List of lubricants required.
    - e. Manufacturer's printed operating and maintenance instructions.
    - f. Description of sequence of operation by control manufacturer.
    - g. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
      - 1) Predicted life of part subject to wear.
      - 2) Items recommended to be stocked as spare parts.
    - h. As installed control diagrams by controls manufacturer.
    - i. Complete equipment internal wiring diagrams.
    - j. Schedule of filters for each air handling system.
    - k. Schedule of belts for each item of equipment.
    - l. Each Contractor's coordination drawings.
    - m. As installed color coded piping diagrams.

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- n. Charts of valve tag number, with location and function of each valve.
  - o. List of original manufacturer's spare parts and recommended quantities to be maintained in storage.
  - p. Other data as required under pertinent sections of the specifications.
2. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.
  3. Additional requirements for operating and maintenance data as outlined in respective sections of specifications.
  4. Provide complete information for products specified in Division 23.
  5. Provide certificates of compliance as specified in each related section.
  6. Provide start up reports as specified in each related section.
  7. Provide signed receipts for spare parts and material.
  8. Provide training report and certificates.

**END OF SECTION**

**Section 23 05 00**  
**Mechanical General Provisions**  
Specifications

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## Section 23 31 13 Ductwork & Devices

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### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Duct construction, support and accessories. Dimensions shown on the drawings are free area dimensions. Furnish and install air distribution devices, including grilles, diffusers, registers, dampers, and extractors.
- B. Furnish and install external insulation on supply, return, exhaust and fresh air ductwork.

#### 1.02 CONTRACTOR COORDINATION

- A. Erect ducts in the general locations shown, but conform to structural and finish conditions of the building. Before fabricating any ductwork, check the physical conditions at the job site and make necessary changes in cross sections, offsets, and similar items, whether they are specifically indicated or not.
- B. Coordinate location of ductwork with structural members and Architectural drawings and requirements.
- C. Coordinate air distribution devices with work under Division 26 Electrical, to ensure that intended functions of lighting and air systems are achieved.

#### 1.03 INSULATION QUALITY

- A. All duct insulation used on the project inside the building must have a flame spread rating not exceeding 25 and a smoke developed rating not exceeding 50 as determined by test procedures ASTM E84, NFPA 255 and UL 723. These ratings must be as tested on the composite of insulation, jacket or facing, and adhesive. Components such as adhesives, mastics and cements must meet the same individual ratings as the minimum requirements and bear the UL label.
- B. Condensation on any insulated system is not approved.
- C. Replace insulation damaged by either moisture or other means. Insulation that has been wet, whether dried or not, is considered damaged. Make repairs where condensation is caused by improper installation of insulation. Also repair any damage caused by the condensation.

#### 1.04 FINISHES

- A. Paint exposed air devices with factory standard prime coat, or factory finish coat, as specified.

### PART 2 - PRODUCTS

#### 2.01 DIFFUSERS, GRILLES AND REGISTERS - Refer to Drawing Schedule.

#### 2.02 ACCEPTABLE AIR DEVICE MANUFACTURERS

- A. Titus.
- B. Krueger.
- C. Nailor Industries.
- D. Price
- E. Metalaire

#### 2.03 DUCTWORK STANDARDS AND CODES

- A. Except as otherwise indicated, sheet metal ductwork material and installation shall comply with the

## Section 23 31 13 Ductwork & Devices

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latest edition of SMACNA HVAC Duct Construction Standards. Air distribution devices (such as dampers) included in this specification shall comply with the latest applicable SMACNA Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems and NFPA 90A.

### 2.04 DUCT MATERIAL AND CONSTRUCTION

- A. Except for the special ducts specified below use lock forming quality prime galvanized steel sheets or coils up to 60" wide. Stencil each sheet with gauge and manufacturer's name. Stencil coils of sheet steel throughout on 10' centers with gauge and manufacturer's name. Provide certification of duct gauge and manufacturer for each size duct.
- B. Rectangular low pressure duct constructed of sheet metal in accordance with the latest edition of SMACNA HVAC Duct Construction Standards.
- C. Low pressure round ducts shall be shop fabricated with snap lock longitudinal seams. Ducts shall be constructed for a minimum of 2" w.g. static pressure.

### 2.05 DUCT SEALING OF SEAMS AND JOINTS

- A. Follow seal classification as indicated in Table 1-2 of SMACNA "HVAC AIR DUCT LEAKAGE TEST MANUAL". Use seal class A for 4" w.g. static. All longitudinal and transverse joints and seams shall be sealed by use of a fireproof, non-hardening, and non-migrating elastomeric sealant. With the exception of continuously welded joints and machine made spiral lock seams, joints and seams made air tight with duct sealer.

### 2.06 FLEXIBLE DUCT LOW PRESSURE

- A. Construction:
  - 1. Continuous galvanized spring steel wire helix, with reinforced metalized cover
    - a. The fabric shall be mechanically fastened to the steel helix without the use of adhesives.
  - 2. UL 181 Class I air duct label
  - 3. Reinforced vapor barrier jacket
  - 4. Rated for use at system pressure (6" wc minimum)
  - 5. Flexible duct connections from lateral taps to variable volume boxes or terminal boxes shall be rated at twice the maximum pressure rating of the medium pressure system.
- B. Fire hazard classification:
  - 1. Flame spread rating 25 maximum.
  - 2. Smoke developed rating 50 maximum.
- C. Thermal characteristics:
  - 1. R-6 BTU/hr/sq. ft./°F
  - 2. 2" wall thickness insulation with 1" overlap
- D. Acceptable manufacturers:
  - 1. Flexmaster
  - 2. Hart & Cooley
  - 3. Omniair

### 2.07 FIRE DAMPERS

- A. Fire dampers for required wall ratings that are 95% minimum free area. Provide Type B or Type C UL dampers for low, medium and high-pressure rectangular, square or round ducts. Dampers shall be activated by a fusible link designed to react at 165°F. Install per manufactures recommendations to provide a UL assembly. Provide sealed sleeve to meet desired leakage performance.
- B. Acceptable Manufacturers:
  - 1. Ruskin
  - 2. Prefco Products
  - 3. Air Balance



## Section 23 31 13 Ductwork & Devices

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4. Greenheck, Inc.
5. Nailor Industries
6. Pottoroff

### 2.08 WALL LOUVERS

- A. Refer to schedule on drawings. Coordinate with Architectural Drawings.
- B. All louver frames shall be a minimum of 0.08" extruded aluminum. All blades shall be a minimum of 0.081" extruded aluminum. Beginning point of water penetration at 0.01 oz/sq.ft.; Shall be a minimum of 800 ft/min.
- C. Provide all louvers with removable aluminum bird screen with 1/4" mesh.
- D. Acceptable manufacturers:
  1. Ruskin
  2. Arrow
  3. American Warming and Ventilation
  4. NCA

### 2.09 DUCT LINING

- A. Duct lining shall be 1" thick, 1-1/2 lb. density, flexible lining coated on the air stream side to reduce attrition. Liner shall be Schuler Lina-Coustic, Certain-Teed Ultralite, or equal meeting requirements of NFPA 90-A. Provide I.A.Q. rated liner.

### 2.10 CONTROL DAMPERS

- A. Opposed blade dampers for 2-position and modulating control. Construct frames of 13-gauge galvanized sheet metal with provisions for duct mounting. Damper blades not exceeding 8" in width, of corrugated type construction, fabricated from two sheets of 22-gauge galvanized sheet metal spot-welded together or a single 16-gauge sheet. Make bearings of nylon or oil impregnated, sintered bronze. Make shafts of 1/2" zinc plated steel. Blades shall be suitable for high velocity performance. Construct damper so that leakage does not exceed 1/2% based on 2000 fpm and 4" static pressure. Provide replaceable resilient seals along top, bottom and sides of frame and along blade edge. Submit leakage and flow characteristics data with shop drawings. Linkage shall be concealed out of the air stream within damper frame to reduce pressure drop and noise.
- B. Acceptable Model is Ruskin Model CD60 or equal by Greenheck.

### 2.11 VOLUME DAMPERS

- A. Manual balancing dampers that meet or exceed the following minimum construction standards:
  1. Frame 16-gauge
  2. Blades 16-gauge
  3. Bearings corrosion resistant
  4. Concealed linkage
  5. Opposed blade dampers
- B. Acceptable manufacturer:
  1. Ruskin Model MD-35 or equal, by
  2. Greenheck
  3. American Warming and Ventilating
  4. Nailor Industries
  5. Pottoroff

### 2.12 ACCESS DOORS

- A. Round spin-in door of galvanized steel.
  1. Fire proof sealing gaskets and quick fastening locking devices
  2. Insulated door

## Section 23 31 13 Ductwork & Devices

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3. Conform to the requirements of the NFPA
  4. Identification and use of each access door
  5. UL label to match the construction in which it is installed
  6. Cable attached to door and outer frame
  7. Low leakage Access Door
- B. Acceptable Manufacturer
1. Flex master, Inspector Series
  2. Approved Equal

### 2.13 DIFFUSER FITTINGS LOW PRESSURE TAPS

- A. Fitting shall meet or exceed the following minimum construction standards:
1. Conical with a base diameter two inches larger than the tap diameter.
  2. Construct fitting and damper of galvanized steel in accordance with ASTM A 527, G90 finish.
    - a. Fitting with a 3/16-inch high stop bead approximately 2-1/2-inches from the discharge end of the fitting
    - b. Provide the fitting with a butterfly damper, damper rod, end bearings and heavy duty locking quadrant.
    - c. Size the length of the straight section of the fitting to match the damper blade diameter. Center the damper blade in the straight section.
  3. Barrel length of at least 9 inches
  4. Fasten damper blade to a 3/8 X 3/8 continuous square rod with minimum (2) galvanized U-bolts.
  5. Support the damper rod to the fitting with airtight nylon end bushings / bearings.
  6. Provide the damper with a self-locking regulator and handle.
  7. Provide a 2" sheet metal stand-off to extend the regulator.
  8. Flex duct grip area – 2 inches behind retaining bead
  9. Flex duct retaining bead – 1 inch from end
  10. Conical length of at least 3 inches

### 2.14 AUXILIARY DRAIN PANS

- A. Galvanized steel, same gauge and same bracing or cross breaks as a duct with same dimensions. Sides of pan turned up to 1-1/2", all joints soldered watertight. Pan is to be large enough to completely cover drip lines of unit.

### 2.15 DUCTWORK INSULATION

- A. Glass fiber blanket duct insulation. Minimum density of 1.0 pcf, installed R value to be 6.0 or better at 75°F mean, facing of 0.35 mil foil reinforced with glass yarn mesh and laminated to 40 lbs. fire resistant kraft. R-value to be indicated on exterior side of insulation to be verified by City inspector. Acceptable Manufacturers: Manville R-series Microlite FSKL, Owens-Corning ED100 RKF, or Knauf 1.0 PCF FSK.

## PART 3 - EXECUTION

### 3.01 DUCTWORK INSTALLATION

- A. Use construction methods and requirements as outlined in SMACNA HVAC Duct Construction Standards as well as SMACNA Balancing and Adjusting publications, unless indicated otherwise in the specifications. Refer to details on the drawings for additional information.
- B. Reinforce ducts in accordance with recommended construction practice of SMACNA. Provide additional reinforcement of large plenums as required to prevent excessive flexing and or vibration.
- C. Cross break or bead sheet metal for rigidity, except ducts that are 12" or less in the longest dimension.
- D. Where ducts pass through walls in exposed areas, install suitable escutcheons made of sheet metal

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## Section 23 31 13 Ductwork & Devices

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angles as closers.

- E. At locations where ductwork passes through floors, provide watertight concrete curb around penetration.
- F. Support ducts where passing through floors with galvanized steel structural angles of adequate bearing surface.
- G. Metal or lined ductwork exposed to view through grilles, registers, and other openings shall be painted flat black. Do not install grilles, registers, or similar items until painting is complete.
- H. Fire Dampers shall be installed per manufacturer's recommendations to create a UL rated assembly.
- I. Install end bearing at all location where damper shaft penetrates duct wall.
- J. Clean duct to remove accumulated dust. Ducts shall be closed on ends between phases of fabrication to assure that no foreign material enters the ducts.
- K. Provide flexible glass fiber insulation with factory-applied, reinforced UL labeled Foil-Skrim-Kraft (FSK) facing on all concealed duct.
- L. Insulate standing seams and stiffeners, which protrude through the insulation with 0.6 lb. per cubic foot density, 1-1/2" thick, faced, flexible blanket insulation. Insulation shall not prevent adjustment of damper operators.
- M. Insulation shall be wrapped tightly on the ductwork with all circumferential joints butted and longitudinal joints overlapped a minimum of 2". In addition, secure insulation to the bottom of rectangular ductwork by the use of either weld pins with washers or cup-head pins welded to the ductwork or perforated based insulation hangers glued to the duct on twelve inch centers to prevent sagging of insulation.
- N. On circumferential joint, the 2" flange on the facing shall be stapled with 9/16" outward clinch steel staples on 2" centers and taped using 3" wide foil tape applied with additional adhesive. Cover all seams, joints, pin penetrations and other breaks with foil tape and glue.

### 3.02 DUCTWORK

- A. Construct rectangular ducts and round ducts in accordance with the latest SMACNA HVAC Duct Construction Standards. Use the static pressure specified on the air handling unit schedule or fan schedules as a minimum for duct construction. All ductwork between the variable volume air handling units and the terminal units shall be constructed to the medium pressure ductwork specification.
- B. Provide adjustable, galvanized splitter-dampers, pivoted at the downstream end with appropriate control device at each supply duct split.
- C. For branch ducts wider than 18", and when shown on drawings provide extractors with an appropriate control device at each rectangular zone or branch supply duct connection. Provide controllers for extractors. Branch ducts shall have a 45° angle in the direction of flow. Do not provide extractor at branch ducts to sidewall registers where the registers are within 10 feet of the main duct.
- D. Shop manufactured curved blade scoops may be used for branch duct takeoffs up to 18" wide. Taper scoop blade to the end, to prevent any sagging that may cut into, or damage duct liner if specified during operation.
  - 1. Construct shop manufactured scoops and splitter blades of galvanized sheet metal 2 full gauges heavier than equivalent sheet metal gauge of branch duct (up to 16 gauge).
  - 2. Check extractors, scoops and splitter blades thoroughly for freedom of operation. Oil bearing points before installing.
- E. Use pushrod operator with locking nut and butt hinges assembly.
- F. Provide opposed blade volume dampers with an appropriate control device in each of the following

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## Section 23 31 13 Ductwork & Devices

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locations:

1. Return air ductwork
2. Outside air branch duct
3. Exhaust branch duct

### G. Elbows

1. Rectangular: Where square elbows are shown, or are required for good airflow, provide and install single wall or airfoil turning vanes. Job fabricated turning vanes, if used, shall be single thickness vanes of galvanized steel sheets of the same gauge metal as the duct in which they are installed. Furnish vanes fabricated for the same angle as the duct offset. The use of radius elbows with a centerline radius of not less than 1-1/2 times the duct width may be provided in lieu of vaned elbows where space and air flow requirements permit.

### H. For control devices concealed by ceilings, furring, or in other inaccessible locations, furnish extension rods and appropriate recessed type Young regulators, mounted on the surface of the ceiling or the furring, unless specified, or shown otherwise. Provide with chrome plated cover plates. Use only one mitered gear set for each control device.

### I. Install streamline deflectors at any point where dividing a sheet metal duct around piping or where other such obstruction is permitted. Where such obstructions occur in insulated ducts, fill space inside streamliner and around obstructions with glass fiber insulation.

### J. Insulated Flexible Duct

1. Install in accordance with manufacturer's instructions, and the terms of its UL listing. Duct shall not exceed 6' in length. Make connections by use of sheet metal collars and stainless steel circular screw clamps. Clamps shall encircle the duct completely and be tightened with a worm gear operator to the point that will provide an airtight connection without unnecessary deformation of the duct. Provide one clamp on flexible duct and one clamp on external insulation. Vapor barrier jacket shall be tucked inside to conceal insulation material.
2. Construct bends over 45° with sheet metal elbows.

### K. Duct Supports.

1. Horizontal ducts up to 40". Support horizontal ducts up to and including 40" in their greater dimension by means of #18 U.S. gauge galvanized iron strap hangers attached to the ducts by a minimum of two locations per side by means of screws, rivets or clamps, and fastened to inserts with toggle bolts, beam clamps or other approved means. Place supports on at least 8' centers. Use clamps to fasten hangers to reinforcing on sealed ducts.
2. Horizontal ducts larger than 40". Support horizontal ducts larger than 40" in their greatest dimension by means of hanger rods bolted to angle iron trapeze hangers. Place supports on at least 8' centers in accordance with SMACNA Standards.
3. Support vertical ducts where they pass through the floor lines with 1-1/2" x 1-1/2" x 1/4" angles for ducts up to 60". Above 60", the angles shall be increased in strength and sized on an individual basis considering space requirements.
4. Supports shall be suspended from structural or by independent support. Do not support from structural bridging. Upper attachments should be selected with a safety factor of 4 or 5 times actual load conditions and subject to Engineers approval. Double wrap straps over open web of joist.

## 3.03 PLENUMS

- A. Return air plenums shall be duct board.

## 3.04 FLEXIBLE CONNECTIONS

- A. Where ducts connect to fans or air handling units that are not internally isolated, make flexible airtight connections using "Ventglas" fabric. The fabric shall be fire-resistant, waterproof and mildew resistant with a weight of approximately 30 ounces per square yard. Provide a minimum of 1/2" slack in the connections, and a minimum of 2-1/2" distance between the edges of the ducts. Also, provide a minimum of 1" slack for each inch of static pressure on the fan system. Fasten fabric to apparatus and to adjacent ductwork by means of galvanized flats or draw bands; where connections are made in outdoor locations, seal fabric to metal with mastic.

## Section 23 31 13 Ductwork & Devices

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### 3.05 ACCESS DOORS

- A. Install ductwork access doors as noted below, arranged for convenient access. Stencil each door for specific use. Install access doors in each of the following locations:
  1. Fire Dampers
  2. Outside Air Dampers
  3. Duct Mounted Coils (up-stream)
  4. Control Dampers

### 3.06 DUCT LINING

- A. Install glass fiber acoustical lining where shown on drawings. Secure to duct surfaces with Foster 85-62 / 85-60 or Childers CP-125-1 / CP-127 adhesive and sheet metal fasteners on 12" centers. Coat exposed edges and leading edges of cross-joints with adhesive.
- B. Provide metal nosing that is either channeled or "Z" profiled or are integrally formed from the duct wall securely installed over transversely oriented liner edges facing the air stream at fan discharge and at any interval of lined duct preceded by unlined duct.
- C. Refer to Insulation & Liner Detail on drawings for locations requiring liner to be installed.

### 3.07 SEALING OF SEAMS AND JOINTS

- A. Seal supply, return, exhaust and outside air duct systems.

### 3.08 SCREENS

- A. Furnish and install screens on all duct, fan, etc., openings furnished by the Contractor that lead to, or are, outdoors; screens shall be No. 16 gauge, one-half inch (1/2") mesh in removable galvanized steel frame. Provide safety screens meeting OSHA requirements for protection of maintenance personnel on all fan inlets and fan outlets to which no ductwork is connected.

### 3.09 CONNECTIONS TO LOUVERS

- A. Make watertight connections to all louvers. Ductwork behind louver shall have watertight soldered joints for a minimum of three feet and be sloped to bottom of louver. Lap duct to be over bottom louver blade where possible.
- B. Where plenums are installed on inside of louver, construct such that bottom of plenum will lap over bottom blade of louver to drain any water that may enter.

### 3.10 AUXILIARY DRAIN PANS

- A. Where coils that have a condensate drain are located above ceiling.

### 3.11 AIR DEVICE INSTALLATION

- A. Louvered diffuser outlets mount tight against the ceiling. Fasten outlets to ductwork with sheet metal screws. For perforated diffusers, attach the frame assembly by a concealed hinge assembly to an outer frame compatible with the type of ceiling on which the diffuser is installed.
- B. Install fiberglass blanket duct insulation on top of supply air grilles not fire rated.

**END OF SECTION**

**Section 23 31 13**  
**Ductwork & Devices**  
Specifications

# Section 23 60 00 HVAC Equipment

Specifications

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## PART 1 - GENERAL

### 1.01 WORK INCLUDED

- A. Furnish and install a split DX air-cooled condensing unit, fan coil unit and controls required for the air conditioning and heating system. Furnish and install copper tubing, valves, strainers and sight glass for refrigerant piping. Provide and install air conditioning condensate drains.
- B. Furnish and install exhaust fans with supplemental equipment.
- C. Provide and install electric unit heaters complete with heating element, propeller mounting brackets and other options as specified.

### 1.02 PERFORMANCE

- A. Provide air conditioning performance as scheduled on drawings, and head pressure control to enable unit to operate in temperatures as low as 20 degrees F. ambient.
- B. Provide exhaust/supply fan type, arrangement, rotation, capacity, size, motor horsepower, and motor voltage as shown. Fan capacities and characteristics are scheduled on the drawings. Provide fans capable of accommodating static pressure variations of +10% of scheduled design at the design air flow.

## PART 2 - PRODUCTS

### 2.01 ACCEPTABLE SPLIT DX AIR CONDITIONING UNIT MANUFACTURERS

- A. Carrier
- B. Trane
- C. York/JCI
- D. Rheem/Ruud

### 2.02 ACCEPTABLE FAN MANUFACTURERS

- A. Cook
- B. Greenheck
- C. Penn Barry Ventilator
- D. Acme

### 2.03 ACCEPTABLE UNIT HEATER MANUFACTURERS

- A. Modine.
- B. Reznor.
- C. Chromalox
- D. Trane.
- E. Markel

### 2.04 CONDENSING UNIT

- A. Compressor. Provide a hermetic or semi-hermetic compressor with crankcase heaters, inherently protected motors, spring mounts and capacity modulation. Provide each compressor with a 5-year

## Section 23 60 00 HVAC Equipment

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parts and labor warranty.

- B. Refrigerant. Provide refrigerant not scheduled for phase out during life of the unit.
- C. Condenser Coils. Provide copper tubes with mechanically bonded aluminum fins. Protect condenser coils with a heavy gauge, corrosion resistant wire guard.
- D. Fan and Motors. Provide propeller-type fans with direct drive or belt drive and vertical discharge. Protect fan with a heavy-gauge, corrosion resistant wire guard. Provide inherently protected, permanently lubricated, and weatherproof motors.
- E. Casing. Furnish a unit designed for outdoor mounting. Fabricate the casing of heavy gauge steel, zinc coated and finished with enamel. Provide removable access panels.
- F. Controls. Provide safety and operating controls factory wired and mounted in a separate enclosure. Include thermostatic expansion valve, high and low pressure switches and compressor motor overload devices. Furnish a time delay device to prevent short cycling. Employ a control transformer, a pressure relief device and suction and discharge valves with service connections.
- G. Thermostat. Low voltage, 7-day programmable thermostat with individual Heating/Cooling setpoints, automatic Heat/Cool change-over, On-Off-Auto fan selection, and Sub-Base Heat-Off-Cool-Auto system selection.

### 2.05 FAN COIL UNIT

- A. Fan. Provide multi-speed direct connected fan motor with built-in motor protection.
- B. Housing. Construct the unit of galvanized steel sheets, and formed members. Internally insulate the entire unit with neoprene coated, 1-1/2 lb. density glass fiber insulation, applied to internal surfaces with adhesive and weld pins. Coat exposed edges of insulation with adhesive.
- C. Filter. Provide full length tracks to support the filter. The filter cells shall be Disposal media and frame. MERV 10.
- D. Cooling Coils: Constructed of copper tubes and aluminum fins. Designed and circuited for use with direct expansion refrigeration.
- E. Electric Heater. Capacity shall be as scheduled on the drawings. Heater shall have 80% nickel, 20% chromium, open resistance coils insulated by floating ceramic bushings, and be supported in an aluminum steel frame.

### 2.06 REFRIGERANT PIPING.

- A. Furnish refrigerant piping of Type K hard drawn copper tubing with sweat-type, wrought copper fittings. Cast fittings are not permitted.
- B. Provide suitable moisture and liquid sight glass in the liquid line leaving the condenser or receiver.
- C. Provide filter dryer.

### 2.07 CONDENSATE PIPING

- A. Schedule 40 PVC pipe with draining pattern fittings. Type "L" copper with drainage pattern fittings in plenum spaces only.

### 2.08 ELASTOMERIC INSULATION

- A. Insulation material shall be 3/4" flexible, closed-cell elastomeric insulation in tubular or sheet form. Material shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E84, latest revision.



## Section 23 60 00 HVAC Equipment

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### 2.09 FANS

- A. Manufacturer's Standard. Apply to fans, motors and accessories, the manufacturer's standard prime coat and finish, except on aluminum surfaces or where special coatings are required.
- B. Motor Covers. Provide weatherproof motor covers for installations out of doors. Apply the same finish as used on the fan.
- C. Safety Disconnect Switch: Provide a factory-wired to motor, safety disconnect switch on each unit.
- D. Provide duct flanges where required for connections.

### 2.10 UNIT HEATER

- A. Casing:
  - 1. Construct casing of sheetmetal with a structural frame.
  - 2. Enamel or lacquer finish to manufacturers standard.
- B. Gas Heat Exchanger: Direct-fired primary heat exchanger tubes constructed of stainless steel.
- C. Electric Heating Elements:
  - 1. Shall bear the UL label.
  - 2. Corrosion resistant materials.
  - 3. Heating coil of 80-20 nickel-chrome wire.
- D. Automatic controls:
  - 1. Factory mounted
  - 2. Prewired to the junction box
  - 3. Unit mounted thermostats 24-volt low voltage
- E. Safety Controls:
  - 1. A primary and secondary thermal cut-off to de-energize each circuit.
  - 2. Manual reset high limit
  - 3. Automatic reset thermal protection
- F. Propeller blade fan
  - 1. Construct the fan of aluminum or other corrosion-resistant material.
  - 2. Statically and dynamically balanced
  - 3. Substantial fan guard

## PART 3 - EXECUTION

### 3.01 CONDENSING UNIT INSTALLATION

- A. Mount condensing units on pre-fabricated metal roof support system by MIRO or approved equal. Install refrigerant filter dryer and sight indicating glass.
- B. Furnish and install control wiring as required. Install control wiring in conduit.
- C. Furnish and install a thermostat with each condensing unit. Control wire shall be installed in a ½" minimum conduit between the wall and the unit.

### 3.02 FAN COIL UNIT INSTALLATION

- A. Install unit so motor connections and filters are accessible.
- B. Install unit in secondary sheet metal drain pan with welded edges and overflow float switch. Support unit in pan with 2" tall minimum sheet metal legs. Entire unit with fan coil shall be hung with 3/8" all thread rod and unistrut rails or platform mounted on a 6" raised platform constructed out of acceptable building materials. Coordinate with Architect prior to installation.

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- C. Route condensate drain from unit to nearest drain point or as shown on the drawings.
- D. Provide new set of filters at substantial completion.

### 3.03 REFRIGERANT PIPING

- A. Pipe shall be routed and sized per condensing unit manufacturer's instructions.
- B. After refrigeration and piping system items are installed, charge the system with dry nitrogen and test to 300 psig.
  - 1. Test joints with a Halide torch or an electronic leak detector.
  - 2. Repair leaks and retest each system until proved tight.
- C. After refrigerant system has been pressure-tested, connect a suitable vacuum pump and evacuate piping system, including lines and equipment.
  - 1. Maintain a vacuum as high as practicable for long enough to evaporate the moisture in the system (at least 2 hours).
  - 2. Check the humidity within the system with a wet bulb indicator, and maintain the vacuum until the wet bulb temperature is reduced to -40°F. After the system has been evacuated and dried, break the vacuum by charging proper refrigerant into the system.

### 3.04 CONDENSATE PIPE

- A. Install the system to facilitate easy removal. Use threaded plugged tee at each change of direction to permit cleaning. Install a cleanout every 50 feet of straight run piping. Maintain a positive slope on all piping
- B. Install a water seal trap leg based on the fan pressure. Size the length of the trap leg 1 inch larger than the actual system pressure.
- C. Do not install piping sized smaller than the unit drain connection size. Minimum pipe size shall be 3/4".

### 3.05 REFRIGERANT AND CONDENSATE PIPING INSULATION.

- A. Cover all pipe with elastomeric insulation by slitting tubular sections or sliding un-slit sections over the open ends of piping or tubing. Seams and butt joints shall be adhered and sealed using Foster 85-75, Childers CP-82 or Armstrong 520 Adhesive.
- B. All fittings shall be insulated with the same insulation thickness as the adjacent piping. All seams and mitered joints shall be adhered with Adhesive.
- C. Outdoor exposed piping shall be painted with two coats of either WB or SB Armaflex finish or Foster 30-64 elastomer foam coating. All seams shall be located on the lower half of the pipe.

### 3.06 EXHAUST/SUPPLY FAN

- A. Install fans according to the manufacturer's instructions and in the locations shown on the drawings.
- B. Do not operate fans or fan powered devices for any purpose until ductwork is clean, filters in place, bearings lubricated and the fan has been run under observation.
- C. Roof mounted fans shall be secured to the curb with stainless steel lag screws at a minimum of 6-inches on center. Follow manufacturer's installation instructions if they are more stringent. Install roof mounted equipment in a level position. Units shall be seated on properly sized curb. Gap between base of the fan and top of the curb shall be sealed with neoprene 1" x 1/4" gasket. Gasket shall be glued or attached with pressure sensitive adhesive.
- D. Install curbs and equipment in level position.

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- E. Ceiling mounted in-line centrifugal blowers
  - 1. Shall be suspended from structure with 3/8-inch zinc plated all-thread rods secured to structure.
  - 2. Provide sub-structure where required.
  - 3. Mount bottom of fan no more than 18-inches above the finished ceiling height.

### 3.07 UNIT HEATER

- A. Furnish units with suitable connections for mounting as shown or as otherwise approved.
- B. Provide start-up to ensure correct operation of unit.
- C. Adjust discharge louvers to control direction of air flow.

**END OF SECTION**

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### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Except as modified in this Section, General Conditions, Supplementary Conditions, applicable provisions of Division 1 General Requirements, and other provisions and requirements of the Contract Documents apply to work of Division 26 Electrical.
- B. Applicable provisions of this section apply to all sections of Division 26, Electrical.

#### 1.02 CODE REQUIREMENTS AND FEES

- A. Electrical work shall comply with applicable inspection services:
  - 1. Underwriters Laboratories,
  - 2. National Fire Protection Association,
  - 3. State Health Department,
  - 4. Local Municipal Building Inspection Department adopted codes with amendments,
  - 5. National Electrical Code with local amendments.
- B. Resolve any code violations discovered in contract documents with the Engineer prior to award of the contract.
- C. Obtain all permits required & pay all fees for such permits.

#### 1.03 CONTRACTOR'S QUALIFICATIONS

- A. An approved contractor for the work under this division shall be:
  - 1. A specialist in this field and have the personnel, experience, training, and skill, and the organization to provide a practical working system.
  - 2. Able to furnish evidence of having contracted for and installed not less than three (3) systems of comparable size and type that have served their Owners satisfactorily for no less than three (3) years.

#### 1.04 WORKMANSHIP

- A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.
- B. Perform work by persons qualified to produce workmanship of specified quality.
- C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking. Under no conditions shall material or equipment be suspended from structural bridging.
- D. Provide finishes to match approved samples; all exposed finishes shall be approved by the Architect / Engineer. Submit color samples as required.

#### 1.05 MANUFACTURER'S INSTRUCTIONS

- A. Comply with instructions in full detail, including each step in sequence.
- B. Should instruction conflict with Contract Documents, request clarification from Architect / Engineer before proceeding.

#### 1.06 MANUFACTURER'S FIELD SERVICES

- A. When required in individual Specification Sections, manufacturer shall provide a manufacturer's qualified personnel to observe:
  - 1. Field conditions.
  - 2. Condition of installation.

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3. Quality of workmanship.
4. Start-up of equipment.
5. Testing and adjusting of equipment.

- B. Manufacturer's qualified personnel shall make written report of observations and recommendations to Architect/Engineer.

### 1.07 CONTRACT DRAWINGS

- A. Contract drawings are diagrammatic only and do not give fully dimensioned locations of various elements of work. Determine exact locations from field measurements.
- B. Every effort has been made by the Engineer to indicate wiring of all receptacles, light fixtures, switches, telephone outlets, HVAC equipment, other equipment, elevator equipment, and all other devices / appliances requiring electrical power. It is the intent of the Engineer that all light fixtures be powered and controlled unless specifically noted on the plans; that all wiring devices (receptacles and direct connected equipment) be circuited to a power source of the correct voltage, unless specifically noted on the drawings; and that all HVAC, elevator equipment and other equipment be properly wired to the correct voltage power source; that all communications and security systems devices and equipment and all fire alarm system devices and equipment are installed, wired and systems are fully operational.
- C. It is the responsibility of the Contractor to review the architectural drawings (reflected ceiling plans) for light fixtures, casework elevation details for electrical devices which are not indicated on the electrical drawings; to review the mechanical and plumbing documents and other consultant equipment drawings to determine the electrical rough-ins for all equipment requiring power connections, and to include in their proposals the correct and complete electrical rough-ins for all of these items which were inadvertently not indicated on the electrical drawings, OR the Contractor shall specifically enumerate each item requiring electrical rough-in which is not specifically shown on the electrical drawings, and indicate the electrical provisions of these items as specifically excluded from his proposal.

### 1.08 PROJECT RECORD DOCUMENTS

- A. Maintain at the job site a separate set of white prints (black line) of the contract drawings for the sole purpose of recording the "as-built" changes and diagrams of those portions of work in which actual construction is significantly at variance with the contract drawings. Mark the drawings with a colored pencil. Prepare, as the work progresses and upon completion of work, reproducible drawings clearly indicating locations of various major and minor feeders, equipment, and other pertinent items, as installed. Record underground and under slab service and feeders installed, dimensioning exact location and elevation of such installations.

### 1.09 SPACE REQUIREMENTS

- A. Consider space limitations imposed by contiguous work in selection and location of equipment and material. Do not provide equipment or material that is not suitable in this respect.

### 1.10 RELATION WITH OTHER TRADES

- A. Carefully study all matters and conditions concerning the project. Submit notification of conflict in ample time to prevent unwarranted changes in any work. Review other Divisions of these specifications to determine their requirements.
- B. Provide sleeves and inserts in forms as required for the work. Stub up and protect open ends of pipe before any concrete is placed. Furnish sizes of required equipment pads. Furnish and locate bolts and fittings required to be cast in them. Locate and size openings required for installation of work specified in this Division in sufficient time to prevent delay in the work.

### 1.11 CONCEALED AND EXPOSED WORK

- A. When the word "concealed" is defined as hidden from sight as in chases, furred spaces or above ceilings. "Exposed" is defined as open to view, in plain sight.

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### 1.12 GUARANTEE

- A. Guarantee work for one (1) year from the date of substantial completion of the project. During that period make good any faults or imperfections that may arise due to defects or omissions in material, equipment or workmanship. At the Owner's option, replacement of failed parts or equipment shall be provided.

### 1.13 MATERIAL AND EQUIPMENT

- A. Furnish new and unused materials and equipment meeting the requirements of the paragraph specifying acceptable manufacturers. Where two (2) or more units of the same type or class of equipment are required, provide units of a single manufacturer.

### 1.14 NOISE AND VIBRATION

- A. Select equipment to operate with minimum noise and vibration. If noise or vibration is produced or transmitted to or through the building structure by equipment, piping, ducts or other parts of work, and judged objectionable by the Owner, Architect, or Engineer, rectify such conditions at no additional cost to the Owner. If the item of equipment is judged to produce objectionable noise or vibration, demonstrate at no additional cost that equipment performs within designated limits on a vibration chart.

### 1.15 ACCEPTABLE MANUFACTURERS

- A. Manufacturers names and catalog number specified under sections of Division 26 are used to establish standards of design, performance, quality and serviceability and not to limit competition. Equipment of similar design, materials, energy efficiency characteristics (where applicable) and lighting performance characteristics (where applicable) equal to that specified, manufactured by a named manufacturer shall be acceptable on approval. A request for prior approval of equipment not listed must be submitted seven (7) days before bid due date. Submit a marked-up set of the relevant specification section indicating all variances, a comparison to the specified product, and of construction and performance criteria, complete design and performance data for the specified product and the proposed substitution for comparison to the Engineer. The Architect issues approvals of acceptable manufacturers as addenda to the Construction Documents.

### 1.16 UTILITIES, LOCATIONS AND ELEVATIONS

- A. Examine the site and verify the location and elevation of all utilities and of their relation to the work. Existing utilities indicated on the site plans are for reference only and shall be field verified by the Contractor with the respective public or private utility.

### 1.17 WARRANTIES

- A. Submit three (3) copies of all warranties and guarantees for systems, equipment, devices and materials. These shall be included in the Operating and Maintenance Manuals.

### 1.18 BUILDING CONSTRUCTION

- A. It shall be the responsibility of the sub-contractor to consult the Contract Drawings, details and specifications and thoroughly familiarize himself as to the construction and all job related requirements. All construction trades shall cooperate with the General Contractor / Construction Manager job site superintendent and lay out work so that all raceways and other items are placed in the walls, furred spaces, chases, etc., so that there shall be no delay in the job.

### 1.19 TEMPORARY FACILITIES

- A. General: Refer to Division 1 for general requirements on temporary facilities.
- B. Temporary Wiring: Temporary power and lighting for construction purposes shall be provided under this Division. Installation of temporary power shall be in accordance with NEC Article 527.

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- C. Temporary facilities, wire, lights, and devices are the property of this Contractor and shall be removed by this Contractor at the completion of the Contract.
- D. Provide a minimum 30-space panelboard with required branch circuit breakers as required and all associated temporary wiring as required. Remove all temporary power prior to substantial completion.

### 1.20 ELECTRICAL OPERATION AND MAINTENANCE MANUAL

- A. Content of Manual:
  - 1. Neatly typewritten Table of Contents for each volume arranged in systematic order as outlined in the specifications.
    - a. Contractor, name of responsible principal, address and telephone number
    - b. A list of each product required to be included, indexed to content of the volume.
    - c. List with each product, name, address and telephone number of:
      - 1) Subcontractor or installer
      - 2) Maintenance contractor as appropriate
      - 3) Identify area of responsibility of each.
      - 4) Local source of supply for parts and replacement
    - d. Identify each product-by-product name and other identifying symbols as set forth in Contract Documents.
  - 2. Product Data:
    - a. Include those sheets pertinent to the specific product.
    - b. Annotate each sheet to:
      - 1) Identify specific product or part installed.
      - 2) Identify data applicable to installation.
      - 3) Delete references to inapplicable information.
  - 3. Drawings:
    - a. Supplement product data with drawings as necessary to illustrate:
      - 1) Relations of component parts of equipment and systems
      - 2) Control and flow diagrams
    - b. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
    - c. Do not use Project Record Documents as maintenance drawings.
  - 4. Written text as required to supplement product data for the particular installation.
  - 5. Copy of each warranty, bond and service contract issued
    - a. Provide information sheet for Owner's personnel, giving:
      - 1) Proper procedures in event of failure
      - 2) Instances that might affect validity of warranties or bonds
  - 6. Shop drawings and product data as specified.
- B. Sections for Equipment and Systems:
  - 1. Content for each unit of equipment and system as appropriate:
    - a. Description of unit and component parts:
    - b. Operating procedures:
      - 1) Start up, break-in, routine / normal operating instructions
      - 2) Regulation, control, stopping, shut down and emergency instructions
      - 3) Summer and winter operating instructions
      - 4) Special operating instructions
    - c. Maintenance procedures:
      - 1) Routine operations
      - 2) Guide to trouble-shooting
      - 3) Disassembly, repair and reassembly
      - 4) Alignment, adjusting and checking
      - 5) Routine service based on operating hours
    - d. Servicing and lubrication schedule
      - 1) List of lubricants required
    - e. Manufacturer's printed operating and maintenance instructions.
    - f. Copies of typed circuit directories of panel board to reflect actual room graphics numbers and room names (not architectural room numbers from the drawings).
      - 1) Electrical

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- 2) Controls
  - 3) Communications
  - g. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
    - 1) Predicted life of part subject to wear
    - 2) Items recommended to be stocked as spare parts
  - h. Schedule of fuses
  - i. Complete equipment field accessible internal wiring diagrams
  - j. Schedule of lamps
  - k. Schedule of ballasts
  - l. Each Contractor's coordination drawings
    - 1) As installed color coded piping diagrams.
  - m. List of original manufacturer's spare parts and recommended quantities to be maintained in storage
  - n. Other data as required under pertinent sections of the specifications
2. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.
  3. Additional requirements for operating and maintenance data as outlined in respective sections of specifications
  4. Provide complete information for products specified in Division 16.
  5. Provide certificates of compliance as specified in each related section.
  6. Provide start up reports as specified in each related section.
  7. Provide signed receipts for spare parts and material.
  8. Provide training report and certificates.

### 1.21 SHOP DRAWINGS AND PRODUCT DATA

- A. Submittals shall not be combined or bound together with any other material submittal.
- B. Submittal Specification Information:
  1. Every submittal document shall bear the following information as used in the project manual:
    - a. The related specification section number
    - b. The exact specification section title
  2. Submittals delivered to the Architect / Engineer without the specified information will not be processed. The Contractor shall bear the risk of all delays, as if no submittal had been delivered.
- C. Submit individually bound shop drawings and product data for the following when specified or provided:
  1. Electrical cable trays
  2. Enclosed Switches and Circuit Breakers
  3. Enclosed Motor Controllers
  4. Panelboards and enclosures
  5. Wiring devices
  6. Transformers
  7. Busway
  8. Switchboards
  9. Sports Lighting Equipment, Fixtures, Poles, Ballast and Lamps
  10. Lighting fixtures, ballasts and lamps
  11. Site Lighting Poles, Fixtures, Ballast and Lamps
  12. Architectural Dimming Systems
  13. Theatrical Lighting Systems
  14. Lightning protection system
  15. Emergency/Standby generator sets and transfer switches
  16. Motor control centers
  17. Electrical controls and time switches
  18. Surge Protection Devices
  19. Electrical Contactors
  20. Lighting Controls and Occupancy Sensors
  21. Surface Raceways
  22. Medium Voltage Cable and Connectors

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### 23. Fire Rated Cables and Connectors

- D. Mark up a complete copy of the specification section for the product to indicate a) acknowledgement of the specification requirement (Comply), or b) acknowledgement that the particular specification requirement does not apply to this specific project (Not Applicable) or, c) acknowledgement that the specification requirement cannot be made or that a variance is being submitted for review to the Architect/Engineer/Owner (Does Not Comply, Explanation:) Do not submit an outline form of compliance, submit a complete copy with the product data.

## PART 2 - PRODUCTS – (Not Used)

## PART 3 - EXECUTION

### 3.01 EARTHWORK

- A. Excavate trenches for underground raceways to the required depth to ensure minimum coverage.
- B. Backfill shall not be placed until the work has been inspected, tested, and approved. Complete backfill to the surface of natural ground or to the lines and grades shown on drawings. Except where special materials are required by other Divisions, use stabilized sand to six inches above conduits, continue backfill with select fill material. Do not use peat, silt, muck, debris or other organic materials. Deposit backfill in uniform layers and compact each layer as specified in other Divisions.

### 3.02 IDENTIFICATION OF EQUIPMENT

- A. Identification of Equipment:
1. All major equipment shall have a manufacturer's label identifying the manufacturer's address, equipment model and serial numbers, equipment size, and other pertinent data. Take care not to obliterate this nameplate. The legend on all nameplates or tags shall correspond to the identification shown on the Operating Instructions.
  2. Three layer laminated plastic engraved identifying nameplate shall be permanently secured to each switchboard, distribution panel, motor control center, transformer, panelboard, safety disconnect switch, enclosed circuit breaker, wireway, busduct plug, terminal cabinet, surge protective device, capacitor, individual motor controller, contactor, fire alarm panels (main and remote booster), and communications (voice, data, video) cabinet or rack and rooftop equipment (ie: supply and exhaust fans, rooftop HVAC equipment) with stainless steel screws.
    - a. Utility Power: White letters on black background
    - b. Identifying nameplates shall have ½-inch high, engraved letters for equipment designation and ¼-inch letters indicating source circuit designation, (i.e., "PANEL HA –served from MDP-6 located in Mech. Rm. 100").
    - c. Each switchboard and distribution panel shall have a nameplate showing the load and location of load served in ¼-inch high, engraved letters. Circuit breaker name and kirk key if applicable.
    - d. Each section of multiple section panelboards shall also indicate panelboard section number (i.e., Panel "HA-Section 2 – served from MDP-6 located in Mech. Rm. 100")
    - e. Enclosed switches, starters, circuit breakers and contactors: Provide neatly typed label inside each motor starter and contactor enclosure door identifying motor or load served, nameplate horsepower, full load amperes, code letter, service factor, and voltage / phase rating. Provide Phenolic nameplate on cover exterior to indicate motor or load served, location of load served, panel(s) and circuit(s) serving load(s), description and location of control controlling contactor (i.e., contactor controlled by switch in Room A107.), and panel and circuit feeding line side of control transformer. Example of label for lighting / receptacle contactor:  
Lighting Contactor  
Panel HA 2,4,6  
Control circuit – Panel HA 2,4  
Location – West parking Lot Pole Lights  
Switched – BMCS

## Section 26 05 00 Electrical General Provisions

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3. Cardholders and directory cards shall be furnished for circuit identification in panelboards. Cardholder shall be located on inside of panel door and shall be in a metal frame with clear plastic front. Circuit lists shall be typewritten. Circuit descriptions shall include explicit description and identification of items controlled by each individual breaker, including final graphics room number or name designation and name of each item served. If no building appointed room number or name is given, list locations per the following examples – A. Storage in Rm 100 – B. Office in Rm 100 – C. Storage west of Rm. 100. List corridors as “corridors.” Identify circuits controlled by contactors using a separate notation for each contactor used. List notation at bottom of schedule stating the circuits are controlled by a contactor, list exact location of contactor, and how switched. Do not use architectural room number designation shown on plans. Obtain final graphics room number identification from Architect’s final room number graphics plan. All locations served by breakers shall be listed on schedule. Panel schedule shall be large enough to contain all information required. Also refer to Section 26 24 16.
  4. Permanent, waterproof, black markers shall be used to identify each lighting and power grid junction box, gutter and wireway. Clearly indicate the panel and branch circuit numbers available at that junction box, gutter or wireway. Where low voltage relay panels are used for lighting control, identify the low voltage relay panel and number in addition to the branch circuit panel and number.
  5. Pull Boxes, Transformers, Disconnect Switches, etc.: Field work each with a name plate showing identity, voltage and phase and identifying equipment connected to it. The transformer rating shall be shown on the panels or enclosures. For an enclosure containing a motor starter, the nameplate shall include the Owner’s motor number, motor voltage, number of motor phases, motor load being serviced, motor horsepower, and motor full load current. Nameplates shall also indicate where panel is fed from.
- B. Prohibited Markings: Markings intended to identify the manufacturer, vendor, or other source from whom the material has been obtained are prohibited for installation in public, tenant, or common areas within the project. Also prohibited are materials or devices that bear evidence that markings or insignias have been removed. Certification, testing (e.g., Underwriters Laboratories), and approval labels are exceptions to this requirement.
- C. Warning Signs: Provide warning signs where there is hazardous exposure associated with access to or operation of electrical facilities. Provide text of sufficient size to convey adequate information at each location; mount permanently in an appropriate and effective location. Comply with industry standards for color and design.
- D. Wire and Cable Markers: Provide vinyl cloth markers with split sleeve or tubing type, except in manholes provide stainless steel with plastic ties.
- E. Wire and Cable Labeling: Provide wire markers on each conductor in all boxes, pull boxes, gutters, wireways, contactors, and motor controllers and load connection. Identify with panelboard / switchboard branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on equipment manufacturer’s shop drawings for control wiring.
- F. Underground Warning Tape: Thomas and Betts or approved equal. Six-inch-wide plastic tape, colored red or orange with suitable warning legend describing buried electrical lines; telephone lines and data lines. All underground electrical conduits shall be so identified. Tape shall be buried at a depth of six (6) inches below grade and directly above conduits or ductbanks. Provide magnetic marking tape below all underground electrical conduits.
- 3.03 CUTTING AND PATCHING
- A. General: Comply with the requirements of Division 1 for the cutting and patching of other work to accommodate the installation of electrical work. Except as authorized by the Architect / Engineer, cutting and patching of electrical work to accommodate the installation of other work is not permitted.
- 3.04 INSTRUCTION OF OWNER'S PERSONNEL

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- A. Prior to substantial completion, conduct an on-site training program to instruct Owner's operating personnel in the operation and maintenance of the electrical systems.
  - 1. Provide the training during regular working day.
  - 2. The Instructors shall be experienced in their phase of operation and maintenance of the electrical systems and with the project.
- B. Use operation and maintenance manuals as the basis of instruction. Review manual with personnel in detail. Explain all aspects of operation and maintenance.
- C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shut down of each item of equipment.
- D. Demonstrate equipment functions (both individually and as part of the total integrated system).
- E. Prepare and insert additional data in the operating and maintenance manuals when the need for additional data becomes apparent during instructions.
- F. Submit a report within one week after completion of training. List time and date of each demonstration, time devoted to the demonstration, and a list of people present.
- G. At the conclusion of the on-site training program, have the person designated by the Owner sign a certificate to certify that he / she has a proper understanding of the system, that the demonstrations and instructions have been satisfactorily completed, and the scope and content of the operating and maintenance manuals used for the training program are satisfactory.
- H. Provide a copy of the report and the certificate in an appropriately tabbed section of each Operating and Maintenance Manual.

### 3.05 OPENINGS

- A. Framed, cast or masonry openings for boxes, equipment or conduits are specified under other divisions. Drawings and layout work for exact size and location of all openings are included under this division.

### 3.06 HOUSEKEEPING PADS

- A. Provide concrete equipment housekeeping pads under all floor and outdoor mounted electrical equipment.
- B. Concrete and reinforcing steel shall be as specified in Division 3, or as indicated or noted.
- C. Concrete pads:
  - 1. Six-inch thick minimum indoors; eight-inch thick minimum outdoors, or thicker if indicated on the drawings or in other sections of the specifications.
  - 2. Chamfer strips at edges and corner of forms.
  - 3. Smooth steel trowel finish.
  - 4. Extend 3-inches minimum indoors beyond perimeter of equipment unless otherwise shown.
  - 5. 6-inch x 6-inch #8 wire reinforcement mesh.

### 3.07 OBSTRUCTIONS

- A. The drawings indicate certain information pertaining to surface and subsurface obstructions, which has been taken from available drawings. Such information is not guaranteed, however, as to accuracy of location or complete information.
  - 1. Before any cutting or trenching operations are begun, verify with Owner's representative, utility companies, municipalities, and other interested parties that all available information has been provided.
  - 2. Should obstruction be encountered, whether shown or not, alter routing of new work, reroute existing lines, remove obstruction where permitted, or otherwise perform whatever

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work is necessary to satisfy the purpose of the new work and leave existing services and structures in a satisfactory and serviceable condition.

### 3.08 VANDAL RESISTANT DEVICES

- A. Where vandal resistant screws or bolts are employed on the project, deliver to the Owner 2 suitable tools for use with each type of fastener used, and 25 percent spare fasteners.
- B. Proof of delivery of these items to the Owner shall be included in the Operating and Maintenance Manuals.

### 3.09 PROTECTION

- A. Protect work, equipment, fixtures, and materials per the manufacturer's requirements. At work completion, work must be clean and in original manufacturer's condition.
- B. Do not deliver equipment to this project site until progress of construction has reached the stage where equipment is actually needed or until building is closed in enough to protect the equipment from weather. Equipment allowed to stand in the weather shall be rejected, and the contractor is obligated to furnish new equipment of a like kind at no additional cost to the Owner.

### 3.10 EQUIPMENT BACKBOARDS

- A. Backboards:  $\frac{3}{4}$  inch, fire retardant, exterior grade plywood, painted gray, both sides.
  - 1. Provide minimum of two 4 ft. by 8 ft. sheets of plywood for each new telephone equipment terminal location.
  - 2. Provide minimum of two 4 ft. by 4 ft. sheets of plywood for each new data / voice / video / communications equipment location / cable TV head end equipment, or security equipment location.

### 3.11 TESTING

- A. The contract will not be declared to be substantially complete until the functional operation of the subsystems have been demonstrated and verified and reports have been provided, reviewed and accepted.
- B. The project will not be declared substantially complete until the following has taken place.
  - 1. The "As-Built" drawings have been submitted, reviewed and accepted by the Architect / Owner / Owner's Construction Representative.
  - 2. The various systems and building emergency lighting system have been commissioned and accepted.
    - a. Building Fire Alarm System
    - b. Building Emergency Lighting System
    - c. Surge Protective Device Equipment

### 3.12 LOAD BALANCING

- A. Balance load on all phases in each panel to within 10% of respective phase loads.

**END OF SECTION**

**Section 26 05 00**  
**Electrical General Provisions**  
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# Section 26 05 10 Utility Coordination & Service Entrance

Specifications

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## PART 1 – GENERAL

### 1.01 WORK INCLUDED

- A. General: Electrical service shall be provided by local utility company. Provide infrastructure, conduit, ductbanks and pathways from public street right-of-way to building for telecommunications and cable service.
- B. Power Company Data: Obtain from utility company information and installation standards for electrical, telecommunication, and cableservice installation.
- C. Responsibilities: Determine what equipment and labor is provided by utility company and what equipment and labor is required of this Contractor.

## PART 2 – PRODUCTS

### 2.01 GENERAL

- A. Service Data: Ensure that utility company service data is accurate and verified.

### 2.02 PRIMARY SERVICE

- A. General: Division 26 shall provide primary service conduit, manholes, and pull boxes as required and as specified for electrical service. Division 26 shall provide grounding rods, grounding conductors, sleeves, conduits, pull boxes and manholes as required by telecommunications and cable service providers.
- B. Electric utility company shall provide primary cables, splices, terminations, and primary underground and overhead service conductors. Telecommunications and cable service utility companies shall provide cabling and connections to the Owner's demarcation point of service.

### 2.03 SECONDARY SERVICE CABLE TAP BOXES

- A. General: Division 26 shall provide secondary service cable tap boxes as approved by the utility company. Where required or specified, enclosure shall be constructed of NEMA 3R construction.

### 2.04 SECONDARY SERVICE CONDUCTORS

- A. General: Division 26 shall provide secondary service entrance conductors and conduit.

## PART 3 – EXECUTION

### 3.01 INSTALLATION

- A. Standards: The installation of the service entrance provisions shall comply with the published standards and requirements of the utility company, the utility company's specific construction requirements for this project, and with requirements of this Division.
- B. Correction: Any failure to meet the standards and requirements shall be corrected to the satisfaction of the utility company and Owner without any additional cost to the Owner.
- C. Contractor shall provide all construction materials and labor that the utility company determines to be the responsibility of the customer, at no additional cost to the Owner.
- D. The materials and labor required by the for a complete installation shall be provided by the contractor and includes, but is not limited to permanent or removable / lockable vehicular barriers, grounding rods, grounding conductors, sleeves, concrete pads, conduits, metering racks and metering enclosures.
- E. Primary distribution poles and service entrance ductbank locations shall be staked and surveyed

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prior to pole installation by the Contractor to verify their proper placement is within the Owner's property and respective utility easements. Contractor shall verify by survey that the pole and service entrance ductbank location and easements do not interfere with existing easements, right-of-ways, or other restricted properties. Conflicts with existing easements and restrictions shall be brought to the attention of the Architect prior to construction.

- F. Contractor shall initiate contact with the utility providers and Owner within 14 days of Notice to Proceed to ensure permanent power will be available to the site. Any delays resulting from lack of this coordination shall be the responsibility of the Contractor.

**END OF SECTION**



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**Utility Coordination & Service Entrance**  
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## Section 26 05 18 Dwelling Unit Cables, Connectors, & Wall Boxes

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### PART 1 - GENERAL

#### 1.01 WORK INCLUDED

- A. Provide electrical boxes, cables, and connector work as shown, required, and specified.
- B. Conductors and connectors required for the dwelling units include the following:
  - 1. 600V copper non-metallic NM and NMC cables.
  - 2. 600V aluminum or copper service entrance rated SE and USE cables.
  - 3. 600V compression connectors.
- C. Outlet and switch boxes required for the project include the following:
  - 1. Non-metallic PVC or thermoplastic
  - 2. Metallic
- D. Application: The applications for boxes, conductors and connectors required on the project are as follows:
  - 1. Power distribution circuitry within residential dwelling units in walls and spaces not shared with common areas or areas not classified as a dwelling unit.
  - 2. Lighting branch circuitry
  - 3. Appliance, receptacle, and equipment branch circuitry
  - 4. Motor branch circuitry
  - 5. Other line voltage circuits
- E. In walls shared with non-dwelling unit spaces, boxes shall be metallic and MC cable shall be used or conductors shall be in metallic conduit or MC as permitted by the NEC. Refer to other specification sections.
- F. Refer to other specification sections for wiring in common for voice, audio, video, data, alarm and instrumentation cables.

#### 1.02 QUALITY ASSURANCE

- A. UL Label: Cables, connectors, boxes, and accessories shall be listed and approved for their intended use.

### PART 2 - PRODUCTS

#### 2.01 CONDUCTORS AND CONNECTORS

- A. General: Except as indicated, provide conductors and connectors of manufacturer's standard materials, as indicated by published product information, designed and constructed as instructed by the manufacturer, and as required for the installation.
- B. Conductors: Provide factory-fabricated conductors of the size, rating, material, and type as indicated for each use. Conductors shall be soft or annealed copper wires meeting, before stranding, the requirements of ASTM B 3, Standard Specification for Soft or Annealed Copper Wire for Electrical Purposes, latest edition.
  - 1. Conductors sized #14 AWG through #10 AWG shall be solid or stranded.
  - 2. Conductors size AWG #8 and larger shall be stranded. Stranding shall be Class B meeting the requirements of ASTM B 8, Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium Hard, or Soft.
  - 3. Where authorized in writing by the Owner and Architect and not prohibited by local codes or the Authority Having Jurisdiction (AHJ), aluminum compact stranded AL SE or USE cable may be substituted at Contractor's discretion only for service entrance conductors. Aluminum conductors shall not be used for grounding or for branch circuits or any equipment terminations. Aluminum conductor size shall meet or exceed the equivalent ampacity for the specified copper conductor using dwelling ampacities for both types of conductors.

## Section 26 05 18 Dwelling Unit Cables, Connectors, & Wall Boxes

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- C. Insulation for standard building conductors: Insulation shall meet or exceed the requirements of UL 83, Standard for Thermoplastic Insulated Wires.
  - 1. All wiring inside lighting fixtures shall be temperature rated per NEC.
  - 2. Insulation for copper conductors shall be UL Type THHN/THWN, 90 degrees C.
  - 3. Insulation for aluminum SE conductors shall be UL Type XHHW-2, 90 degrees C.
- D. Color coding for conductors as required by NEC. Color coding for phase and voltage shall be as required by local codes and local standards.

### 2.02 BOXES AND FITTINGS

- A. Interior Outlet Boxes: Provide PVC or thermoplastic outlet wiring boxes, of the type, shape, and size, including depth of box, to suit respective locations and installation. Provide gang boxes where devices are shown grouped. Single box design; sectional boxes are not acceptable.
  - 1. Type of Various Locations:
    - a. Technology, data, voice, video and multi-media outlet boxes: minimum 4-inch square (2-gang), 3-inch deep.
    - b. Security, access control, and video surveillance outlet boxes: single gang outlet boxes mounted long axis vertically, 3-inch deep.
    - c. All other applications: minimum 4-inch square (2-gang) 3-inch deep boxes.
    - d. Surface: Type FS or FD box with surface cover.
    - e. Special: Where above types are not suitable, boxes as required, taking into account space available, appearance, and code requirements.
  - 2. Interior Outlet Box Accessories: Outlet box accessories required as for installation, including covers or wall device plates, mounting brackets, wallboard hangers, extension rings, plaster rings for boxes in plaster construction, fixture studs, cable clamps and metal straps or bar hangers for supporting outlet boxes. Accessories shall be compatible with outlet boxes used and meet requirements of individual wiring.
- B. Damp or wet location outlet and switch boxes: Deep type, cast-metal weatherproof outlet wiring boxes, of type, shape, and size required. Include depth of box, threaded conduit ends, and stainless-steel cover plate with spring-hinged waterproof caps suitable for application. Include faceplate gasket.
- C. Junction and Pull Boxes: Galvanized sheet steel junction and pull boxes, with screw-on covers, of type, shape, and size, to suit respective location and installation.
  - 1. Type for Various Locations:
    - a. Minimum Size: 4-inch square, 2-1/8-inches deep.
    - b. 150 Cubic Inches in Volume or Larger: Code gauge steel with sides formed and welded, screw covers unless shown or required to have hinged doors. All boxes mounted above ceiling shall have screw covers. Boxes in all other areas with covers larger than 12-inches shall have hinged with screw covers. Knockouts factory stamped or formed in field with a cutting tool to provide a clean symmetrically cut hole.
    - c. Exterior or Wet Areas: 304 stainless steel NEMA 4X construction with gaskets and corrosion-resistant fasteners
- D. Conduit Bodies: Provide galvanized cast-metal conduit bodies, of type, shape, and size, to suit location and installation. Construct with threaded conduit ends, removable cover, and corrosion-resistant screws.
- E. Bushings, Knockout Closures, and Locknuts: Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts, and insulated conduit bushings of type and size to suit use and installation.
- F. Outlet boxes in fire rated walls: Provide 2-hour rated gasket within box and below cover, equal to Rectorseal Metacaulk box guard and cover guard.

### PART 3 - EXECUTION

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## Section 26 05 18 Dwelling Unit Cables, Connectors, & Wall Boxes

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### 3.01 CABLE AND CONDUCTOR INSTALLATION

- A. General: Install electrical cable and conductors and connectors as shown, in accordance with the manufacturer's written instructions, the requirements of NEC, the NECA Standard of Installation, and industry practices.
- B. Coordination: Coordinate conductor installation work with electrical raceway and equipment installation work, as necessary for interface.
- C. Cables:
1. Provide a grounded (neutral) conductor for each branch circuit. Do not share grounded (neutral) conductors.
  2. Run service entrance cables their entire length in continuous section without joints or splices.
  3. No wire smaller than #14 AWG shall be permitted for any 15 Amp circuit. No wire smaller than #12 AWG shall be used for any 20 Amp circuit.
  4. Provide the same size wire from the load center to last outlet on circuit.
  5. Branch circuit voltage drop shall not exceed 3% of rated voltage.
  6. No tap or splice shall be made in any conductor except in outlet boxes, switch boxes, pull boxes, junction boxes, splice boxes. Those boxes shall be in an accessible location. Make taps and splices using an approved connector. Insulate taps and splices equal to the adjoining conductor. Make splices or taps only on conductors that are a component part of a single circuit, protected by approved methods. Taps or splices in feed through branch circuits for connection to light switches or receptacles shall be made by pigtail connection to the device.
  7. Support cables to building structure framing as required by NEC.
  8. Do not permit conductors entering or leaving a junction or pull box to deflect to create pressure on the conductor insulation.
  9. Make joints in branch circuits only where circuits divide. These shall consist of one through circuit to which the branch from the circuit shall be spliced.
  10. Make connections in conductors up to a maximum of one #6 AWG wire with two #8 AWG wires using twist-on pressure connectors of required size.
  11. Make connections in conductors or combinations of conductors larger than specified using cable fittings of type and size required for specific duty.
  12. After a splice is made, insulate entire assembly with UL-approved insulating tape to a value equivalent to the adjacent insulation.
  13. Make splices and connections in control circuit conductors using UL-approved solderless crimp connectors.
  14. All cables shall include a grounding conductor.
  15. Neatly train and lace wiring inside boxes, equipment, and load centers.
  16. Clean conductor surfaces before installing lugs and connectors.
  17. Make splices, taps and terminations to carry full ampacity of conductors with no perceptible temperature rise.
  18. Provide stranded conductors connected with pressure type connectors / compression fittings and terminal lugs UL listed for the type of conductor used (AL-CU) and correctly sized to the diameter of the bare conductors.
  19. Run mains and feeders their entire length in continuous pieces without splices or joints.
  20. Color code conductors.
  21. Conductors shall be the same color from load side of overcurrent protection device to outlet or utilization equipment.
  22. Spare cables or conductors shall not be installed in any conduit, gutter, raceway, panel, load center, or enclosure unless noted otherwise.
- D. Splices and Joints:
1. In accordance with UL 486A, C, D, E, and NEC.
  2. Aboveground Circuits (No. 6 AWG and smaller):
    - a. Connectors: Solderless, screw-on, reusable pressure cable type, rated 600 V, 220° F, with integral insulation, approved for copper and aluminum conductors.
    - b. The integral insulator shall have a skirt to completely cover the stripped wires.
    - c. The number, size, and combination of conductors, as listed on the manufacturers' packaging, shall be strictly followed.

## Section 26 05 18 Dwelling Unit Cables, Connectors, & Wall Boxes

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- E. Above ground Circuits No. 4 AWG and larger:
  - 1. Connectors shall be indent, hex screw, or bolt clamp type of high conductivity and corrosion resistant material, listed for use with copper and aluminum conductors.
  - 2. Provide field-installed compression connectors for cable sizes 250 kcmil and larger with not less than two clamping elements or compression indents per wire.
  - 3. Insulate splices and joints with materials approved for the particular use, location, voltage, and temperature. Splice and joint insulation level shall be not less than the insulation level of the conductors being joined.
  - 4. Plastic electrical insulating tape: Per ASTM D2304, flame-retardant, cold and weather resistant.
- F. Underground Branch Circuits and Feeders:
  - 1. Submersible connectors in accordance with UL 486D, rated 600 V, 190°F, with integral insulation.

### 3.02 BOXES AND FITTINGS INSTALLATION

- A. Install electrical boxes and fittings as shown and as required, in compliance with NEC requirements, in accordance with the manufacturer's written instructions, in accordance with industry practices. All boxes at finished surfaces shall be recessed to a depth compatible with the finish material without the use of box extenders or field modifications.
- B. Provide minimum 4-inch square (2-gang), 3-inch deep interior outlet boxes for technology, data, audio/video, and multi-media outlet boxes. Provide single gang only, 3-inch deep outlet boxes mounted long axis vertically for security, signaling, access control, and video surveillance, coordinate with communications, security and technology equipment installation. Provide minimum 3-inch deep boxes for all other applications. Where indicated differently on plans or where conflicts arise, notify the Architect / Engineer prior to installation. Box extenders or plaster rings shall not be used to increase size. Provide increased box size as required for the specific installation.
- C. Determine from the drawings and by field measurement the location of each outlet. Locate electrical boxes to accommodate millwork, fixtures, marker boards, and other room equipment at no additional cost to the Owner. The outlet locations shall be modified from those shown to accommodate changes in door swing or to clear interferences that arise from construction as well as modifying them to center in rooms. The modifications shall be made with no cost to the Owner as part of coordination. Check the conditions throughout the job and notify the Architect of discrepancies. Verify modifications before proceeding with installation. Set wall boxes in advance of wall finish construction, blocked in place and secured. Set all wall boxes flush with the finish. Provide wall box support legs, hangers, or other approved accessories attached to studs to prevent movement of box in wall and to hold plumb and square.
- D. Unless noted or directed otherwise at installation, place outlet boxes as indicated on architectural elevations and as required by local codes.
- E. Outlets above counters, mount long axis vertically. Refer to architectural elevations and coordinate to clear backsplash and millwork.
- F. Provide pull boxes, junction boxes, wiring troughs, and cabinets where necessary for installation of electrical systems.
- G. Provide weatherproof boxes for interior and exterior locations exposed to weather or moisture.
- H. Provide knockout closures to cap unused knockout holes in boxes.
- I. Locate boxes and conduit bodies to ensure access to electrical wiring. Provide minimum 12-inch clearance in front of box or conduit body access.
- J. Secure boxes to the substrate where they are mounted or embed boxes in concrete or masonry.

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## Section 26 05 18 Dwelling Unit Cables, Connectors, & Wall Boxes

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- K. Boxes shall not be secured to the drywall or wall finishes, HVAC ductwork, or piping system.
- L. Provide junction and pull boxes for feeders and branch circuits where shown and where required by NEC, regardless of whether or not boxes are shown.
- M. Coordinate locations of boxes in fire rated partitions and slabs to not affect the fire rating of the partition or slab. Notify the Architect in writing where modification or construction is required to maintain the partition or slab fire rating.
- N. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
- O. Use flush mounting outlet box in finished areas unless specifically indicated as being used with exposed conduit.
- P. Locate flush-mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- Q. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches with stud separation. Provide minimum 24 inches with separation in acoustic rated walls.
- R. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness. Provide UL listed materials to support boxes in walls to prevent movement. Ensure box cannot be pushed inside wall.
- S. Use stamped steel bridges to fasten flush mounting outlet box between studs that can not be directly fastened to the stud.
- T. Install flush mounting box without damaging vapor barriers, wall insulation or reducing its effectiveness.
- U. Use adjustable steel channel fasteners for hung ceiling outlet box.
- V. Use gang box where more than one device is mounted together. Do not use sectional boxes.
- W. Install knockout closures in unused metal box openings.
- X. Mount boxes to the building structure with supporting facilities independent of the conduits or raceways.
- Y. Adjust flush-mounting outlets to make front flush with finished wall material.
- Z. Do not mount junction boxes above in inaccessible spaces. Do not mount junction boxes above ceilings accessible only by removing light fixture, mechanical equipment or other devices. At inaccessible spaces use junction box furnished with light fixture or light fixture wiring compartment UL listed for through wiring accessible through the fixture housing.
- AA. All boxes shall be protected from building finish painters' over spray and from fire proofing overspray. Remove protective coverings when painting and fire proofing are complete.
- BB. Bond equipment grounding conductor to all metallic junction and pull boxes.
- CC. Box extenders or plaster rings shall not be used to increase the code mandated cable capacity of a box. Provide proper size box.

### 3.03 TESTING

- A. Pre-Energization Check: Before energizing, check cable and conductors for circuit continuity and short circuits. Correct malfunctions.
- B. Service Entrance and Feeder Insulation Resistance Test: Each service entrance conductor and each feeder conductor shall have its insulation resistance tested after the installation is complete

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**Dwelling Unit Cables, Connectors, & Wall Boxes**

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except for connection at its source and point of termination. Testing shall be performed by qualified technicians who have been trained in testing procedures and in the use of all test equipment.

1. Make tests using a Biddle Megger or equivalent test instrument at a voltage of not less than 1000 VDC; measure resistance from conductor to conductor, conductor to neutral (if present) and from conductor to ground. Insulation resistance shall not be less than the following:

Wire Size (AWG)	Insulation Resistance (Ohms)
#8	250 K
#6 through #2	100 K
#1 through #4/0	50 K
Larger than #4/0	25 K

2. Conductors that do not meet or exceed the insulation resistance values listed above shall be removed, replaced, and retested.

- C. Submittals: Contractor shall furnish instruments and personnel required for tests. Submit 4 copies of certified test results to Architect for review. Test reports shall include conductor tested, date and time of test, relative humidity, temperature, and weather conditions.
- D. Voltage and Current Values: The voltage and current in each conductor shall be measured and recorded after connections have been made and the conductor is under load.

3.04 SAMPLE DC HIGH VOLTAGE CABLE TEST REPORT

Date \_\_\_\_\_

Contract and Work Location: \_\_\_\_\_

Contract (Project) No.: \_\_\_\_\_

Circuit Identification: \_\_\_\_\_  
 (Dwg., Title, Number and Ckt. Number)

Test Equipment: \_\_\_\_\_

(Make, Model, Serial No., Etc.)

Applied Test Voltage \_\_\_\_\_

Normal Oper. Voltage \_\_\_\_\_

Cable Installation: New \_\_\_\_\_ Used \_\_\_\_\_  
 (Date) (No. Years)

Cable Size \_\_\_\_\_AWG

Cable Length \_\_\_\_\_Ft.

Cable Material \_\_\_\_\_Cu \_\_\_\_\_Al

Temperature \_\_\_\_\_ Humidity \_\_\_\_\_

TEST DATA - RESISTANCE IN KILO OHMS

CONDUCTOR PER PHASE	A-N	B-N	C-N	A-G	B-G	C-G	A-B	B-C	A-C

END OF SECTION

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**Dwelling Unit Cables, Connectors, & Wall Boxes**

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# Section 26 05 19

## Conductors & Connectors

Specifications

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### PART 1 - GENERAL

#### 1.01 WORK INCLUDED

- A. Provide electrical conductors, wire and connector work as shown, and specified.
- B. Types: The types of conductors and connectors required for the project include the following:
  - 1. 600V building conductors
  - 2. 600V building conductor connectors
- C. Application: The applications for conductors and connectors required on the project are as follows:
  - 1. Power distribution circuitry
  - 2. Lighting branch circuitry
  - 3. Appliance, receptacle, and equipment branch circuitry
  - 4. Motor branch circuitry
  - 5. Control wiring
  - 6. Line voltage
- D. Refer to other specific specification sections for voice, video, data, alarm and instrumentation cables.

#### 1.02 QUALITY ASSURANCE

- A. UL Label: Conductors and connectors shall be UL labeled.

#### 1.03 REFERENCES

- A. Refer to other specific specification sections regarding specialized wiring and connections.

### PART 2 - PRODUCTS

#### 2.01 CONDUCTORS AND CONNECTORS

- A. General: Except as indicated, provide conductors and connectors of manufacturer's standard materials, as indicated by published product information, designed and constructed as instructed by the manufacturer, and as required for the installation.
- B. Conductors: Provide factory-fabricated conductors of the size, rating, material, and type as indicated for each use. Conductors shall be soft or annealed copper wires meeting, before stranding, the requirements of ASTM B 3, Standard Specification for Soft or Annealed Copper Wire for Electrical Purposes, latest edition.
  - 1. Conductors for control wiring sized #14 AWG through #10 AWG shall be stranded.
  - 2. Conductors for power and lighting shall be stranded. Stranding shall be Class B meeting the requirements of ASTM B 8, Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium Hard, or Soft.
- C. Insulation for standard building conductors: Insulation shall meet or exceed the requirements of UL 83, Standard for Thermoplastic Insulated Wires.
  - 1. All wiring inside lighting fixtures shall be temperature rated per NEC.
  - 2. Insulation for copper conductors shall be UL Type THHN/THWN, 90 degrees C.

#### 2.02 COLOR CODES FOR CONDUCTORS FOR BRANCH CIRCUITS AND FEEDERS

- A. Provide color coding for conductors as required by NEC 210.5. Color coding for phase and voltage shall be as required by local codes and standards.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. General: Install electrical conductors and connectors as shown, in accordance with the manufacturer's written instructions, the requirements of NEC, the NECA Standard of Installation, Specifications

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and industry practices.

- B. Coordination: Coordinate conductor installation work with electrical raceway and equipment installation work, as necessary for interface.
- C. Conductors:
  - 1. Provide a grounded (neutral) conductor for each branch circuit. Do not share grounded (neutral) conductors.
  - 2. No more than six phase conductors shall be installed in a single raceway.
  - 3. When any combination of four or more phase and grounded (neutral) conductors are installed in a raceway, the minimum size for all conductors including equipment ground conductor shall be #10 AWG, and they shall be de-rated accordingly.
  - 4. Any combination of phase conductors and grounded (neutral) conductors in any raceway shall not exceed nine.
  - 5. When more than three (3) conductors are size #10 AWG, they shall be installed in a one-inch conduit.
  - 6. Pull conductors together when more than one is being installed in a raceway. Whenever possible, pull conductors into their respective conduits by hand. Use pulling lubricant when necessary.
  - 7. No wire smaller than #12 AWG shall be permitted for any lighting or power circuit. No wire smaller than #14 AWG shall be used for any control circuit, unless shown otherwise.
  - 8. For 15 and 20 amp branch circuits operating at 150V or less, provide #10 AWG wire when the first outlet is over 75-feet from the panelboard. For branch circuits operating at 150 to 600 volts, provide #10 AWG wire when the first outlet is over 150-feet from the panelboard.
  - 9. Neatly train and lace wiring inside boxes, equipment and panelboards. Provide tie-straps around conductors with their shared neutral conductor where there are more than two neutral conductors in a conduit.
  - 10. Do not install a pull string in conduits containing conductors.
- D. Identification: Label each phase conductor in each junction box with corresponding circuit number, using self-adhesive wire markers.
- E. Splices and Joints:
  - 1. In accordance with UL 486A, C, D, E, and NEC.
  - 2. Aboveground Circuits (No. 10 AWG and smaller):
    - a. Connectors: Solderless, screw-on, reusable pressure cable type, rated 600 V, 220° F, with integral insulation, approved for copper and aluminum conductors.
    - b. The integral insulator shall have a skirt to completely cover the stripped wires.
    - c. The number, size, and combination of conductors, as listed on the manufacturers' packaging, shall be strictly followed.
- F. Aboveground Circuits (No. 8 AWG and larger):
  - 1. Connectors shall be indent, hex screw, or bolt clamp type of high conductivity and corrosion resistant material, listed for use with copper and aluminum conductors.
  - 2. Provide field-installed compression connectors for cable sizes 250 kcmil and larger with not less than two clamping elements or compression indents per wire.
  - 3. Insulate splices and joints with materials approved for the particular use, location, voltage, and temperature. Splice and joint insulation level shall be not less than the insulation level of the conductors being joined.
  - 4. Plastic electrical insulating tape: Per ASTM D2304, flame-retardant, cold and weather resistant.
- G. Underground Branch Circuits and Feeders:
  - 1. Submersible connectors in accordance with UL 486D, rated 600 V, 190°F, with integral insulation.

### 3.02 TESTING

- A. Pre-Energization Check: Before energizing, check cable and conductors for circuit continuity and short circuits. Correct malfunctions.

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**END OF SECTION**

**Section 26 05 19**  
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# Section 26 05 26 Electrical Grounding

Specifications

26 05 26 - 1

## PART 1 - GENERAL

### 1.01 WORK INCLUDED

- A. Grounding shall conform to the requirements of:
  - 1. National Electrical Code.
  - 2. Governing local codes.
  - 3. All Local Utility Companies
- B. Ground effectively and permanently.
  - 1. Neutral conductor at the main service disconnect and other separately derived systems.
  - 2. All conduit systems.
  - 3. All electrical equipment and related current carrying supports or structures.
  - 4. All metal piping systems.
  - 5. All building structural metal frames.
  - 6. All telephone/voice/video/CATV/data utilities

### 1.02 REFERENCE STANDARDS

- A. ANSI/IEEE Standard 142 - "Recommended Practice for Grounding of Industrial and Commercial Power Systems."
- B. ANSI/UL 467 - "Safety Standard for Grounding and Bonding Equipment."
- C. Article 250 of the NEC (NFPA 70) for grounding.
- D. NECA – Standard of Installation
- E. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems
- F. EIA / TIA 607

## PART 2 - PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

- A. Copperweld
- B. Cadweld
- C. Burndy
- D. O. Z Gedney

### 2.02 GROUNDING ELECTRODES

- A. Driven Rod Electrode: UL Listed, 3/4" x 10'-0" copper clad grounding electrode.
- B. Metal Frame of Building.
- C. Foundation concrete encased rebar.

### 2.03 DATA / VOICE COMMUNICATIONS CLOSET GROUND BAR

- A. Heavy-duty, two bolt type, copper alloy or bronze for grounding and bonding applications, in configurations required for particular installation.

### 2.04 WIRE

- A. Stranded, copper cable

## Section 26 05 26 Electrical Grounding

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- B. Foundation Electrodes: 4/0 AWG
- C. Grounding Electrode Conductor: Size to meet NFPA 70 requirements

### PART 3 - EXECUTION

#### 3.01 GROUNDING AND BONDING

- A. In the service equipment, provide a separate (dedicated) ground bus.
  - 1. Bond the ground bus with copper bus bar or cable, of equal or greater current carrying capacity of the service grounding conductor, to the neutral bar.
  - 2. Resistance of neutral to ground shall not exceed 10 Ohms.
  - 3. Connect the electric service grounding electrode conductors to the incoming metal water pipe system (when available, using a suitable ground clamp) and to a supplemental electrode such as a ground rod or ground loop.
  - 4. Provide grounding and bonding at the power company's metering equipment.
  - 5. Provide access and cover for access to the ground grid and removable connections for testing the system.
- B. Connect the grounding electrode conductor between the ground bus and the grounding electrode system.
  - 1. In rigid PVC conduit.
  - 2. Provide connection for each rod ground electrode.
    - a. All rod electrodes shall be located outside the building in non-paved areas where available. Access cover top shall be flush with finish grade or floor.
    - b. Install rod electrodes as indicated. Install additional rod electrodes as required to achieve specified resistance to ground.
    - c. The minimum distance between driven ground rod electrodes shall be 10'.
  - 3. The total ground resistance shall not exceed 10 Ohms for service entrance grounds and 25 Ohms for equipment grounds.
    - a. Where this condition cannot be obtained with one electrode, install a longer electrode, deep-driven sectional electrodes, or additional grounding electrodes until the required ground resistance is obtained.
- C. Provide an insulated equipment grounding conductor inside all conduits, raceways, surface raceways, gutters and wireways. The ground wire shall be bonded to each box to suitable lug, bus, or bushing. All bonding jumpers shall be routed inside conduit or raceway.
- D. Provide all conduit terminating in transformers, panelboards and voice/data outlets with grounding bushings, where required and ground wire extended to ground bus in equipment.

#### 3.02 METAL FRAME OF BUILDING OR STRUCTURE

- A. Effectively ground the building steel or structure per NEC 250-52 (2).

#### 3.03 UFER GROUND

- A. Provide a UFER ground at bottom of building slab per NEC 250.52 (3), bond to building steel.

#### 3.04 MISCELLANEOUS REQUIREMENTS

- A. Continuity of the building equipment grounding system shall be maintained throughout the project. Equipment grounding jumpers shall be installed across conduit expansion fittings, liquid-tight flexible metal and flexible metal conduit, light fixture pigtails in excess of 6', and other non-electrically continuous raceway fittings.
- B. Equipment grounding conductors and grounding electrode conductor shall be stranded copper conductors and run in a suitable raceway. Grounding conductors and grounding electrode conductor shall be continuous, without joints or splices over their entire length, except as allowed by NFPA 70/NEC.

## Section 26 05 26 Electrical Grounding

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- C. For separately derived alternating current system grounds, bond the case and neutral of each transformer secondary winding directly to the nearest available effectively grounded structural metal member as required in NEC 250.
  - D. Technology/Data/Voice Communications, CATV, CCTV, and MATV Equipment Grounding: Provide grounding electrode conductor from the communications service equipment to the building grounding system as required. Provide #6 ground conductor from telephone/voice/CATV/data company demarcation point to building electrical service entrance ground electrode connection and as required by all local utility companies.
  - F. Ground lighting fixture bodies to the conduit grounding system.
  - G. Receptacles shall require a ground wire bonded to the conduit ground system, except where and insulated/isolated grounding receptacle or outlet is specified.
  - H. Motor Frames: Ground the frame of each motor with a properly sized separate ground wire inside flexible conduit.
  - I. Ground each panelboard by connecting the grounding conductors to the grounding stud.
  - L. Ground each secondary dry-type transformer to the ground bus of the primary side panelboard. Provide a bonding jumper between the ground stud and the neutral only at one location either inside the transformer enclosure or at each transformer secondary overcurrent protection device. Ground transformer ground stud or the nearest structural steel member, or nearest member of the ground electrode system.
  - M. Bond every item of equipment served by the electrical system to the building equipment ground system. This includes panelboards, disconnect switches, receptacles, fans, air handling units, pumps and flexible duct connections.
  - N. Ground each light pole and metal conduit stub-ups at each light pole base.
  - O. Ground all metal conduit including metal conduit used for bends and penetrations through concrete.
- 3.05 ELECTRICAL SWITCHGEAR NOT INTENDED NOR UL LISTED AS SERVICE ENTRANCE RATED
- A. Remove all factory installed grounding screws, straps or studs identified for neutral to ground bonding.
  - B. Do not convert neutral bus to ground bus.
- 3.06 MANHOLE AND/OR PULL BOX GROUNDING
- A. Provide a driven ground rod and ground bond loop in each power and telephone manhole or pull box. Bond cable racks and medium voltage cable shields at splices and terminations, ductbank conduit ground bushings and all other metal components in manholes or pull box to the ground loop.

**END OF SECTION**

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**Electrical Grounding**  
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## Section 26 05 33 Conduit Systems

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### PART 1 - GENERAL

#### 1.01 WORK INCLUDED

- A. Furnish and install a complete system of electrical conduits and fittings.

### PART 2 - PRODUCTS

#### 2.01 ACCEPTABLE MANUFACTURERS

- A. Raceways and Fittings unless otherwise indicated:
  - 1. Allied
  - 2. International Metal Hose
  - 3. Ipex
  - 4. Heritage Plastics
  - 5. Wheatland
  - 6. Can-Tex
  - 7. North American Pipe
  - 8. Anamet, Inc.
  - 9. Electri-Flex Co.
  - 10. Western Tube and Conduit
- B. Stainless Steel Conduit and Fittings:
  - 1. Calbrite
  - 2. Gibson
- C. Aluminum Conduit and Fittings:
  - 1. American Conduit/Sapa
  - 2. Wheatland
  - 3. Patriot Aluminum Products
- D. Condulets and Conduit Bodies unless otherwise indicated:
  - 1. Appleton
  - 2. Form 85
- E. Stainless Steel Condulets and Conduit Bodies:
  - 1. Calbrite
  - 2. Gibson
  - 3. Crouse Hinds
- F. Steel MC Cable
  - 1. AFC
  - 2. Southwire
  - 3. General Cable
  - 4. Kaf-Tech

#### 2.02 PROHIBITED PRODUCTS

- A. Prohibited Products
  - 1. BX cable
  - 2. AC cable
  - 3. Electrical nonmetallic tubing (ENT)
  - 4. Flexible polyethylene or PVC tubing
  - 5. Intermediate Metal Conduit (IMC)

#### 2.03 RIGID METAL CONDUIT (RMC)

- A. Schedule 40 conduit and fittings:
  - 1. Galvanized Conduit - Mild steel pipe, Zinc coated inside and out
  - 2. Aluminum Conduit - Aluminum Alloy 6063, T-1 temper

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3. Threaded ends and fittings
4. Insulated bushings

### 2.04 ELECTRICAL METALLIC TUBING (EMT)

- A. Metallic Tubing
  1. Zinc Coated Steel - Cold rolled steel tubing, Zinc coated inside and out
  2. Aluminum - Aluminum Alloy 6005, 6063. Temper T-1
- B. Fittings shall meet the same requirements as EMT conduits.
  1. Full Compression Fittings
  2. Insulated throat connectors
- C. Prohibited Products
  1. Cast metal fittings
  2. Uni-couple type connectors
  3. Split ring, anti-short bushings

### 2.05 FLEXIBLE CONDUIT

- A. Steel flexible metallic conduit:
  1. Zinc coated inside and out
  2. 18-inches minimum length, 24-inches maximum length
  3. 18 inches minimum length; 6 feet maximum length for light fixture whips only
- B. Liquid tight flexible steel conduit
  1. Type L.A. - Grounded
  2. 18-inches minimum length, 24-inches maximum length

### 2.06 PVC CONDUIT

- A. Schedule 40 and Schedule 80
- B. PVC fittings and solvent welded joints
- C. PVC elbows and fittings, except for threaded/slip-on/glue or straight conduit slip-on / glue fittings, shall not be used on this project.

### 2.07 CONDULETS AND CONDUIT BODIES

- A. Form 85
- B. PVC Coated: Form 8
- C. LBC Condulets shall be used for size 2 inch and above. LL and LR Condulets shall not be used for 2 inch and above

### 2.08 ROOF MOUNTED CONDUIT AND BOX SUPPORTS

- A. Refer to roofing specifications for additional information. The limitations and restrictions contained in any roofing specification shall prevail and supercede these specifications for roof mounted supports for conduits and boxes.
- B. Acceptable Manufacturer:
  1. Portable Pipe Hangers
  2. Cooper B-Line C-Port
  3. Miro Industries Models 2.5, 2.5-5, 2.5-AH, 12-AH, 16-AH

### 2.09 STAINLESS STEEL CONDUIT

- A. Rigid Conduit, Fittings and Supports:

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1. Type 304 Stainless Steel
  2. Threaded ends
  3. Insulated Bushings
- B. EMT, fittings and Supports:
1. Type 304 Stainless Steel
  2. Compression Fittings
  3. Insulated Bushings

### 2.10 METAL CLAD (MC) CABLE

- A. Minimum conductor size shall be #12 AWG. All conductors shall be stranded copper.
- B. All MC Cable shall have an insulated ground conductor.
- C. Armor: A zinc coated galvanized steel armor shall be applied over the cabled wire assembly with an interlock in compliance with Section 13 of UL 1569.
- D. Fittings shall be UL listed and identified as MCI-A for such use with metal clad interlocking armor ground. Connectors shall be of steel or malleable iron and shall have saddle clamp to insure a tight termination of MC or MCI-A Cable to box.

### 2.11 EXTERIOR IN-GRADE PULL BOXES

- A. Hubbell CDR 30x48 inch minimum, provide larger size as required by conduit size or quantity:
1. Tier 22 rated traffic duty
  2. Conduit entry knock-outs as required
  3. Bolt down cover
  4. Integral or separate bottom
  5. Adjust to grade option
  6. Extension as required for specified conduit depth

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install electrical conduits and fittings for all wiring of any type unless otherwise indicated.
- B. Minimum Size Conduit:
1. 0.5-inch unless otherwise indicated
  2. (2) 1-inch for low voltage systems unless otherwise indicated
  3. 2-inch between buildings unless otherwise indicated
- C. Provide separate raceway systems for each of the following when specified, indicated or required:
1. 120/208 volt circuits
  2. Voice/Data
  3. Fire Alarm
- D. Maintain 13-inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.
- E. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- F. Use conduit hubs to fasten conduit to sides and tops of electrical equipment, device, box, gutter, wireway, disconnect, etc. in damp and wet locations.
- G. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- H. Do not use no-thread couplings and connectors for galvanized steel or aluminum rigid conduit.
- I. In areas where raceway systems are exposed and acoustical or thermal insulating material is to be installed on walls, partitions, and ceilings, raceways shall be blocked out proper distance to allow insulating material to pass without cutting or fitting. Also provide Kindorf galvanized steel channels

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to serve as standoffs for panels, cabinets and gutters.

- J. All conduit terminations at locations including but not limited to, switchgear, pull boxes, outlet boxes, stub-up, and stub-outs:
  - 1. Insulated throat connectors for EMT conduits.
  - 2. Insulated bushing on all rigid conduit terminations.
  - 3. Locknuts inside and outside of all boxes and enclosures.
  - 4. Threaded type plastic bushing at all boxes and enclosures.
- K. All boxes are to be accessible after completion of construction.
- L. All conduits must be kept dry and free of water or debris with approved pipe plugs or caps. Cap or plug conduit ends prior to concrete pours.
- M. Install expansion and deflection fittings and bonding jumpers on straight runs which exceed 200-feet, on center, and at 200-feet maximum, on center, on straight runs which exceed 400-feet, and where conduits cross building expansion joints.
- N. Provide grounding bushings at concentric/eccentric knockouts or where reducing washers are used.
- O. Install conduit as a complete system, without conductors, continuous from outlet to outlet and from fitting to fitting.
- P. Make up threaded joints of conduit carefully in a manner to ensure a tight joint.
- Q. Conduit bends shall be factory elbows or shall be bent using equipment specifically designed to bend conduit of the type used to maintain the conduit's UL listing.
- R. Provide chrome or nickel-plated escutcheon plates on conduit passing through walls and ceilings in finished areas.
- S. Install one 2-inch diameter conduit nipple between multi-sectional panels independent of feeder conductors.
- T. Prohibited Installations unless noted otherwise
- U. Do not route on floors, paved areas or grade.
- V. Do not Obstruct Equipment Manufacturer's Recommended Service Space or access to that location
- W. Where aluminum alloy conductors are specified, approved and substituted for copper conductors, provide the required conduit size based on conduit fill using NEC or recognized cable manufacturer's conduit fill tables for aluminum alloy compact conductors.

### 3.02 INTERIOR ABOVE GRADE INSTALLATION

- A. Conduit Types
  - 1. Concealed Conduits:
    - a. EMT
  - 2. Exposed conduits in Equipment Rooms:
    - a. EMT
    - b. RGC when installed below 18-inches above finished floor.
  - 3. Exposed conduits:
    - a. RGC:
      - i. Below 9-feet AFF
    - b. Aluminum rigid conduit
  - 4. Wet Location
    - a. Aluminum rigid conduit
  - 5. Damp Location
    - a. Aluminum rigid conduit
  - 6. Conduit in concrete walls, floor or roof slab:
    - a. RGC
- B. Maintain head room and present neat appearance.

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- C. Minimum 6-inches clear of bottom of roof deck.
- D. Perpendicular or parallel to building lines.
- E. Where a piece of equipment is connected from a switch or box on adjacent wall, the conduit shall go up the wall from the box, across, and back down to the equipment.
- F. Conceal conduit systems in finished areas.
- G. Conduit may be exposed in exposed mechanical and electrical rooms or where otherwise indicated.
- H. Prohibited Installations
  - 1. Do not block walkways

### 3.03 LIGHT FIXTURE WHIPS

- A. Flexible conduit or MC cable used for lighting fixture connection shall be supported from the structure with #13 AWG galvanized iron wire pendants and "Caddy clips".
- B. Each light fixture shall have its own fixture whip from junction box.
- C. Light Fixtures installed end to end or recessed in non-accessible ceilings may connected use chase nipples.
- D. Prohibited installation:
  - 1. Do not install "Daisy Chain" light fixtures installed above accessible ceilings.

### 3.04 BELOW GRADE INSTALLATION

- A. Conduit Type:
  - 1. PVC
- B. Unless shown otherwise, do not install conduit in or below concrete building slabs.
- C. Conduit for all floor boxes shall be routed below building slab from floor box to nearest column, wall, or as indicated.
- D. Changes in direction of underground conduit runs exceeding a total of 10 degrees, either vertical or horizontal, shall be accomplished by long sweep bends having a minimum radius of curvature of 25 feet and a maximum arc of 22.5 degrees.
- E. Provide conduit spacers for parallel branch/feeder conduits. Use suitable manufactured separators and chairs installed 4 feet on centers. Securely anchor conduit at each chair to prevent movement during concrete placement.
- F. Conduit below building slab shall be installed minimum 18-inches below finished floor and in select fill.
- G. Electrical feeder conduits, telecommunications tie, trunk, or service cable conduits shall be installed minimum 48-inches below finished floor and in select fill.
- H. Electrical service primary shall comply with the respective utility company requirements and standards.
- I. Provide two "caution" plastic tapes at 6-inches and 18-inches below finished slab, grade, or pavement.
- J. Conduits located outside building, provide magnetic locator tape at top of first compacted layer of backfill.
- K. As each section of the underground conduit is completed, a testing mandrel with diameter ¼-inch smaller than the conduit, shall be drawn through each conduit. A brush with stiff bristles shall be drawn through until conduit is clear of particles of earth, sand, or gravel. Conduit plugs shall then

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be installed.

- L. Verify location and routing of all new and existing underground utilities with the Owner and Architect on the job site. Stake out these existing utilities so that they will not be damaged. Stake out new utilities to provide coordination with other trades and with new and existing utilities, easements, property lines, restricted land use areas, and right-of-ways.
- M. Conduit for 120V and above shall be separated from control and signal conduits by a minimum of 3-inches.
- N. Prohibited Installation.
  - 1. Unless shown otherwise, do not install conduit horizontally in concrete slabs.

### 3.05 EXTERIOR ABOVE GRADE INSTALLATION

- A. Conduit Type:
  - 1. Aluminum Rigid Conduit
  - 2. RGC where subject to physical damage or where located less than four feet above finished floor, grade or pavement.
- B. Conduit for mechanical / plumbing equipment shall be routed with the associated mechanical / plumbing pipe support rack system where practical, coordinate with Divisions 22 and 23.

### 3.06 ABOVE ROOF INSTALLATION AND ROOF PENETRATION

- A. Where specifically indicated to be routed or mounted on the roof, installation shall be as specified, recommended by roofing manufacturer, recommended by roof support manufacturer and as required by NEC.
- B. Roof penetrations shall be made in adequate time to allow the roofing installer to make proper flashing.
- C. Conduit for equipment mounted on roof curbs shall be routed through the roof curb.
- D. Prohibited Installations:
  - 1. Conduit, gutters, pull boxes, junction boxes, etc. shall not be routed on roof unless specified otherwise.
  - 2. Do not install conduit, junction boxes, etc. within 18 inches of outside edges of roof access openings.

### 3.07 CONDUIT SUPPORTS

- A. Fasten conduit supports to building structure and surfaces;
- B. Support with malleable iron conduit clamps or on conduit racks at intervals as required by NEC
- C. Support conduit on galvanized channel, using compatible galvanized fittings (bolts, beam clamps, and similar items), and galvanized threaded rod pendants at each end of channel and secure raceway to channel and channel to structure. Channel supports shall have cut ends filed smooth
- D. Where rod pendants are not used, channel supports are to be secured to structure at each end.
- E. Conduit supports are to be secured to structure using washers, lock washers, nuts and bolts or rod pendants; use of toggle bolt "wings" are not acceptable.
- F. Support single conduit runs using a properly sized galvanized conduit hanger.
- G. Group related conduit on conduit rack. Construct rack using steel channel; provide space on each rack for 25 percent additional conduits.
- H. Connections to joists shall be made with galvanized channel extended between joist chords or with galvanized channel bearing on the vertical legs of joist chord angles.
- I. Conduits installed in public areas, not concealed by architectural ceilings, shall be supported by

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- galvanized steel channel racks. Coordinate routing with Architect / Owner.
- J. Provide electrical insulating sleeve or wrapping for aluminum conduit supported by zinc coated supports or fasteners.
  - K. Galvanized Surfaces: Clean welds, bolted connections, cuts, and abraded areas and apply ZRC galvanized paint or equivalent.
  - L. Terminate all motor connection conduits in mechanical room spaces with a floor pedestal and with "Tee" conduit at motor outlet height for flexible conduit.
  - M. Where conduit is not embedded in concrete or masonry, conduit shall be firmly secured by approved clamps, half-straps or hangers.
  - N. No more than 12 conduits containing branch circuits may be installed in junction boxes, pull boxes or gutters.
  - O. Anchors:
    - 1. Rawl Plugs or approved equal anchors.
    - 2. Lead cinch anchors or pressed anchors.
  - P. Hardware:
    - 1. Indoors: cadmium plated unless noted otherwise
    - 2. Exterior: Galvanized unless noted otherwise
  - Q. Prohibited Installation.
    - 1. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
    - 2. Do not support conduit from conduit, ceiling support wires, roof deck, structural bridging
    - 3. Plastic anchors and lead anchors shall not be used for overhead applications.
    - 4. Beam clamp attachments to steel joist chords
    - 5. Do not support more than one conduit from a single all-thread rod support.
    - 6. Do not utilize Tie wire or short pieces of conduit as supports or hangers.
  - R. Acceptable Manufacturer's
    - 1. Kindorf,
    - 2. Unistrut,
    - 3. Superstrut,
    - 4. Caddy,
    - 5. Minerallac

### 3.08 CONDUIT PENETRATIONS, SLEEVES AND ESCUTCHEONS

- A. Furnish sleeves for placing in construction for all conduit passing through concrete or masonry walls, partitions, beams, grade level other than floor, and roofs. A conduit sleeve shall be one size larger than the size of conduit, which it serves except where larger sizes are required for manufactured water, fire, or smoke stop fittings.
  - 1. Sleeves set in concrete floor construction shall be minimum Schedule 40 galvanized steel.
  - 2. Sleeves shall extend 3-inches above the finished floor.
- B. Sleeves in concrete or masonry walls shall be Schedule 40 galvanized steel. Sleeves shall be set flush with finished wall.
- C. Install manufactured UL listed water, fire, and smoke stop fittings, or caulk around conduit or cables in sleeves with sufficient UL listed fire safe insulation or foam to maintain wall or floor slab fire or smoke rating. Refer to Architecture drawings for locations of rated walls.
- D. Provide Linkseal Mechanical Seals around conduit penetrations through walls below grade. Provide a pull box to serve as a water stop inside wall penetration. Internally seal low voltage cabling conduit penetrations with waterproof caulking.

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- E. Sleeves penetrating walls below grade shall be Schedule 40 black steel pipe with ¼-inch thick steel plate secured to the pipe with continuous fillet weld. The plate shall be located in the middle of the wall and shall be 2-inches wider all around than the sleeve that it encircles. The sleeve should extend a minimum of 24-inches on either side of the penetration. The entire assembly shall be hot-dipped galvanized after fabrication. Do not sleeve or penetrate grade beams.
- F. Conduit passing through the housing on connected equipment shall pass through a cleanly cut hole protected with a threaded steel bushing. Route conduit through roof openings, for piping and ductwork or through suitable roof jack, with pitch pocket. Coordinate location with roofing installation as required.
- G. Conduit passing through fire rated wall shall be sealed with Fire Stop. Route conduit to preserve fire resistance rating of partitions and other elements, using materials and methods under the provisions of Division 7.

### 3.09 PVC CONDUIT AND FITTINGS INSTALLATION

- A. Where 3-1/2-inch conduit is specified and the required or specified material is Schedule 80 PVC, provide 4-inch conduit.

### 3.10 FLEXIBLE METAL AND LIQUID TIGHT FLEXIBLE METAL CONDUIT AND FITTINGS INSTALLATION

- A. Liquid Tight Flexible Metal Conduit shall only be used for connections to equipment mounted on roof, rotating equipment, transformers, and kitchen or food processing equipment, or where flexible conduit is required outdoors.
- B. Liquid tight flexible metal conduit may be 0.5-inch for roof top supply / exhaust fans only
- C. Flexible metal conduit and liquid tight flexible metal conduit shall only be used for final connections from junction box to equipment, light fixtures, power poles, etc.
- D. Prohibited Installation:
  - 1. Do not use for exterior wall or roof penetrations unless sleeved utilizing PVC coated RGC conduit at least one size larger than the outside diameter of the flexible conduit.

### 3.11 EXTERIOR IN-GRADE PULL BOXES

- A. Provide pull boxes where specified and as required.
- B. Pull boxes located in pavement shall be set with proper extensions so that top of cover is flush with pavement.
- C. Pull boxes located in non-paved areas shall be set two-inches above surrounding finished grade. Provide 12-inch wide by 8-inch deep reinforced concrete crown around neck or opening and sloped down away from pull box opening.

### 3.12 IDENTIFICATION

- A. Conduit Systems: Provide adequate marking of conduit larger than one inch exposed or concealed in interior accessible spaces to distinguish each run as either a power (120/208V or 277/480V) or signal / communication conduit (Fire Alarm, BAS, BMCS, Security, CCTV, Access Control, Intrusion Detection, Telecom, etc.). Except as otherwise indicated, use orange banding with black lettering. Provide self-adhesive or snap-on type plastic markers. Locate markers at ends of conduit runs, near switches and other control devices, near items of equipment served by the conductors, at points where conduit passes through walls or floors or enters non-accessible construction, and at spacing of not more than 50-feet along each run of exposed conduit. Switch-leg conduit and short branches for power connections need not be marked, except where conduit is larger than 1-inch.

**END OF SECTION**

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## Section 26 05 37 Electrical Boxes & Fittings

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### PART 1 - GENERAL

#### 1.01 WORK INCLUDED

- A. Provide electrical box and fitting work as required, scheduled, indicated, and specified.

#### 1.02 QUALITY ASSURANCE

- A. UL Label: Electrical boxes and fittings shall be UL labeled.

### PART 2 - PRODUCTS

#### 2.01 FABRICATED MATERIALS

- A. Interior Outlet Boxes: Provide galvanized steel interior outlet wiring boxes, of the type, shape, and size, including depth of box, to suit respective locations and installation. Construct with stamped knockouts in back and sides. Provide gang boxes where devices are shown grouped. Single box design; sectional boxes are not acceptable, except for wall mounted electronic displays.
  - 1. Type of Various Locations:
    - a. Wall mounted video displays, televisions, electronic signage and similar installations; recessed wall mounted box for power and/or multi-media (low voltage) outlets: Arlington Industries #TVBS 613 or equal, 4-gang steel box with white trim plate.
    - b. Technology, data, voice, video and multi-media outlet boxes at locations other than wall mounted video displays, televisions, electronic signage and similar installations: minimum 4-inch square (2-gang), 3-inch deep interior outlet boxes.
    - c. Security, access control, and video surveillance outlet boxes: single gang, 3-inch deep outlet boxes mounted long axis vertically.
    - d. All other applications: minimum 4-inch square (2-gang) 2-1/8-inch deep boxes.
  - 2. Interior Outlet Box Accessories: Outlet box accessories required as for installation, including covers or wall device plates, mounting brackets, wallboard hangers, extension rings, plaster rings for boxes in plaster construction, fixture studs, cable clamps and metal straps for supporting outlet boxes. Accessories shall be compatible with outlet boxes used and meet requirements of individual wiring.
- B. Damp Location Outlet and Damp or Wet Location Switch Boxes: Deep type, hot dipped galvanized cast-metal weatherproof outlet wiring boxes, of type, shape, and size required. Include depth of box, threaded conduit ends, and stainless steel cover plate with spring-hinged waterproof caps suitable for application. Include faceplate gasket and corrosion-resistant, tamper / vandal proof fasteners.
- C. Wet Location Outlet Boxes: Hot dipped galvanized cast-iron weatherproof outlet wiring boxes, of type, shape, and size required. Include depth of box, threaded conduit ends.
- D. Junction and Pull Boxes: Galvanized sheet steel junction and pull boxes, with screw-on covers, of type, shape, and size, to suit respective location and installation.
  - 1. Type for Various Locations:
    - a. Minimum Size: 4-inch square, 2-1/8-inches deep.
    - b. 150 Cubic Inches in Volume or Larger: Code gauge steel with sides formed and welded, screw covers unless shown or required to have hinged doors. All boxes mounted above ceiling shall have screw covers. Boxes in all other areas with covers larger than 12-inches shall have hinged with screw covers. Knockouts factory stamped or formed in field with a cutting tool to provide a clean symmetrically cut hole.
    - c. Exterior or Wet Areas: 304 stainless steel NEMA 3R construction with gaskets and corrosion-resistant fasteners
- E. Conduit Bodies: Provide galvanized cast-metal conduit bodies, of type, shape, and size, to suit location and installation. Construct with threaded conduit ends, removable cover, and corrosion-resistant screws.

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- F. Bushings, Knockout Closures, and Locknuts: Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts, and insulated conduit bushings of type and size to suit use and installation.
- G. Outlet boxes in fire rated walls: Provide 2-hour rated gasket within box and below cover, equal to Rectorseal Metacaulk box guard and cover guard.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION OF BOXES AND FITTINGS

- A. Install electrical boxes and fittings as shown and as required, in compliance with NEC requirements, in accordance with the manufacturer's written instructions, in accordance with industry practices.
- B. Provide recessed device boxes for wall mounted interactive media boards, video displays, televisions, electronic signage and similar installations.
- C. Junction and pull boxes, condulets, gutters, located above grid ceilings shall be mounted within 18-inches of ceiling grid. Junction and pull boxes above grid ceilings shall be mounted in the same room served. Junction boxes and pull boxes required for areas with inaccessible ceilings shall be located above the nearest accessible ceiling area. All junction box or pull box openings shall be side or bottom accessible. Removal of light fixtures, mechanical equipment or other devices shall not be required to access boxes.
- D. Determine from the drawings and by measurement the location of each outlet. Locate electrical boxes to accommodate millwork, fixtures, marker boards, and other room equipment at no additional cost to the Owner. The outlet locations shall be modified from those shown to accommodate changes in door swing or to clear interferences that arise from construction as well as modifying them to center in rooms. The modifications shall be made with no cost as part of coordination. Check the conditions throughout the job and notify the Architect of discrepancies. Verify modifications before proceeding with installation. Set wall boxes in advance of wall construction, blocked in place and secured. Set all wall boxes flush with the finish and install extension rings as required extending boxes to the finished surfaces of special furring or wall finishes. Provide wall box support legs attached to stud to prevent movement of box in wall.
- E. Unless noted or directed otherwise at installation, place outlet boxes as indicated on architectural elevations and as required by local codes.
- F. Outlets above counters, mount long axis horizontally. Refer to architectural elevations and coordinate to clear backsplash and millwork.
- G. Provide pull boxes, junction boxes, wiring troughs, and cabinets where necessary for installation of electrical systems. Surface mounted boxes below 9 feet and accessible to the public shall not have stamped knockouts.
- H. Provide weatherproof boxes for interior and exterior locations exposed to weather or moisture.
- I. Provide knockout closures to cap unused knockout holes in boxes.
- J. Locate boxes and conduit bodies to ensure access to electrical wiring. Provide minimum 12-inch clearance in front of box or conduit body access.
- K. Secure boxes to the substrate where they are mounted, or embed boxes in concrete or masonry.
- L. Boxes for any conduit system shall not be secured to the ceiling system, HVAC ductwork or piping system.
- M. Provide junction and pull boxes for feeders and branch circuits where shown and where required by NEC, regardless of whether or not boxes are shown.

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- N. Coordinate locations of boxes in fire rated partitions and slabs to not affect the fire rating of the partition or slab. Notify the Architect in writing where modification or construction is required to maintain the partition or slab fire rating.
- O. Identification: Paint the exterior and cover plates of building interior junction boxes and pull boxes to correspond to the following colors:
  - 1. Red – All Emergency circuits, regardless of load, and fire alarm system.
  - 2. Light Green - 120/240 VAC single-phase systems
- P. All box covers shall be labeled with Panel ID and circuit numbers of all circuits available in box using permanent black marker. Boxes containing main feeders are to list where fed from and load (example "MSB to Panel HA"). Information listed is to be legible, markovers are not acceptable. Multi-sectional panel numbers are not to be listed on covers (example "LA2" referring to Panel LA sec. 2 is to be listed as "LA"). Label covers for special applications explaining contents (example "Emerg. Gen. Annunciator controls", "IDF ground"). Do not attach box covers that have both sides painted or labeled differently. In public areas where boxes are painted same color as room per architect, label inside covers.
- Q. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
- R. Use flush mounting outlet box in finished areas unless specifically indicated as being used with exposed conduit.
- S. Locate flush-mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- T. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches with stud separation. Provide minimum 24 inches with separation in acoustic rated walls.
- U. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness. Provide UL listed materials to support boxes in walls to prevent movement. Ensure box cannot be pushed inside wall.
- V. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- W. Install flush mounting box without damaging vapor barriers, wall insulation or reducing its effectiveness.
- X. Use gang box with plaster ring for single device outlets.
- Y. Support outlets flush with suspended ceilings to the building structure.

### 3.02 ADJUSTING

- A. Adjust flush-mounting outlets to make front flush with finished wall material.
- B. Install knockout closures in unused box openings.
- C. Box extenders or plaster rings shall not be used to increase the Code mandated cable capacity of a box.

**END OF SECTION**

Specifications

**Section 26 05 37**  
**Electrical Boxes & Fittings**  
Specifications

# Section 26 24 00

## Electrical Gear

Specifications

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### PART 1 - GENERAL

#### 1.01 WORK INCLUDED

- A. Panelboards and enclosures, including cabinet, as shown, scheduled, indicated, and specified. Safety and disconnect switch work where required, scheduled, indicated, and specified.

#### 1.02 QUALITY ASSURANCE

- A. UL Standards: All electrical gear shall confirm to all applicable UL standards and shall be UL labeled.

### PART 2 - PRODUCTS

#### 2.01 ACCEPTABLE MANUFACTURERS

- A. General Electric Co.
- B. Square D
- C. Siemens
- D. Eaton

#### 2.02 PANELBOARDS

- A. General: Panelboards shall be dead-front type equipped with fusible switches or circuit breakers as shown and scheduled.
- B. Busing Assembly: Panelboard phase, neutral and equipment ground busing shall be copper. Bus structure and mains shall have ratings as shown and scheduled. Ratings shall be established by heat rise tests with maximum hot spot temperature on any connector or busbar not to exceed 65°C rise above 40°C ambient. Heat rise test shall be conducted in accordance with UL 67. The use of conductor dimensions is not accepted in lieu of actual heat tests. Furnish a bare uninsulated ground bus inside each panelboard enclosure. Two section panelboards shall be connected with copper cable, with an ampacity conforming to the upstream overcurrent device. Panelboards serving non-linear loads and fed with neutrals greater than 100% shall have 200% neutral busing.
- C. Circuit Breakers: Circuit breakers shall be molded case, thermal magnetic type equipped with individually insulated, braced, and protected connectors. The front faces of circuit breakers shall be flush with each other. Tripped indication shall be shown by the breaker handle taking a position between ON and OFF. Make prepared space provisions for additional breakers so that no additional connectors will be required to add breakers. Circuit breakers in panelboards 600 Amps and below shall have bolt-in breakers. Two and three pole breakers shall have internal common trips. External handle ties will not be accepted for line to line connected loads. External handle ties are acceptable only for designated shared neutral loads. Circuit breakers for panelboards rated 601 amps and above shall have plug-on circuit breakers.
  - 1. Provide panelboard branch circuit breakers with interrupting capacity as shown, but in no case less than the following symmetrical amperes RMS:

Voltage (volts)	Interrupting Capacity
120/208/240	10,000 AIC

- 2. Circuit breakers for lighting circuits shall be UL listed switch duty (SWD).
- 3. Ground fault interrupter (GFI) circuit breakers, where shown, shall be 5 mA ground fault trip and shall include a TEST button.
- 4. Arc fault circuit breakers shall comply with UL 1699.
- 5. Circuit breakers with frame size 600A and higher shall have magnetic trip adjustment of 3X to 10X.
- 6. Provide distribution panel circuit breakers with high interrupting capacity, or integral current limiters as shown. Circuit breakers shall have interrupting capacity not less than the

## Section 26 24 00

### Electrical Gear

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following symmetrical amperes RMS:

CONVENTIONAL FRAME SIZE/ VOLTAGE	INTEGRAL INTERRUPTING CAPACITY
100A/240V	10,000 AIC
225A/240V	25,000 AIC
400A/240V	65,000 AIC
600A/240V	65,000 AIC
800A/240V	65,000 AIC

- D. Fusible Switches: Fusible switches shall be quick-make, quick-break type. Each switch shall be enclosed in a separate steel enclosure. The enclosure shall employ a hinged cover for access to the fuses. Interlock cover with the operating handle to prevent opening the cover when the switch is in the ON position. This interlock shall be constructed so that it can be overridden for testing fuses without interrupting service. The switches shall have padlocking provisions in the OFF position. Switches shall include positive pressure rejection type fuse clips for use with UL Class R or Class J fuses and be UL labeled for 200,000 AIC.
- E. Spaces: Where space for future breakers or switches is shown, panelboard enclosure shall include removable blank panels or knockouts to allow installation of future breakers or switches, prepared spaces, and panelboard busing shall be complete, including required connectors.
- F. Integrated Equipment Rating: Each panelboard, as a complete unit, shall have a short-circuit rating equal or greater than the available short circuit current. Rating shall have been established by tests on similar panelboards with the circuit breakers or fusible switches installed. Series rated panelboards and their protective upstream devices shall be labeled as required by the NEC.
- G. Panelboard Enclosures:
1. Provide sheet steel enclosures. Provide all NEMA 1 panelboard fronts with spring-loaded door pulls, and flush lock and key.
  2. All NEMA 1 enclosure panelboards shall be hinged "door-in-door" type with interior hinged door with hand operated latch or latches, as required providing access only to circuit breaker or fusible switch operating handles, not to exposed energized parts. Outer hinged door shall be securely mounted to the panelboard box with factory bolts, screws, clips, or other fasteners, requiring a tool for entry. Hand operated latches are not acceptable. Push inner and outer doors shall open left to right.
  3. Equip with interior circuit directory frame, card, and clear plastic covering for panelboards.
  4. Provide gray powder coat finish over a rust inhibitor.
  5. Enclosures at exterior locations shall be NEMA 3R.
  6. Enclosure shall be for recessed or surface mounting as shown.
  7. Enclosures shall be fabricated by the same manufacturer as panelboards to be enclosed. Multi-section panelboards shall have same physical dimensions.

#### 2.03 ENCLOSED SWITCHES

- A. General: Provide commercial duty type, dead-front, sheet steel enclosed, surface-mounted safety switches of the type and size indicated. Safety switches shall be rated for the voltage of the circuit where they are installed. Safety switches used as motor disconnects shall be horsepower rated for the motor served.
- B. Switch Mechanism:
1. Safety switches shall be quick-make, quick-break type with permanently attached arc suppressor. Constructed so that switch blades are visible in the OFF position with the door open. The operating handle shall be an integral part of the box, not the cover. Switch shall have provision to padlock in the OFF position. Safety switches shall have a cover interlock to prevent unauthorized opening of the switch door when the switch mechanism is in the ON position, or closing of the switch mechanism when the switch door is open.
  2. Cover interlock shall have an override mechanism to permit switch inspection by authorized

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### Electrical Gear

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personnel. Current-carrying parts shall be constructed of high conductivity copper with silver-plated switch contacts. Lugs shall be suitable for copper conductors and front removable.

- C. Fusing: Provide fusible safety switches where required or indicated. Fuse clips shall be positive pressure rejection type fuse clips suitable for use with UL Class R or Class J fuses.
- D. Neutral: Provide safety switches with number of switched poles indicated. Where a neutral is present in the circuit, provide a solid neutral with the safety switch. Where a ground conductor is present in the circuit, provide a separate solid ground with the safety switch.
- E. Enclosures in indoor locations shall be NEMA 1 heavy duty enclosures unless shown otherwise. Enclosures in exterior locations shall be NEMA 3R stainless steel, heavy duty

#### 2.04 ENCLOSED CIRCUIT BREAKERS

- A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
  - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250A and larger.
  - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
  - 3. Electronic Trip Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:
    - a. Instantaneous trip
    - b. Long-and short-time pickup levels.
    - c. Long-and Short-time time adjustments.
    - d. Ground-fault pickup level, time delay and I<sup>2</sup>t response
- B. Molded-Case Circuit Breaker Features and Accessories: Standard frame sizes, trip ratings and number of poles.
  - 1. Lugs: Mechanical style suitable for number, size, trip ratings and material of conductors.
  - 2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
- C. Enclosures in indoor locations shall be NEMA 1 heavy duty enclosures unless shown otherwise. Enclosures in exterior locations shall be NEMA 3R stainless steel, heavy duty.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION OF PANELBOARDS AND ENCLOSURES

- A. General: Install panelboards and enclosures, as shown, including electrical connections, in accordance with the manufacturer's written instructions, the requirements of NEC, NECA Standard of Installation, and industry practices. Circuit breakers shall be factory installed except for required field modifications due to actual site conditions.
- B. Coordination: Coordinate installation of panelboards and enclosures with conductor and raceways installation work.
- C. Anchoring: Anchor enclosures to walls and structural surfaces ensuring that they are permanently and mechanically secured.
- D. Directory Card: Provide a typed circuit directory card(s) upon completion of work. Directory card shall be of super heavy-weight index card stock, 110 lb., white. Directory shall include type of load (i.e.: receptacles, lighting, exhaust fan, etc.) and location (i.e.: Room 102, Office in Room 102, Storage Room north of Room 102, etc.). Room number shall be identified as the actual graphics room number assigned to the space and not the room number identified on the Plans. If no school room number is assigned, list school name for room. List corridors as "corridor". If unsure how to list rooms that may not have a number or name contact maintenance electrical supervisor or his designee. Circuits with shunt trip shall be identified with the control circuit operating the shunt trip (i.e.: Kitchen Hood No. 2). Shunt trip breakers with common trip circuit shall be grouped in the panelboard (i.e.: circuits 1, 3, 5



## Section 26 24 00

### Electrical Gear

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and 7). All breakers controlled via contactors, or that supply control voltage to contactors shall be noted, and provide information at the bottom of directory card to include exact location of contactors, (example – plenum of Room 100) and how controlled (example – via BMCS). If breakers serve more than one contactor, the notations shall be separate for each contactor. Directory cards shall be large enough, including plastic holders, to include all necessary information. Directory cards are not to be folded to fit in holders. All breaker spaces are to be identified including for 2-pole and 3-pole breakers (list load on each space).

- E. Fuses: Install fuses, of the ratings and class shown, in each power distribution and motor control panelboard.
- F. Circuit Arrangement: Arrange branch circuit connections to 3-phase panelboards so that when two or three circuits are run with a common neutral, each circuit is connected to a different phase unless shown otherwise. Branch circuits shall be connected to the circuit breakers in the panelboard to provide the best possible phase balance, unless shown otherwise.
- G. Panelboards not intended to be used as service entrance (SE) rated shall have the factory installed neutral to ground bonding screws and straps removed.
- H. Spare Conduits: Provide (3) 1-inch conduits capped to 6-inches above accessible ceiling space all recessed panelboards.
- I. Conductors shall be bent neatly opposite the fuse or circuit breaker to which they are to be attached. Vertically installed conductors shall be neatly tie-wrapped. Conductors shall be connected in a neat and professional manner. Conductors brought in from the top or bottom of the cabinet shall be bent neatly opposite the fuse or circuit breaker to which they are to be attached. Each conductor shall be run along the full height of the panel and returned to the circuit breaker or fuse location to allow relocation of the conductor to any position along the bus. Neutral and grounding conductors shall be installed similar to the phase conductors. Panelboard shall be cleaned of all construction debris prior to substantial completion review.
- J. Circuit breakers and conductors installed for SPD devices shall be located at the top or bottom of the panelboard in respect to the location of the SPD device. Route all conductors to the SPD device using long sweep bends and the shortest conductor length possible.
- K. Install copper ground bus for copper ground conductors. Ground conductors size #1 and larger are to be landed to can with mechanical lugs and not to ground bus.
- L. Install panels so that breaker number 1 is the top left breaker. Panel interiors shall not be installed where breaker number 1 is the bottom right breaker.
- M. In panels that contain multi-layered neutral bus install neutrals beginning with the back neutral bus row and work forward. Do not make up neutrals on front neutral bus row unless all other rows are full.
- N. Label breaker mounting space with stick-on number labels.
- O. Mount the fully aligned panelboard such that the maximum height of the top circuit breaker above the finished floor shall not exceed 78 inches. Mount panelboards that are too high such that the bottom of the cabinets will not be less than 6 inches above the finished floor.

#### 3.02 ENCLOSED SWITCH AND CIRCUIT BREAKER INSTALLATION

- A. General: Install safety and disconnect switches where required or indicated, in accordance with the manufacturer's written instructions, requirements of the NEC, NECA Standard of Installation, and industry practices. Provide fuse identification label when fused switches are required showing type and size inside door of each switch. Include devices in coordination study to indicate overcurrent devices will selectively coordinate.
- B. Location: Provide safety switches within 50' and in sight of motor served. There shall be minimum 3' clearance in front of safety switch and a clear path in which to access wall mounted switches (ie.: not having to walk and/or stand on obstacles such as drain pans on floor to service).

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### Electrical Gear

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- C. Supports: Provide all safety and disconnect switches with galvanized angle or other supports where mounting on wall or other rigid surface is impractical. Switches shall not be supported by conduit alone. Where safety and disconnect switches are mounted on equipment served, the switch shall not inhibit removal of service panels or interfere with access areas. Provide mounting hardware that will allow removal of safety and disconnect switches. Do not utilize drive pin anchors through enclosure.
- D. Safety and Disconnect Switches: Install disconnect switches used with motor-driven appliances, motors and controllers within sight of the controller position unless indicated otherwise.

#### 3.03 TESTING

- A. Before energizing, energization, check for continuity of circuits and short circuits.

**END OF SECTION**

**Section 26 24 00**

**Electrical Gear**

Specifications

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# Section 26 24 15

## Load Centers for Dwelling Units

Specifications

26 24 15-1

### PART 1 - GENERAL

#### 1.01 WORK INCLUDED

- A. Load centers, including cabinet, as shown, scheduled, indicated, and specified.

#### 1.02 QUALITY ASSURANCE

- A. UL Standards: Load centers and enclosures shall confirm to all applicable UL standards and shall be UL labeled.

### PART 2 - PRODUCTS

#### 2.01 ACCEPTABLE MANUFACTURERS

- A. Schneider Electric - Square D
- B. ABB-General Electric Co.
- C. Siemens
- D. Eaton

#### 2.02 MATERIALS AND COMPONENTS

- A. General: Panelboards shall be dead-front type equipped with circuit breakers as shown and as required.
- B. The overcurrent protective device short circuit, coordination and arch flash studies performed by the overcurrent protective device manufacturer shall be used by the respective switchgear vendor(s) to select appropriate equipment, switchgear, and overcurrent protective device characteristics such as but not limited to: equipment bracing, AIC rating, circuit breaker frame size and trip settings, and fuse type/class. The appropriate equipment suitable and required by the studies for code compliance shall be included with the submittal data for review and provided at no additional cost to the Owner. The appropriate equipment recommended by the studies for enhanced selective coordination or enhanced arc flash energy reduction beyond code compliance shall be included with the submittal data for review and consideration purposes by the engineer.
- C. Busing Assembly: Panelboard phase, neutral, and equipment ground busing shall be aluminum or copper. Bus structure and mains shall have ratings as shown and scheduled. Furnish a bare uninsulated ground bus inside each panelboard enclosure. Neutral bus termination quantity shall match or exceed the maximum number of single pole circuit breakers the load center will accept.
- D. Main circuit breakers and feeder / branch circuit breakers:
  - 1. Thermal magnetic with factory fixed trip.
  - 2. 125-600 Amps: Thermal magnetic with adjustable instantaneous trip of 5X – 10X with short time tracking.
  - 3. General requirements:
    - a. Two pole breakers shall have internal common trips.
    - b. All circuit breakers used as the main or branch mounted back-fed main shall be bolt-on.
    - c. Load centers shall have interrupting capacity as shown or as required, but in no case less 10k AIC for 120/208/240-Volt systems.
    - d. Personnel ground fault interrupter (GFI) circuit breakers, where shown, shall be maximum 5 mA ground fault trip and shall include a TEST button.
- E. Spaces: Where space for future breakers or switches is shown, panelboard enclosure shall include removable blank panels or knockouts to allow installation of future breakers or switches.
- F. Integrated Equipment Rating: Do not apply series ratings. Each load center, as a complete unit,

## Section 26 24 15 Load Centers for Dwelling Units

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26 24 15-2

shall have a short-circuit rating equal or greater than the available short circuit current. Rating shall have been established by tests on similar panelboards with the circuit breakers or fusible switches installed.

- G. Load center enclosures:
  - 1. Provide sheet steel enclosures, minimum 16-gauge nominal thickness, with multiple knockouts, unless shown otherwise.
  - 2. Equip with interior circuit directory frame, card, and clear plastic covering for panelboards.
  - 3. Enclosure shall be for recessed or surface mounting as shown or as required.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION OF PANELBOARDS AND ENCLOSURES

- A. General: Install load centers only within the confines of the residential dwelling unit it serves, as shown, including electrical connections, in accordance with the manufacturer's written instructions, the requirements of NEC, NECA Standard of Installation, and industry practices.
- B. Coordination: Coordinate installation of panelboards and enclosures with conductor and raceways installation work.
- C. Anchoring: Anchor enclosures to walls and structural surfaces ensuring that they are permanently and mechanically secured.
- D. Directory Card: Provide a typed circuit directory card(s) upon completion of work. Directory card shall be of super heavy-weight index card stock, 110 lb, white. Directory shall include type of load (i.e.: receptacles, lighting, exhaust fan, etc.) and location (i.e.: Dining Room, Bath Room, etc.).
- E. Circuit Arrangement: Branch circuits shall be arranged to provide the best possible phase balance, unless shown otherwise.
- F. Load centers not intended to be used as service entrance (SE) rated or for establishing a separately derived neutral system shall have the factory installed neutral to ground bonding screws and straps removed and disposed of.
- G. Conductors shall be bent neatly opposite circuit breaker to which they are to be attached. Conductors shall be connected in a neat and professional manner. Conductors brought in from the top or bottom of the cabinet shall be bent neatly opposite the circuit breaker to which they are to be attached. Each conductor shall be run along the full height of the panel and returned to the circuit breaker location to allow relocation of the conductor to any position along the bus. Panelboard shall be cleaned of all construction debris prior to substantial completion review. Neutral and grounding conductors shall be installed similar to the phase conductors.
- H. Circuit breakers and conductors installed for SPD devices shall be located at the top or bottom of the load center in respect to the location of the SPD device. Route all conductors to the SPD device with straight as possible run, using longest sweep bends and the shortest conductor length possible. Twist all SPD conductors and secure with tie straps wherever possible.
- I. Install load centers so that breaker number 1 is the top left breaker.
- J. Label breaker mounting space with stick-on number labels.
- K. Mount the fully aligned panelboard such that the maximum height of the top circuit breaker above the finished floor shall not exceed 78-inches. Mount panelboards as high as practical and such that the bottom of the cabinets will not be less than 6 inches above the finished floor.

#### 3.02 TESTING

- A. Before energizing, energization, check for continuity of circuits and short circuits.

**END OF SECTION**

Specifications

**Section 26 24 15**  
**Load Centers for Dwelling Units**  
Specifications

26 24 15-3

# Section 26 27 13 Residential Metering System

Specifications

26 27 13-1

## PART 1 - GENERAL

### 1.01 WORK INCLUDED

- A. Work Included: Switchboard work as shown, scheduled, indicated, and specified.
- B. Types: Metering Systems required for the project include power distribution metered switchgear.

### 1.02 QUALITY ASSURANCE

- A. UL Labels: Provide switchboards UL labeled for service entrance and meeting requirements of UL 891.
- B. NEMA Compliance: Comply with National Electrical Manufacturers Association (NEMA) Standard PB2
- C. Comply with all requirements of Entergy

### 1.03 SUBMITTALS

- A. Indicate detailed dimensions for the front and side views.
- B. Indicate conduit entrance locations and requirements.
- C. Indicate enclosure material finish and NEMA classification type.
- D. Indicate nameplate legends.
- E. Indicate size and number of bus bars and ground; switchboard instrument details.
- F. Include electrical characteristics including voltage, frame size and trip ratings, withstand ratings, and time current curves of all equipment and components.

## PART 2 - PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

- A. General Electric Co.
- B. Square D
- C. Siemens
- D. Cutler-Hammer.

### 2.02 MATERIALS AND COMPONENTS

- A. Except as otherwise indicated, provide manufacturer's standard materials and components as indicated by published product information, designed and constructed as recommended, and as required for a complete installation.

### 2.03 DEAD-FRONT METERING SYSTEM

- A. Provide a factory-assembled, dead-front, NEMA 1 construction, metal enclosed, self supporting, metering system of voltage, phase, ampacity, and short circuit bracing shown.
  - 1. Metering System shall consist of the required number of front and rear aligned vertical sections bolted together to form one metal enclosed rigid metering system.
- B. Completely assembled and self-contained metering devices shall be in accordance with the plans and descriptions herein, equal to Siemens Unified Uni-Pak metering with branch breakers

## Section 26 27 13 Residential Metering System

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- immediately adjacent to the meter socket, in a separate compartment for positive identification.
- C. Metering devices shall be suitable for use as service entrance equipment. The service entrance compartment shall provide for sealing and shall have lay-in lugs suitable for the service entrance cable.
  - D. Main cross-bus shall have a rating equivalent to the service entrance cable.
  - E. Vertical bus shall be welded to the main horizontal bus connection straps with bolts accessible through the socket bases. Bus connections shall be provided between socket load jaws and individual branch breakers.
  - F. The unmetered bus in each meter section shall be completely barriered off to prevent unauthorized access to current. Meters sockets shall have individual covers of ring or ringless style design. A separate compartment under a separate cover shall be supplied for branch circuit breakers. Covers over tenant section wireways shall be removable with the watt-hour meters sealed in place.
  - G. All current carrying parts shall be tin-plated to resist corrosion. Branch breakers shall be quick-break and trip indicating. All lugs shall be suitable for use with 60 / 75 degree C copper or aluminum wire.
  - H. Metering system metering shall have meter sockets listed by Underwriters Laboratories, Inc. and shall be continuous duty rated. They shall be rated for 125 or 200 amperes and shall have provisions for 15-125 or 15-200 ampere, 2-pole branch breakers. Line side meter jaws shall have meter guides. All meter jaws shall be spring reinforced.
  - I. Integrated Equipment Rating: Each switchboard, as a complete unit, shall be given a single integrated equipment rating by the manufacturer. The integrated equipment short circuit rating shall certify that equipment is capable of withstanding the stresses of a fault equal to that shown in RMS symmetrical amperes. Ratings shall have been established by actual tests by the manufacturer on similar equipment construction as the subject switchboard. This test data shall be available and furnished, if requested, with or before the submittal of shop drawings.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION OF METERING SYSTEM

- A. Install metering system where shown, in accordance with the electric utility, manufacturer's written instructions, and industry practices to ensure that the metering systems meet the specifications.
- B. Comply with the requirements of NEMA and NEC, and NECA Standard of Installation, for installation of switchboards.
- C. Torque bus connections and tighten mechanical fasteners.
- D. Adjustment: Adjust operating mechanisms for free mechanical movement. Adjust main circuit breaker time characteristic curves as directed by the Engineer.

#### 3.02 TESTING

- A. Pre-Energization Checks: Before energizing, check metering system for continuous of circuits and for short circuits.
- B. Switchboard Insulation Resistance Test: Each metering system bus shall be insulation resistance tested after installation is complete except for line and load side connections. Tests shall be made using Biddle Megger or equivalent test instrument at a voltage of not less than 1000 VDC. Resistance shall be measured from phase-to-phase and from phase-to-ground. Minimum acceptable value for insulation resistance is 2 megohms.

**END OF SECTION**

Specifications



**Section 26 27 13**  
**Residential Metering System**

Specifications

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## Section 26 27 73

### Wiring Devices

Specifications

26 27 73-1

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED

- A. Provide wiring device work as shown, scheduled, indicated, and specified.

##### 1.02 QUALITY ASSURANCE

- A. UL Label: Wiring devices shall be UL labeled.
- B. NEMA Standard WD1 and WD6
- C. Fed. Spec. WC596, W-S-896

#### PART 2 - PRODUCTS

##### 2.01 ACCEPTABLE MANUFACTURERS

- A. Leviton, Mfg. Co., Inc.
- B. Pass and Seymour, Inc.
- C. Hubbell, Inc.
- D. Cooper – Arrow Hart
- E. Lutron, Inc. (Dimming)

##### 2.02 WIRING DEVICE COLOR

- A. Device color shall be white except 20A, 125V receptacles and toggle wall switches which are directly supplied from an emergency source shall be red. Verify with Architect prior to submitting for approval.

##### 2.03 RECEPTACLES

- A. Commercial grade receptacles, NEMA configuration indicated.
  - 1. 20A, 125V grounded duplex NEMA #5-20R: Leviton #16352 or equal
  - 2. 20A, 125V ground fault circuit interruption (GFCI) NEMA #5-20R: Leviton #7898 or equal
  - 3. Provide weather resistant (WR) receptacles at all exterior locations

##### 2.04 WALL SWITCHES

- A. Toggle: Commercial grade flush toggle switches, with mounting yoke insulated from mechanism, equipped with plaster ears, switch handle, back and side-wired screw terminals.
  - 1. Single-pole, 120/277V, 20A switch: Leviton #54521 or equal
  - 2. Double Pole 120/277V, 20A switch: Leviton #54522 or equal
  - 3. Three-way, 120/277V, 20A switch: Leviton #54523 or qual
  - 4. Four-way, 120/277V, 20A switch: Leviton #54524 or qual
- B. Local relay switch for remote control low voltage switching systems:
  - 1. Single-pole, double throw, center off, 120/277V, 15A momentary switch: Hubbell #HBL-1556 or equal

##### 2.05 WALL DIMMERS

- A. Wall Box Dimmers: Self-contained, wall box mounted, linear slide square law dimmers with a positive OFF position at the end of travel. Dimmers shall operate continuously at rated load in an ambient temperature up to 40°C and an input of 100 to 130V.
  - 1. Single-pole, 120V, 1000 watt incandescent: Lutron #N-1000-X.
  - 2. Single-pole, 120V, 2000 watt: Lutron #N-2000-X.

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## Section 26 27 73

### Wiring Devices

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3. Single-pole, 120V, 16A for Lutron Electronic Dimming Ballast, Lutron #NF-10-X.
4. Single-pole, 277V, 8A for Lutron Electronic Dimming Ballast, #NF-10-277.
5. Three way, four way, Lutron to match above.

#### 2.06 GFCI – GROUND FAULT CIRCUIT INTERRUPTER, BLANK FACE

- A. 20A, 125V, GFCI, switch rated, blank face feed through, Hubbell #GFBF20GYL, gray finish, stainless steel cover plate engraved with device protected, (example: DRINKING FOUNTAIN GFCI).

#### 2.07 INTERIOR WALL COVER PLATES

- A. Smooth finish, molded of high impact nylon.
  1. Plate color shall match device and/or toggle color.
  2. Fastening screws shall match plate color.

#### 2.08 EXTERIOR RECEPTACLE COVER PLATES

- A. Thomas & Betts CKSUV, cast aluminum standard depth, locking mount, while-in-use, wet location, universal configuration.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. All wiring devices for receptacles and wall switches shall be of the same manufacturer throughout unless otherwise noted.
  1. Lutron dimming controls shall be used with Lutron dimming electronic ballast.
- B. Install wiring devices where shown, in accordance with manufacturer's written instructions, requirements of NEC, and in accordance with industry practices. Do not install devices until wall construction and wiring is completed.
- C. Install receptacles and switches only in electrical boxes that are clean, free from excess building materials, debris, and similar matter.
- D. Install wiring devices plumb and aligned in the plane of the wall, floor, or ceiling in where they are installed.
- E. Install switches in boxes on the strike side of doors as hung. Verify door swing of all doors prior to rough-in. Install a uniform position so the same direction will open and close the circuit throughout the project. Where more than one switch is in the same location, install switches in a multi-gang box with a single cover plate.
- F. Provide a plate for every receptacle, switch, telephone outlet and other wiring devices
- G. Mounting heights of all wiring devices shall comply with current Accessibility Standards and local codes, except where wiring devices are indicated for special purpose and access is only required by maintenance or service personnel.
- H. Refer to Architectural drawing, elevations, etc. for exact location of wiring devices where indicated on the Architectural plans. Coordinate location of all wiring devices with other specialty items and millwork and avoid conflicts. Coordinate with all trades to avoid conflicts during construction.
- I. Locate receptacles for electric drinking fountains so that the receptacle is accessible and concealed as much as practical from public view. Provide GFCI blank face up-stream to provide GFCI protection for the drinking fountain. Locate blank face in an accessible location as indicated or as directed by Architect / Owner. At all electric drinking fountain locations provide GFCI blank face with test/reset in an easily accessible location in corridor adjacent to drinking fountain. From this GFCI receptacle, circuit non-GFCI type receptacle(s) located at and for the drinking fountain, but protected downstream by GFCI type receptacle in corridor. Locate receptacle for drinking fountain so that it is hidden from public view, concealed by drinking fountain cowling.

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## Section 26 27 73

### Wiring Devices

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- J. Provide weatherproof and weather resistant (WR) GFCI, 20A, 125V duplex receptacles outdoors where indicated and within 25' of all new electrically operated equipment mounted outdoors and on roofs.
- K. Provide GFCI, 20A, 125V duplex receptacles at all receptacle locations in custodial rooms, electric drinking fountains, vending machines, kitchen and food preparation areas, and all locations where receptacles indicated are within six feet of water sources, sinks, lavatories, faucets, and mop sinks. Where outlet is indicated behind vending machines or drinking fountain cowling, or other equipment, provide remote GFCI blank face in readily accessible location with standard receptacle outlet behind equipment.
- L. Install wall box dimmers to achieve full rating specified and indicated after de-rating for ganging as instructed by manufacturer.
- M. Do not share neutral conductor on dimming circuits.
- N. Install receptacles with grounding pole down, or as directed by Owner. If installed horizontally, install with neutral on top.
- O. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
- P. Connect wiring devices by wrapping ground conductor around screw terminal or inserting into mechanical lug. Provide pigtail to each receptacle and each switch. Neutral and phase conductors shall be installed using side or rear entry lugs only. Do not wrap neutral and phase conductors around screw terminals. Tighten all screws and lugs as recommended by manufacturer.
- Q. Provide nameplate engraving for emergency outlets at locations indicating panelboard and circuit number.

#### 3.02 TESTING

- A. Before energizing, check for continuity of circuits, short circuits, and grounding connections. After energizing, check wiring devices to demonstrate proper operation and receptacles for correct polarization. Test GFCI receptacle operation with simulated ground fault tester.
- B. Operate each wall switch with circuit energized and verify proper operation.
- C. Verify that each receptacle device is energized.
- D. Test each receptacle device for proper polarity.
- E. Test each GFCI receptacle device for proper operation.

**END OF SECTION**

**Section 26 27 73**

**Wiring Devices**

Specifications

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# Section 26 29 00

## Miscellaneous Electrical Controls & Control Wiring

Specifications

26 29 00 - 1

### PART 1 - GENERAL

#### 1.01 WORK INCLUDED

- A. Miscellaneous electrical controls and control wiring work is as shown and scheduled, and as specified.
- B. Types: Miscellaneous electrical controls and control wiring specified in this Section include, but are not limited to, the following:
  - 1. Miscellaneous Electrical Controls:
    - a. Photo Sensors
    - b. Time switches.
  - 2. Miscellaneous Control Wiring:
    - a. Stop-start stations and inter-connecting and interlock wiring for motors, controllers, air-cooled condensing units, interlocks, safety devices, and similar items.
    - b. Capacitor control wiring.
    - c. Additional control wiring and safety devices as shown and specified.

### PART 2 - PRODUCTS

#### 2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: Provide products produced by one of the following:
  - 1. Time Switches and Photo Sensor
  - 2. Intermatic Time Controls
  - 3. Tork
  - 4. Paragon
  - 5. Grasslin

#### 2.02 INTERIOR AND EXTERIOR LIGHTING CONTROL

- A. Photo Sensors: Self-contained, adjustable, weatherproof Photo Sensor designed for mounting on an outdoor junction box.
- B. Time Switches: Tork #DLC 400 Seven-day four-zone digital electronic time switch with integral photo sensor with 40-year memory feature. Time switches shall be installed in flush or surface mounted NEMA enclosure as required.
- C. Control Relays: As required for control of lighting contactors.

#### 2.03 WIRING AND RACEWAYS

- A. Line Voltage Control Wiring: As specified in Section 16120.
- B. Low Voltage Control Wiring: As specified in Section 16120, except that conductors shall consist of a multi-conductor jacketed cable whenever possible.
- C. Raceways: Raceways for line voltage and low voltage control wiring shall be as specified in Sections 16110 and 16130.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION OF MISCELLANEOUS ELECTRICAL CONTROLS

- A. Install miscellaneous electrical control devices as required, in accordance with NECA Standard of Installation, and industry practices.
- B. Conductors: Connect electrical conductors to miscellaneous electrical control devices in accordance with equipment manufacturer's written instructions and wiring diagrams. Wherever

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## **Section 26 29 00**

### **Miscellaneous Electrical Controls & Control Wiring**

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possible, match conductors of the electrical enclosures as shown; ensure they are complete, including control wiring and devices.

- C. Photo Sensors and Time Switches: Photo Sensor and time switch settings shall be as directed by the Owner.
- D. Line and Low Voltage Control Wiring: Line and low voltage control wiring shall be installed in a suitable raceway.
- E. Connections: Refer to Section 16121 for connections to equipment.

**END OF SECTION**

**Section 26 29 00**  
**Miscellaneous Electrical Controls & Control Wiring**  
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# Section 26 51 13 Lighting Fixtures & Lamps

Specifications

26 51 13 - 1

## PART 1 - GENERAL

### 1.01 WORK INCLUDED

- A. Work Included: Lighting fixture work is as shown, scheduled and specified.

## PART 2 - PRODUCTS

### 2.01 MATERIALS AND COMPONENTS

- A. General: Provide lighting fixtures of the size, type, and rating indicated, complete with, but not limited to, lamps, lamp holders, reflectors, ballasts, starters, and wiring.
- B. Fixture Types:
  - 1. Fluorescent Fixtures: Provide fluorescent fixtures complete with lamps and ballasts.
    - a. Fluorescent fixtures in continuous rows shall be supplied with fixture couplings, chase nipples, and accessories recommended by the manufacturer for continuous row installation.
  - 2. Downlight Fixtures: Provide recessed downlight fixtures with trim rings compatible with the ceiling material where fixture is to be installed. Downlight fixtures shall have a minimum efficiency of 65-percent and exhibit "lamp before lamp image" 45-degree cutoff for ceiling up to 10 feet.
  - 3. LED Exit Signs: The exit lighting fixtures shall meet the requirements of Federal, State, and Local Codes.
  - 4. Emergency Lighting Units: Lead Calcium batteries with self-diagnostics. Provide full light output at 90 minutes of battery operation.
  - 5. LED Site Fixtures: Provide luminaries of the sizes, type and ratings indicated, complete with housings, lenses, refractors, lamps, lamp holders, reflectors, ballasts, starters, igniters, mounting brackets or hardware with adjusting means and wiring.
- C. Electronic Ballast - Fluorescent:
  - 1. Provide programmed start T8 and T5, multi-volt (120-277V), high power factor, normal light output, Class P, thermally protected, electronic ballasts for fluorescent lighting fixtures. Programmed Start T8 ballast shall have parallel circuiting so that if any one lamp fails or is removed the others remain illuminated.
- D. Lamps:
  - 1. Provide lamps of the wattage, type, color, and reflector lamps with type of beams indicated, as shown, scheduled, and complying with the light fixture's recommendations. Any deviation between the lamps specified and those recommended by the light fixture manufacturer shall be brought to the attention of the Architect/Engineer prior to submission of shop drawings.
  - 2. Similar wattage and type fluorescent lamps shall be from the same manufacturer and production run.
- E. Emergency Fluorescent Battery Ballasts - Fluorescent: Full light output 90-minute minimum operation. Nominal 1250-1400 lumen battery ballasts for emergency linear fluorescent or long compact fluorescent lighting fixtures. Provide minimum 3400 lumen battery ballasts for emergency fluorescent lighting fixtures in areas where the ceiling height is 14' or greater. Where pendant mounted direct / indirect fixtures are mounted above 14-feet, provide two 1400 lumen emergency battery packs for each 4-foot emergency lighting segment indicated. Locate each 1400 lumen battery pack in two separate 4-foot segments, as required. Provide minimum 700-lumen emergency battery ballast for small compact fluorescent lighting fixtures 3-year replacement warranty.
- F. Emergency fluorescent battery ballasts shall illuminate two lamps for fixtures with two or more lamps.
- G. Emergency Battery Packs – Exit Signs: Nickel Cadmium battery with self- diagnostics; Minimum 3-year non-prorated replacement warranty.

## Section 26 51 13 Lighting Fixtures & Lamps

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### 2.02 POLES AND STANDARDS

- A. Provide poles of the types and heights indicated. Provide internal raceway for underground power supply, with luminaire support pole base indicated. Provide poles that will carry the indicated supports, luminaires and appurtenances, at the required heights above grade, without excessive deflection or whipping of the luminaire when subjected to 115 mph basic wind speed with 1.3 gust factor. Pole structural integrity shall rely solely on the anchor bolts, nuts and washers. Pole shall not be in direct contact with concrete base or mortar.
- B. Provide metal lighting poles with steel or aluminum shaft; equipped for post top or mast arm luminaire mounting. Provide wiring access hand hole with welded ½" NC ground lug, readily accessible from hand hole opening. Provide features as follows:
  - 1. Provide a one-piece pole shaft fabricated from weldable grade carbon structural steel tubing with a uniform thickness as required. Material shall conform to ASTM A-500, Grade C.
  - 2. Provide anchor base of the same material and finish as the pole, welded to the pole. Provide adequately sized (at least 15 square inches) hand hole with screwed cover. Provide galvanized steel hold-down or anchor bolts and leveling nuts. Provide full base cover.
- C. Anchor bolts:
  - 1. Provide zinc coated anchor bolts and nuts. Length shall be per pole manufacturer's shop drawings, complete with 3 inch right angle bend on one end and 6 inches of thread on the other end. Provide zinc coated flat washers, lock washers, and hexagonal nuts for each pole.
  - 2. Provide template for positioning of anchor bolts.
- D. Accessories:
  - 1. Full base covers, finish to match pole
  - 2. Hand hole with cover plate and vandal resistant hardware.
- E. Mounting: Provide corrosion resistant metal luminaire mounting compatible with the poles and fixtures that will not cause galvanic action at contact points. Provide mounting that will correctly position the luminaire to provide the required light distribution. Provide drill mounting to pole shaft unless specified otherwise

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Attachment: Fasten fixtures to the indicated structural support members of the building. Provide two separate wire supports for recessed ceiling mounted lighting fixtures, at opposite corners of fixture. Check to ensure that solid pendant fixtures are plumb.
- B. Coordination: Field coordinate and locate lighting fixtures in open ceiling areas including mechanical and electrical rooms so that light is not obstructed by piping, ductwork, etc. Locate light fixtures in front of electrical and mechanical equipment to provide adequate illumination for testing and maintenance.
- C. Final adjustment of all aimable exterior light fixtures shall be in coordination with, and to the satisfaction of, the Owner's designated representative. Pre-aim all fixtures prior to scheduled final aiming and adjustment with Architect/owner. Verify that all rotatable optics are in the proper orientation prior to final aiming.
- D. Install suspended luminaires using pendants supported from swivel hangers. Provide pendant length required to suspend luminary at indicated height.
- E. Locate recessed ceiling luminaires as indicated on the Architectural reflected ceiling plan.
- F. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prohibit movement.
- G. Install recessed luminaires using accessories and fire stopping materials to meet regulatory requirements for fire rating.

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## Section 26 51 13 Lighting Fixtures & Lamps

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- H. Install wall-mounted luminaries at height as directed by Architect.
- I. Provide generator transfer devices for light fixtures powered by generator or inverter emergency lighting circuits which are used for normal lighting and to be switched with the switched normal lighting circuit in the same room, corridor or area.
- J. Provide un-switched, constant-hot circuit to all battery powered emergency lighting equipment and generator transfer devices (GTD). Where normal light fixture circuit is switched or contactor controlled, non-switched battery charging or GTD circuit shall originate from same branch circuit breaker as switched lighting circuit.
- K. Provide emergency powered light fixture in front of all electrical switchgear, including but not limited to panelboards, low voltage control panels, transfer switches, and disconnect switches.
- L. Provide automatic controls for exterior light fixtures. Exterior building mounted light fixtures shall be circuited through lighting contactors. Provide time clock switches and photocells to control lighting contactors.
- M. Contactors shall not be installed above ceiling and shall be readily accessible.
- N. Lighting Fixture Supports: provide support for all of the fixtures. Supports may be anchored to channels of the ceiling construction to the structural slab or to structural members within a partition, or above a suspended ceiling.
- O. Install lighting poles as follows:
  - 1. Install lighting poles and standards as indicated, in accordance with manufacturer's written instructions, and in compliance with ANSI C2.
  - 2. Provide excavation and poured concrete bases using 3,000 pound 28-day concrete, and provide anchor hook-bolts, nuts and washers in conformance with the details and manufacturer's requirements. Refer to Division 3 for concrete work. Project anchor bolts 2-inches minimum above base. Use double nuts for adjustment.
  - 3. To protect finish, use fabric web slings (not chain or cable) to raise and set finished poles and standards.
  - 4. Install pole clear of contact of concrete base or mortar.
- P. Pole Grounding: Provide equipment bonding and grounding connections, sufficiently tight to assure permanent and effective grounds. Bond all metal, non-current carrying parts to ground. Provide 25-foot #2 solid ground electrode from pole base hand holes encased in concrete pier, to bottom of concrete pier with excess ground electrode coiled at bottom of concrete pier. Secure the ground electrode to the reinforcement steel to prevent movement during concrete pour. Bond all metal parts of the pole shaft ground lug. Provide #6 electrode grounding conductor from pole base ground lug to the ground conductor, using thermal fusion (exothermic) methods.

### 3.02 TESTING

- A. General: Upon installation of lighting fixtures, and after building circuits are energized, apply electrical energy to demonstrate proper operations of lighting fixtures, emergency lighting, and controls. When possible, correct malfunctioning units at the site, then retest to demonstrate proper operation; otherwise, remove and replace with new units, and proceed with retesting.
- B. Lamps: Install new incandescent lamps before final inspection. Fluorescent and HID lamps may be used to finish the building. Replace gaseous discharge lamps that are defective, show discolorations, or have exceeded more than 1/3 of their rated life, in accordance with construction inspector's records, with new lamps for final inspection.
- C. Pre-Inspection Tasks: Immediately before final inspection, clean fixtures inside and out, including plastics and glassware, adjust trim to fit adjacent surfaces, replace broken or damaged parts, and lamp and test fixtures for electrical and mechanical operation. Any fixtures, or parts of fixtures that show signs of rust or corrosion at the time of completion, shall be removed, and replaced with protected metal parts.

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**Section 26 51 13**  
**Lighting Fixtures & Lamps**

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- D. Final aiming and Adjustment: Aim and adjust aimable and adjustable lighting fixtures for their intended purpose. Re-aim and re-adjust as required to the satisfaction of the Architect / Owner, including nighttime adjustment of exterior lighting in the presence of the Architect / Owner.

**END OF SECTION**

**Section 26 51 13**  
**Lighting Fixtures & Lamps**  
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# Section 28 31 00

## Fire Alarm & Smoke Detection System

Specifications

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### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Provide all detailed engineering, documentation, materials and devices, installation, calibration, software programming and check-out necessary for a complete and fully operational fire detection and alarm system in accordance with the full intent and meaning of the drawings and specifications including, but not limited to, the following:
  - 1. Supply, install and connect all hardware necessary to provide a complete and operational fire detection and alarm system.
  - 2. Supply, install and wire all field hardware, fire alarm control panel, power supplies, power circuits, alarm initiating devices, audible and visual alarm devices, auxiliary control relays, signal initiating and signaling devices, conduits, wires, fittings and all accessories required for the system to perform as specified as required.
  - 3. Supply, install, debug and test all software required to provide all software functions described in accordance with the full intent and meaning of the drawings and specifications.
  - 4. Coordinate the work specified under this Section with other trades and contractors to assure a complete and fully operational system.
- B. The intent of fire detection and alarm system work is specified in this section and indicated on the drawings. The installing contractor shall design and provide a complete system, meeting the requirement of Specification Section 16725. The Contractor shall provide all fire alarm and initiation devices required for a complete system acceptable to all governing authorities. Provide proper spacing and coverage of all devices.

#### 1.02 CODES / STANDARDS / REFERENCES (LATEST EDITIONS)

- A. National Fire Protection Association (NFPA):
  - 1. NFPA 13 Systems, Installation
  - 2. NFPA 70 National Electrical Code
  - 3. NFPA 72 National Fire Alarm Code.
  - 4. NFPA 101 Life Safety code.
- B. Local & State Building Codes
- C. In addition the above requirements, comply with all local codes. Where discrepancies exist between codes, drawings or specifications, the more stringent requirement shall prevail. Installation shall be subject to approval, inspection and test of applicable regulatory agencies.

#### 1.03 PLANNER AND INSTALLER QUALIFICATIONS

- A. The installing contractor shall have been actively engaged in the business of designing, selling, installing, and servicing fire alarm systems for at least five (5) years.
- B. The entire Fire Detection and Alarm System shall be installed by an authorized representative of the Fire Alarm Manufacturer and certified by the manufacturer to distribute, sell, and install the specified fire alarm and smoke detection system. Include all components, elements, and testing and acceptance procedures.
- C. The installing contractor shall be licensed by the State Fire Marshall to design, sell, install, and service fire alarm systems as required by the State Insurance Code.
- D. The installing contractor shall have on his staff a Fire Alarm Planning Superintendent (APS) licensed by the State Fire Marshall's office for such purpose and under whose supervision installation, final connections, and check out will take place as required by the State Insurance Code.
- E. The APS shall be a certified NICET Level III state licensed fire alarm planner under whose supervision system design shall take place

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- F. The installing contractor shall provide 24-hour, 365 days per year emergency service with factory trained, state licensed service technicians.

### 1.04 COORDINATION

- A. It shall be the responsibility of the installing contractor to coordinate all requirements surrounding installation of the fire alarm system with all other trades.
- B. Contractor shall schedule a pre-construction meeting with the Owner / Architect regarding the Fire Detection and Alarm System.

### 1.05 SUBMITTALS

- A. Fire alarm submittal shall be bound and separate from all other submittals. The installing contractor and/or equipment supplier shall provide complete and detailed shop drawings and include:
  - 1. Bound form with contractor's name, supplier's name, project name, state fire alarm license, Fire Alarm Planning Superintendent license and all Technician(s) license adequately identified.
  - 2. Complete point-to-point wiring diagrams.
  - 3. Complete floor plan drawings locating all system devices.
  - 4. Complete system bill of material.
  - 5. Detailed system operational description. Any specification differences and deviations shall be clearly noted and marked.
  - 6. Provide a complete description of system operation.
  - 7. Manufacturer's installation instruction.
  - 8. Floor plan drawings including all panel and device locations, conduit sizes between devices and panels; number, size and type of conductors between devices and panels; walls, doors and graphic room numbers; exact power requirements and conduit routing with the location of all junction boxes and exact locations of devices and equipment. Submit a floor plan drawing circuiting/zoning shall be identified on the drawings.
  - 9. Submittal sheets sequentially numbered with the format: sheet number of number total. For example: 1 of 3.
  - 10. Complete set of manufacturer's operating instructions, circuit diagrams and the information necessary for proper installation, operation and maintenance.
  - 11. Submit sound and visual level to confirm that number and location of signaling devices will provide required sound and visual levels throughout the building.
  - 12. Submit a riser diagram of trunk wiring and device-to-device wiring and device to fire alarm control panel wiring. Riser shall show:
    - a. Conduit sizes and types.
    - b. Number, size and type of conductors.
    - c. Fire detection and alarm devices arranged in the required circuiting/zoning, as defined in the specifications and on the drawing.
    - d. Battery calculations to show compliance with the requirements of the specifications for both alarm and supervisory mode.
  - 13. Fire detection and alarm system's panel configuration complete with peripheral devices, batteries, power supplies, and interconnection diagrams.

### 1.06 OPERATION AND MAINTENANCE MANUALS

- A. Submit complete sets of operation and maintenance manuals. Manual, less as-builts, and sign-off sheets, shall be provided upon completion of the work. Approval of the manual will be required prior to substantial completion.

### 1.07 AS-BUILT DRAWINGS

- A. Prepare and submit detailed "As-Built" drawings. The drawings shall include certified test of the system, testing and acceptance sign-off sheets, and other items specified elsewhere to be performed after initial submission of operation and maintenance manuals, complete wiring diagrams showing connections between all devices and equipment, both factory and field wired. Include a riser diagram and drawings showing the as built location of all devices and equipment. The drawings shall show the system as installed, including all deviations from both the project drawings and the approved shop drawings. The drawings shall be prepared on uniform sized

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sheets, the same size as the project drawings. These drawings shall be submitted to be inserted in the specified Operations and Maintenance Manuals.

### 1.08 OPERATIONAL INSTRUCTIONS

- A. Provide a printed instruction card mounted behind a lexan plastic or glass cover in a stainless steel or aluminum frame. Install the frame in a conspicuous location observable from the Fire Alarm Control Panel (FACP).

## PART 2 - PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturers acceptable contingent upon Products' compliance with the specifications:
  - 1. Notifier – Notifier Engineered Systems Distributor
  - 2. Silent Knight – Farenhyt, Notifier, Gamewell, or Siemens Engineered Systems Distributor
  - 3. Gamewell – Engineered Systems Distributor

### 2.02 SYSTEM DESCRIPTION

- A. System shall be a completely multiplexed addressable fire detection and alarm system, tested and left in first class operating condition.
- B. The system shall provide communication with initiating and control devices individually. All of these devices shall be individually annunciated at the fire alarm control panel. Annunciation shall include the following conditions for each point:
  - 1. Alarm
  - 2. Trouble
  - 3. Open
  - 4. Short
  - 5. Device missing/failed.
- C. The system shall contain independently supervised initiating device circuits. The alarm activation of any initiation circuit shall not prevent the subsequent alarm operation of any other initiation circuit.
- D. There shall be supervisory service initiation device circuits for connection of all sprinkler water flow switches and valves. Device activation shall cause a general alarm at the fire alarm control panel. Each flow and tamper switch shall have an individual address.
- E. The incoming power to the system shall be supervised so that any power failure must be audibly and visually indicated at the fire alarm control panel. A green "power on" LED shall be displayed continuously while incoming power is present at the building fire alarm control panel.
- F. The system batteries shall be supervised so that a low battery condition or disconnection of the battery shall be audibly and visually indicated at the building fire alarm control panel.
- G. The system modules shall be electrically supervised for module placement. Should a module become disconnected, the system trouble indicator shall illuminate and the audible trouble signal shall sound.
- H. The system shall have provisions for disabling and enabling all circuits individually for maintenance or testing purposes.
- I. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120 VAC power in a normal or supervisory mode for a period of 24 hours with 20 minutes of alarm operation at the end of this period as a minimum. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations shall be automatic. If batteries are fully discharged, the charger shall recharge them back to full charge in four hours.



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### 2.03 FIRE ALARM CONTROL PANEL (FACP)

- A. The FACP shall be modular with solid state, microprocessor based electronics and shall be capable of communicating with the types of addressable devices specified below. It shall display only those primary controls and displays essential to operation during a fire alarm condition. Keyboards or keypads shall not be required to operate the system during fire alarm conditions.
- B. The fire alarm control panel (FACP) shall be fully enclosed in a lockable steel enclosure as specified herein. All operations required for testing or for normal care and maintenance of the system shall be performed from the front of the enclosure. If more than a single unit is required to form a complete control panel, the unit enclosures shall match exactly. The system shall operate at 24 VDC.
- C. Panel shall be large enough to accommodate all components and also to allow ample gutter space for interconnection of all panels as well as all field wiring. Each enclosure and each component shall be identified by an engraved red laminated phenolic resin nameplate. Lettering on the nameplate shall not be less than 1" high. Individual components and modules within the cabinets shall be identified by engraved laminated phenolic resin nameplates.
- D. A local audible device shall sound during alarm, trouble, or supervisory conditions. This audible device shall sound differently during each condition to distinguish one condition from another without having to view the panel. This audible device shall also sound during each key press to provide an audible feedback to ensure that the key has been pressed properly.
- E. The following primary controls shall be visible through a front access panel:
  - 1. 80 character alphanumeric display.
  - 2. Individual red system alarm LED.
  - 3. Individual yellow supervisory service LED.
  - 4. Individual yellow trouble LED.
  - 5. Green "power on" LED.
  - 6. Alarm acknowledge key.
  - 7. Trouble acknowledge key.
  - 8. Alarm silence key.
  - 9. System reset key.
- F. The power supply shall provide all control panel and peripheral power needs with filtered power as well as unregulated 24VDC power for external audio-visual devices. The audio-visual power shall be increased as needed by adding additional modular expansion power supplies. All power supplies shall be designed to meet UL and NFPA requirements for POWER-LIMITED operation on all external signaling lines, including initiating circuits and indicating circuits. Design the system power supplies and power trunk wiring for all annunciation devices required, and to add a minimum of five (5) 110cd visual devices in the future. Individual design loading shall not exceed 70% of power supply and system wiring capacity.
  - 1. Input power shall be 120VAC 60Hz. The power supply shall provide internal supervised batteries and automatic charger. The power supply shall provide positive and negative ground fault supervision, battery/charger fail condition, AC power fail indicators. The power supply shall also provide supervision of modular expansion power supplies as may be required.
  - 2. Surge protection shall be integral to the control panels.
  - 3. Each power supply shall be monitored and have an individual address.
- G. DIGITAL FIRE ALARM COMMUNICATOR
  - 1. Two line primary and secondary telephone line connections
  - 2. Automatically seizes telephone line.
  - 3. Automatic verification between panel and receiving station.
  - 4. Transmits common trouble and supervisory conditions.
  - 5. Dialer status LED.
  - 6. DIALER Enable / Disable switch.
  - 7. Two communication formats 20PPS or 4/2 format.
  - 8. Dual tone multi-frequency (DTMF) or Pulse modes.
  - 9. Programming password protected.
  - 10. UL approved.

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- H. IP Communicator:
  - 1. UL 864 Listed
  - 2. Supervise IP Ethernet connection every 90-seconds or less
  - 3. Upload/Download capable
  - 4. Transmit all signals and information from the DTMF Communicator

### 2.04 FIELD DEVICES

- A. All devices shall be supervised for trouble conditions. The fire alarm control panel shall be capable of displaying the type of trouble condition (open, short, device missing/failed). Should a device fail, it shall not hinder the operation of other system devices.
- B. Visual Signals
  - 1. Strobe lights shall be of the electronic flashing xenon strobe type and operate on 24 VDC. The strobe light shall be capable of producing 75 candela on axis to comply with ADA and UL 1638 requirements, and 15, 30, or 110 candela to comply with UL 1971 requirements. Visual signals in common areas of illumination shall have synchronized flash. Provide white with red letters.
  - 2. Provide enviro kit for locations where dampness, water or dust are present.
- C. Combination Alarm Signal and High Intensity Visual Signals
  - 1. Strobe lights shall be of the electronic flashing xenon strobe type and operate on 24 VDC. The strobe light shall be capable of producing 75 candela on axis to comply with ADA requirements, and 15, 30 or 110 candela to comply with UL 1971 requirements. Visual signals in common areas of illumination shall have synchronized flash. Each unit shall provide a Code 3 Temporal tone. The horn shall be capable of an output of 95dB at 10', and intensity adjusted accordingly for the area of coverage. Electronic Mini-Sounder or horn set on low setting shall be provided in interior rooms 900 square feet or less. Mini-sounder shall not be used in any corridors, mechanical electrical rooms and similar large spaces and areas of high ambient noise level. Provide white with red letters.
  - 2. Provide enviro kit for locations where dampness, water or dust are present.
  - 3. The audible emergency alarms shall produce a sound that exceeds the prevailing sound level in the room or space by at least 15 dba or shall exceed any maximum sound level with a duration of 60 seconds by 5 dba, whichever is louder with or without protective cover. Sound levels for alarm signals shall not exceed 110 dba at the minimum hearing distance from the audible appliance.
- D. Exterior Audible Signal:
  - 1. Provide semi-flush mounted, molded of high impact red thermoplastic and listed for exterior weatherproof locations.
- E. Manual Pull Station: Addressable pull stations shall contain electronics that communicate the station's status (alarm, normal) to the control panel over two wires which also provide power to the pull station. They shall be manufactured from high impact red Lexan with white lettering. Station shall mechanically latch upon operation and remain so until manually reset by opening with a key common to all system locks. Pull stations shall be double action without glass rods. The front of the station shall be hinged to a back plate assembly and shall be opened with a key to reset the station. The key shall be common with the control panels. The addressable manual station shall have address setting programmed electronically and automatically from the fire alarm control panel. Manual stations shall be designed for semi-flush (surface) mounting on standard electrical box.
- F. Intelligent Multi-Criteria Photoelectric Smoke Detectors
  - 1. The intelligent multi-criteria detection device shall include the ability to combine the signal of the thermal sensor with the signal of the photoelectric signal in an effort to react hastily in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a false alarm condition by examining the characteristics of the thermal and smoke sensing chambers and comparing them to a database of actual fire and deceptive phenomena.
  - 2. The detectors shall use the photoelectric principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the ANALOG level of smoke density. The detector shall provide automatic sensitivity "drift" compensation.

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- The detector shall also provide a "maintenance alert" feature whereby the detector shall initiate a trouble condition should the unit's sensitivity approach the outside limits of the normal sensitivity window.
3. The detectors shall provide address-setting means electronically and automatically at the control panel.
  4. The detectors shall provide operational status and alarm state LED. Under normal conditions, the LED shall flash, indicating the detector is operational and in regular communication with the control panel. An output connection shall also be provided in the base for connecting an external remote alarm LED.
  5. The detector shall be semi-flush ceiling mounted and be provided with modular detector head with twist-lock base. No radioactive material shall be used.
  6. Voltage and RF transient protection techniques shall be employed as well as smoke signal verification circuit and an insect screen.
- G. Intelligent Thermal Detectors
1. The detectors shall use dual electronic thermostats to measure temperature levels in its chamber and shall, on command from the control panel, send data to the panel representing the analog temperature level.
  2. The detectors shall provide address-setting means electronically and automatically at the control panel.
  3. The detectors shall provide operational status and alarm state LED. Under normal conditions, the LED shall flash, indicating the detector is operational and in regular communication with the control panel. An output connection shall also be provided in the base for connecting an external remote alarm LED.
  4. The detector shall be semi-flush ceiling mounted and be provided with modular detector head with twist-lock base.
  5. Thermal Detectors shall be combination rate-of-rise and fixed-temperature- rated at 135°F for areas where ambient temperatures do not exceed 100°F and shall be 200°F for areas where ambient temperatures exceed 100°F but not 150°F. The fixed temperature element shall consist of a fusible alloy retainer and actuator shaft. Detectors shall have a smooth ceiling rating of 2,500 square feet. Detectors shall be located as specified and where required by local code authority.
  6. Provide fixed temperature 190°F detector in kitchen in lieu of combination rate-of-rise / fixed-temperature type.
- H. Monitor Module:
1. Addressable monitor modules shall be provided where required to interface to contact alarm devices.
  2. The monitor module shall provide address-setting means electronically and automatically at the control panel. A status/alarm LED shall be provided which shall indicate that the monitor module is operational and in regular communication with the control panel, and indicate detection of an alarm condition.
- I. Control Module
1. Control/relay modules shall be provided where required to provide audible alarm interface and/or relay control interface. The control module may be optionally wired as dry contact (form C) relay.
  2. The control module shall provide address-setting means electronically and automatically at the control panel. A status/alarm LED shall be provided which shall indicate that the control module is operational and in regular communication with the control panel and indicate when the device is actuated via the fire alarm control panel.
- J. Auxiliary Interface Points: All auxiliary input points (fire suppression hoods, water flow, fire pump, AHU shut-down points, tamper switches, fire extinguishing systems etc.) shall be connected as required, and addressed as a separate initiating point of annunciation at the fire alarm panel and any remote annunciator as required.
- K. Water flow switches / Valve supervisory switches shall be provided and installed by the fire protection contractor and connected by the fire alarm contractor. Wiring of these field devices to the fire alarm system shall be the responsibility of the fire alarm contractor. It is the responsibility of this contractor to ensure the proper function of the system. Each fire protection zone (flow switch) and (Valve switch) shall be addressed electronically and automatically at the control panel as a

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separate point of annunciation at the fire alarm panel. Coordinate exact location with fire protection contractor and civil drawings.

### PART 3 - EXECUTION

#### 3.01 GENERAL REQUIREMENTS

- A. All installation practices shall be in accordance with, but not limited to, the specifications and drawings. Installation shall be performed in accordance with the applicable standards, requirements and recommendations of the National Electrical Code and any authorities having jurisdiction. Proper protection against corrosion shall be provided on all electrical equipment in accordance with the requirements of the National Electrical Code. The installation shall conform to all manufacturers' recommendations.
- B. All boxes, equipment, etc., shall be plumb and square. The contractor must take such precautions as are necessary to prevent and guard against electrostatic hum, to supply adequate ventilation, and to install the equipment to provide reasonable safety for the operator.
- C. In the installation of equipment and cables, coordinate with Architectural drawings for possible conflicts with millwork, casework, marker boards, furniture, lockers, etc., and notify the architect of any discrepancies. Verify modifications before proceeding with installation.
- D. Provide two dedicated phone lines from telephone company demarcation point to fire alarm panel. Telephone cable shall be Category 6 rated and installed in 3/4" conduit.
- E. Upright and/or Wall Post-Indicating Valve: Provide conduit and wiring from fire alarm control panel to post-indicating valve, coordinate exact location of PIV with fire sprinkler contractor prior to rough-in. Coordinate final location with Civil Drawings and Fire Protection Contractor.
- F. Auxiliary Equipment Monitoring Wiring and connection to equipment shall be the responsibility of the fire alarm contractor.
- G. Smoke detectors shall be mounted to a 4-inch octagon box with hanger bar or with box secured to building structure.
- H. Provide power via 120-volt, 20-Amp dedicated circuits with lock-on provisions at the respective circuit breaker for the main fire alarm control panel, each panel extender and each remote power supply at no additional cost to the Owner. The complete fire alarm system shall be powered under emergency power when emergency life safety power is available at the project site. When emergency life safety power is not available at the project site, power shall originate from the nearest available 120-volt panel. Label 120-Volt circuit origination (ie: "120-Volt Circuit ELA-3")
- I. Provide smoke detectors in the following locations:
  - 1. Elevator landings.
- J. Provide manual pull stations at each exterior exit and at each exit from all floors. Provide one manual pull station at the central reception area as directed by Owner.

#### 3.02 CABLE AND BOXES INSTALLATION

- A. All circuits shall be protected to avoid interruption of service due to short-circuiting or other conditions, which might adversely affect the connected devices. Each individual signaling circuit shall be classified as a circuit pair.
- B. The system ground is to be connected to the local ground bus. Under no conditions shall the AC neutral either in a power panel or in receptacle outlets be used for a reference ground.
- C. All wiring shall be in accordance with NFPA 72, the National Electrical Code, Local Codes. All wiring shall conform to recommendations of the equipment manufacturer, and as indicated on the engineered shop drawings.
- D. All wire shall be UL Listed FPL for limited energy (300V) and fire alarm applications and shall be

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installed in conduit. Limited energy FPLP or MPP wire may be run open in return air ceiling plenums provided such wire is UL Listed for such applications and is of the low smoke producing fluorocarbon type and complies with NEC Article 760 and approved by the local authority having jurisdiction.

- E. All fire alarm wiring to be red. All fire alarm circuits shall be identified at each termination and at each 25 feet between terminations.
- F. Systems utilizing open wiring techniques with low smoke plenum cable shall provide conduit in all inaccessible locations, inside concealed walls, all mechanical/electrical rooms, or other areas where wiring might be exposed to view and or subject to damage.
- G. All vertical wiring and all main trunk/riser wiring shall be installed in a complete raceway/conduit system. All riser boxes shall be adequately sized for the number of conductors transversing the respective box as well as the number of terminations required.
- H. All plenum wiring is to be installed parallel and perpendicular to the building structure. Cable shall be bundled with cable ties on a maximum of 2'-6". Install cable in D-ring hangers and secure to the structure at a maximum of 5' on center. Cable shall not lie on ceiling grid or ceiling tiles, light fixtures, piping, ductwork or foreign equipment.
- I. The system ground is to be connected to the local ground bus. Under no conditions shall the AC neutral either in a power panel or in receptacle outlets be used for a reference ground.

### 3.03 FINISHES

- A. Main Fire Alarm Panel color shall be approved by Owner / Architect.

### 3.04 SPARE PARTS AND TOOLS

- A. Interchangeable Parts: All spare parts furnished shall be directly interchangeable with the corresponding components of the installed system. Spare parts shall be packaged and identified by nameplate, tagging, or stamping. Spare parts shall be delivered to the site in unopened cartons for storage as directed by the Owner.
- B. Spare Parts: Provide minimum of two unless noted otherwise.
  - 1. Spare shut down modules
  - 2. Spare detectors of each type in the system
  - 3. Spare alarm indicating devices of each type in the system
  - 4. Spare manual pull stations
  - 5. Spare protective covers of each type in the system.
  - 6. Spare relays/controls required for connection to smoke and fire/smoke dampers
  - 7. Devices listed above are to be installed as directed by Architect/Engineer or local code authorities at no additional cost to the Owner. Unused spare parts are to be parts for Owner's cabinet.
- C. Parts list: Furnish a list, in duplicate, of all other parts and accessories the manufacturer of the system recommends to be stocked for maintenance.

### 3.05 KEYS

- A. Keys and locks for all equipment shall be identical. Provide not less than six keys of each type required. Identify keys by an appropriate number stamped on each key or on a metal tag attached thereto. Provide a key numbering chart in each operation and maintenance manual furnished.

### 3.06 GRAPHIC FLOOR PLANS

- A. Provide two (2) color coded floor plan detailed with actual room names, actual graphic room numbers as directed by the Owner, and adequate information to direct people to the fire alarm devices in alarm and to exits with non-fading floor plan media. Do not use architectural plan room names and numbers.

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### 3.07 OPERATING INSTRUCTIONS

- A. Provide Fire Alarm System Operating Instructions for the following items including, but not limited to:
  - 1. Alarm Signal
    - a. How to open panel door
    - b. What to read and follow the instruction on display
    - c. How to acknowledge alarm
    - d. How to silence the signals
    - e. How and when to reset the system
    - f. How to return system to normal operation
  - 2. Trouble / Supervisory
    - a. How to open panel door.
    - b. What to read and follow the instruction on display
    - c. How to acknowledge trouble condition
    - d. Appropriate personnel to respond
- B. Provide laminated instructions in extruded aluminum frame. Mount adjacent to the Fire Alarm Control Panel and remote annunciator panel(s) for ready reference.

### 3.08 ADDITIONAL REQUIREMENTS

- A. The contractor is to ensure all areas of the building are covered with visual and audio alarm devices for occupant notification of a fire alarm, including remote portable or temporary buildings used for administrative or educational purposes.
- B. Provide all accessories required for off-site monitoring for both analog POT (DTMF) and IP Ethernet communications. Coordinate with Owner for appropriate off-site monitoring service and communication technology to be used. Provide all necessary programming for interfacing with the Owner's on-site and off-site remote signaling receiving station, including programming of descriptors and addresses at the receiving station.

### 3.09 COMMISSIONING THE SYSTEM

- A. The installing contractor shall be responsible for verifying that each component of the system is fully operational and in conformity with the specifications. He shall also be responsible for insuring that all elements function together as a system in accordance with the specifications.
- B. A state licensed and factory trained technical representative of the manufacturer shall supervise the final control panel connections and testing of the system. Upon completion of the acceptance tests, the owner and/or his representatives shall be instructed in the proper operation of the system.
- C. The installing contractor shall functionally test each and every device in the entire system for proper operation and response. Any items found not properly installed or non-functioning shall be replaced or repaired and retested. The final test indicating a fully functional fire alarm system shall be recorded and printed and a copy submitted to the Architect, Engineer and Owner.
- D. It is the intent of these specifications and of the Architect/Engineer that a continued program of system maintenance be provided by the Owner in compliance with NFPA 72. It is mandatory that the installing Contractor provide such services and make available these services to the Owner upon completion of the project.

### 3.10 WARRANTY

- A. The fire alarm system, including labor and material, shall be free from defects in workmanship and materials, under normal use and service, for a period of one year from the date of substantial completion; Major components including but not limited to the main fire alarm panel, sub-panels, panel extenders, power supplies, and remote annunciators. Any equipment or workmanship shown to be defective shall be repaired, replaced or adjusted during normal working hours at no cost to the owner within 4-hour notification. Any equipment replaced shall be complete with full factory warranty for that part beginning on the date of installation.

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3.11 TRAINING

- A. Provide a minimum of 2-hours training course to all fire personnel assigned by Owner's Representative. The training shall include a course syllabus and hands-on participation. Training shall be conducted on site. The system shall be able to perform all system operations and simulate all types or forms of alarm conditions.

**END OF SECTION**

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Specifications



# Section 31 31 16

## Termite Control

Specifications

31 31 16-1

### PART 1 - GENERAL

- 1.01 SECTION INCLUDES
  - A. Soil treatment for termite control below grade and foundation perimeter at new and existing buildings.
- 1.02 RELATED SECTIONS
  - A. Section 31 06 20 - Schedules for Earth Moving
- 1.03 REFERENCES
  - A. EPA - Environmental Protection Agency - Federal Insecticide, Fungicide and Rodenticide Act.
- 1.04 SUBMITTALS FOR REVIEW
  - A. Section 01 33 00 - Submittals: Procedures for submittals.
  - B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.
- 1.05 SUBMITTALS FOR INFORMATION
  - A. Section 01 33 00 - Submittals: Procedures for submittals.
  - B. Test Reports: Indicate regulatory agency approval reports when required.
  - C. Manufacturer's Application Instructions: Indicate caution requirements.
  - D. Manufacturer's Certificate: Certify toxicants meet or exceed specified requirements.
- 1.06 REGULATORY REQUIREMENTS
  - A. Conform to applicable code for requirements for application, application licensing, authority to use toxicant chemicals in accordance with EPA.
  - B. Provide certificate of compliance from authority having jurisdiction indicating approval of toxicants.
- 1.07 SEQUENCING
  - A. Apply toxicant 12 hours prior to installation of vapor barrier under slabs-on-grade.
- 1.08 WARRANTY
  - A. Written in the form of an insurance policy in the amount of 10% of the project construction cost or \$100,000.00, whichever is less, for damages to building and contents. Rating for insurance company shall be A-, IV (4).
  - B. Shall be secured with a bond by a Louisiana-licensed Surety.
  - C. If evidence of termites occurs within warranty period, areas shall be retreated at no cost to the Owner.
  - D. Include optional renewal policy on annual basis after fifth year; fee shall be equitable and agreed upon by applicator and the Owner.
  - E. Test Reports: Indicate regulatory agency approval reports when required.
  - F. 5-years non-prorated from Date of Substantial Completion (not the application date) against infestation and/or termite damage.
  - G. Include coverage for damage and repairs to building and building contents caused by termites. Repair damage. Re-treat where required.
  - H. Inspect and report annually to Owner in writing.

### PART 2 - PRODUCTS

- 2.01 MATERIALS
  - A. Manufacturers:
    - 1. Dow AgroSciences
    - 2. FMC Corporation
    - 3. American Cyanamid Corp.
  - B. The chemical to be used shall be one which is accepted by the U.S. Department of Agriculture, Division of Insecticides and Fungicides as having prolonged effectiveness as a toxicant against subterranean termites. In no event shall the anticipated effective duration of the termite chemical be for less than two years. The chemical shall be applied at the dosage rate recommended by the manufacturer and the U.S. Department of Agriculture.
  - C. Toxicant Chemical: EPA approved; synthetically color dyed to permit visual identification of treated soil.

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- D. Diluent: Recommended by toxicant manufacturer.

### 2.02 MIXES

- A. Mix toxicant to manufacturer's instructions.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Notify Architect at least 48 hours prior to application.
- B. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.
- C. Verify final grading is complete.

### 3.02 APPLICATION

- A. Spray apply toxicant in accordance with manufacturer's instructions.
- B. Apply toxicant 12 hours min. prior to installation of vapor barrier under slabs-on-grade
- C. Apply toxicant at locations indicated in Schedule at end of Section.
- D. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.
- E. Re-treat disturbed treated soil with same toxicant as original treatment.
- F. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

### 3.03 PROTECTION OF FINISHED WORK

- A. Protect finished Work.
- B. Do not permit soil grading over treated work.
- C. Post signs in areas of application warning that poison has been applied; leave signs in place for minimum 2 weeks following application

### 3.04 SCHEDULES

- A. Locations:
  - 1. Under slabs-on-grade at building; apply as required at existing building.
  - 2. Soil within 10 ft. of building perimeter. Apply treatment to building perimeter after final grading is complete.
  - 3. All other areas as required to obtain Contractor's and/or manufacturer's warranty required by this Section.

**END OF SECTION**

## SECTION 32 1000 – DRIVEWAY AND PARKING CONCRETE PAVEMENT

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to construct the 6-inch, 8-inch, and 10-inch concrete pavement as shown on the Drawings and specified herein.
- B. The concrete pavement shall consist of Portland Cement Concrete placed in accordance with these Specifications, Plans, and any field adjustments made by the Project Architect.

### PART 2 - PRODUCTS

#### 2.1 MATERIAL

- A. Portland Cement Concrete (4000psi):
  - 1. Portland cement concrete shall consist of aggregates, Portland cement and water combined to meet requirements presented in the following paragraphs.

TABLE 02720

Mix types shall be used as follows:

<u>Class</u>	<u>Use</u>
6A4000	Pavement, Walks, Drives

- a. Cement: Allowable types of cement are as follows:

	<u>Cement Types</u>
Cast-in-Place Concrete (Non-Prestressed)	Type I, I(B) or II
Prestresses or Precast Concrete	Type I, I(B), I(C), II or III

- b. Admixtures: When approved, water-reducing and air-entraining admixtures may be used; however, no fly ash will be permitted. Air-entraining shall be required for slip form paving.

When air temperature is above 70°F and below 85°F, water-reducing admixture shall be the set-retarding type; when air temperature is 70°F or below, water-reducing admixture shall be the normal set type.

- c. Water: Free water shall include all water entering the mix with aggregate, except water absorbed by aggregate.
- d. Aggregate: Coarse aggregate shall be the grade specified in Table 10-11 of the current East Baton Rouge Standard Specification for Public Works Construction, Section 1005.
- e. Slump: Mixtures shall have slumps within the ranges shown in Table 02720-1 when tested by DOTO TR 207. The engineer may authorize an increase in maximum slump for concrete in walls and diaphragms less than 8" thick.
- f. Compressive Strength: Concrete mixtures shall provide compressive strengths not less than as specified in Table 02720-1.

B. Preformed Joint Fillers:

1. Preformed Resilient Bituminous Type: Fillers shall consist of preformed strips made of cane or other cellular fibers bound together and saturated with asphalt or strips formed from granulated cork bound together by an asphalt binder and encased between 2 layers of saturated or glass-fiber felt conforming to AASHTO M 213.
2. Wood Fillers: Bottom boards shall be clear heart redwood. Top boards shall be any type of wood which is free of defects that will impair its usefulness.
3. Preformed Bituminous Type: Bituminous preformed expansion joint filler shall consist of bituminous (asphalt or tar) mastic, formed and encased between 2 layers of bituminous impregnated felt. Preformed filler shall conform to ASTM D 994.
4. Preformed Closed Cell Polyethylene Joint Filler: Filler shall be formed by expansion of polyethylene base resin, extruded as a multicellular, closed cell, homogeneous section of foamed polyethylene. This material shall be used with an adhesive-lubricant conforming to ASTM D 717 4, Type I.

Filler and adhesive -lubricants shall be products listed in the LA DOTD QPL-18.

Filler shall conform to the following requirements:

<u>Property</u>	<u>Test Method</u>	<u>Requirement</u>
Density, pcf	ASTM D 3574	1.1-3.0
Water Absorption, % by vol, max.	ASTM C 272 <sup>1</sup>	1.0
Compression, psi	ASTM D 1056	
@20% deflection, min.		3.0
@80% deflection, max.		125.0
Extrusion @ 80% deflection, inches, max.	ASTM D 545	0.12

<sup>1</sup> The requirement that materials which trap water in flutes be dipped in absolute alcohol shall be omitted. Instead, filler shall be dried by blotting with absorbent paper.

C. Poured and Extruded Joint Sealant:

1. Hot Poured Rubberized Asphaltic Type: This material shall conform to ASTM D 6690, Type II. Sealant and backer materials shall be products listed in the QPL-67. Backer material shall be capable of withstanding temperatures up to 410°F (AASHTO D 5249, Type I).

2. Polyurethane Sealants: This joint system shall be a 1- or 2-component pourable or extrudable sealant with primers and backer material. It shall cure to a solid rubber-like material able to withstand both tension and compression.

Sealant with primers and backer materials shall be products listed in the QPL-5. Backer material shall comply with ASTM D 5249, Type II without the heat resistant requirement or Type III.

Container shall be labeled with name and type of material, batch number, manufacture date, and expiration date.

The material shall conform to the following requirements.

<b>Property</b>	<b>Test Method</b>	<b>Requirement</b>
Flow, inches, max.	AASHTO T 187 <sup>1</sup>	0.2
Tack-Free Time, h, max.	ASTM C 679	72
Bond, in. sep., max.	ASTM D 5893	0.25
Resilience, %, min.	ASTM D 5329	75
Ball Penetration	ASTM D 5329	5-20
Resilience (after heat aging) %, min.	ASTM D 5329	75
Weatherometer, 600 h, min.	ASTM D 5893	Pass
Ozone Resistance (Exposure to 100pphm ozone for 100 h@ 104°F, sample under 20% strain or bent loop)	ASTM D 1149	No Cracks
Weight loss, % max.	ASTM C 792	10
Infrared Charts Activator	DOTO TR 610	Pass
Base	DOTO TR 610	Pass
<sup>1</sup> Flow test will be conducted according to AASHTO T 187 except that samples shall be placed in an oven maintained at 150±2°F for 24 hours.		

3. Silicone Sealant: This joint system shall be an extrudable sealant and backer material with primer, if required. Silicone polymer shall cure to a solid rubber-like material able to withstand both tension and compression.

Sealant, backer materials and primers, if required, shall be products listed in the QPL-42.

Container shall be labeled with name and type of material, batch number, manufacture date, and expiration date.

Sealant shall conform to Fed. Spec. TT-S-001543 for Class A Sealants as modified by the following requirements:

<u>Property</u>	<u>Test Method</u>	<u>Requirement</u>
Flow, inches, max.	AASHTO T 187 <sup>1</sup>	0.3
Tack-Free Time at 77 °F and 45-55% R.H., minutes	Fed. Spec. TT-S-00227	20-75
Resilience, %, min.	ASTM D 3583 <sup>2</sup>	60
Resilience (after heat aging) %, min.	ASTM D 3583 <sup>2</sup>	60
Durometer, Shore A	ASTM C 661 <sup>2</sup>	10-25
Tensile Stress at 150% elongation, psi, max.	ASTM D 412, Die C <sup>2</sup>	75
Elongation, % min.	ASTM D 412, Die C <sup>2</sup>	1000
Bond, inches separation, max.	DOTD TR 635	0.25

<sup>1</sup> Flow test will be conducted according to AASHTO T 187, except that samples shall be placed in an oven maintained at 150±2°F for 24 hours or as recommended by the manufacturer.

<sup>2</sup> Cured 7 days at 75-90°F and 45-55% relative humidity or as recommended by the manufacturer. Check (carefully) above Table.

D. Preformed Elastomeric Compression Joint Seals:

1. Seals: Seal shall be a product listed in the QPL. Uncompressed seal depth shall be equal to or greater than the uncompressed seal width. Actual seal width shall not be less than nominal seal width.
  - a. Pavements: The material shall conform to ASTM D 2628 with the following exceptions:
    - 1) Ozone resistance may be determined by bent loop test method.
    - 2) Seal shall exert a minimum pressure of 3 psi (4 psi for expansion joints) at 80% of nominal width and a maximum of 25 psi at 50% of nominal width.
2. Bridges: Seal shall conform to ASTM D 3542 and shall exert a minimum pressure of 4 psi at 80% of nominal width.
3. Adhesive-Lubrocant: Adhesive-lubricant shall conform to ASTM D 4070 and shall be a product listed in the QPL-8.

E. Combination Joint Former/Sealer: This joint former/sealer is for use in simultaneously forming and sealing a weakened plane in concrete pavements.

Material shall consist of an elastomeric strip epoxied into a toothed groove formed at top of each of 2 rigid plastic side frames or mechanically bonded at top of the 2 rigid plastic side frames and covered with a removable plastic top cap. Side frames shall be of such configuration that when sealer is inserted into plastic concrete and vibrated, a permanent bond forms between side frames and concrete.

1. Elastomer: Elastomer strip portion of material shall be manufactured from vulcanized elastomeric compound using polymerized chloroprene as base polymer, and shall conform to the following requirements:

<u>Property</u>	<u>Test Method</u>	<u>Requirement</u>
Tensile Strength; psi; min.	ASTM D 412	1800
Elongation at Break, % min.	ASTM D 412	200
Hardness, Shore A	ASTM D 2240	65±10
Properties after Aging, 70 h @212°F		
Tensile Strength,% loss, max.	ASTM D 573	20
Elongation, % loss, max.		25
Hardness, pts. increase, max.		10
Ozone Resistance, 20% strain or bentloop, 300 pphm in air, 70 h@ 104°F	ASTM D 1149	no cracks
Oil Swell, ASTM Oil #3, 70 h@ 212°F, Wt. change,%, max.	ASTM D 471	45

2. Bond of Elastomer to Plastic: Force required to shear elastomer from plastic shall be at least 5 pounds per linear inch of sealer when tested by DOTO TR 636.
  - a. Bond of Plastic to Cement Mortar: Force required to separate cement mortar from plastic shall be at least 5 pounds per linear inch of sealer when tested by DOTD TR 636.

- F. Preformed Polyurethane Joint Filler: This material shall be a preformed polyurethane foam joint filler made with a semi-open, flexible polyurethane foam which is molded to such cross-sectional shape that it can be easily installed in joint and which will be sufficiently self-locking to prevent material from floating out of joint. Molded polyurethane foam shall be free of defects and internal voids greater than ½" and shall show no deterioration when immersed in a 50% by volume solution of mineral spirits and linseed oil for 24 hours. When filler is used to form joint, self-locking feature will not be required and filler will extend full depth.

Properties of polyurethane foam when determined on skin-free specimens shall conform to the following requirements:

<u>Property</u>	<u>Test Method</u>	<u>Requirement</u>
Tensile Strength; psi; min.	ASTM D 412	1800
Elongation at Break, % min.	ASTM D 412	200
Hardness, Shore A	ASTM D 2240	65±10
Properties after Aging, 70 h @212°F		
Tensile Strength,% loss, max.	ASTM D 573	20
Elongation, % loss, max.		25
<u>Property</u>	<u>Test Method</u>	<u>Requirement</u>
Hardness, pts. increase, max.		10
Ozone Resistance, 20% strain or bentloop, 300 pphm in air, 70 h@ 104°F	ASTM D 1149	no cracks

Oil Swell, ASTM Oil #3, 70 h@ 212°F,		
Wt. change,%, max.	ASTM D 471	45

<sup>1</sup> 65% deflection after 1-minute relaxation from deflection return.

Lubricant-adhesive recommended by joint filler manufacturer shall be applied according to manufacturer's directions.

G. Waterstops:

1. Copper waterstops shall conform to ASTM B 370, soft temper.
2. Polyvinyl chloride (PVC) waterstops shall conform to U.S. Army Corps of Engineers Specification CRD-C 572.
3. Rubber waterstops shall conform to U.S. Army Corps of Engineers Specification CRD-C 513.

H. Reinforcing Steel: Reinforcing steel for structures shall be Grade 60. No. 2 bars need not be deformed. Deformed bars shall conform to Headings (a), (b) or (c) below. Wire conforming to Heading (d) below may be used in lieu of No. 2 bars when furnished in size W 5.

1. Billet-Steel Bars shall conform to ASTM A 615.
2. Rail-Steel Bars shall conform to ASTM A 996.
3. Axle-Steel Bars shall conform to ASTM A 996.
4. Cold-Drawn Steel wire shall conform to ASTM A 82 with the following amendment: For material testing over 110,000 psi tensile strength in high strength applications such as spirals and ties, the 25% minimum reduction in area shall be reduced 5% for each 10,000 psi increment of tensile strength exceeding 110,000 psi.
5. Welded Steel Wire Fabric shall conform to ASTM A 185.
6. Epoxy Coated Reinforcing Steel shall conform to AASHTO M 284 and shall be a product listed on the DOTD QPL-51.
7. Spiral Reinforcing: Spiral reinforcing shall conform to Subsection 1006-1 (a), (b), (c) or (d).
8. Tie bars shall conform to Subsection 1006-1 (a), (b) or (c). Tie bars to be bent and restraightened during construction.

I. Curing Materials:

1. Liquid Membrane-Forming Compounds: This material shall conform to AASHTO M 148 and be a product listed in the QPL-65. Types shall be Type 2 white-pigmented or Type 1-D, clear or translucent with a fugitive dye, as specified.
2. Burlap Cloth shall conform to AASHTO M 182, Class 3.
3. Waterproof Paper shall conform to AASHTO M 171.
4. White Polyethylene Sheeting shall conform to AASHTO M 171.



5. Combined Burlap and White Polyethylene Sheeting shall conform to AASHTO M 171.
- J. Concrete admixtures shall be products listed in the QPL-58.
1. Water-Reducing Admixtures: These admixtures shall conform to DOTO TR 224.
  2. Water-Reducing, Set-Retarding Admixtures: These admixtures shall conform to DOTO TR 224.
  3. 3. Set-Accelerating Admixtures: These admixtures shall conform to DOTO TR 224.
- K. Applied Finish Coating: This material shall be a product listed in the QPL-14 and shall provide a uniform, fine-textured finish.

Material shall consist of a water-based coating containing pigments, texturizers, resins and water. Coating shall contain fungicides to prevent growth of mildew, mold, etc. No field additions to coating will be permitted.

- L. Concrete Curing Materials:
1. Liquid Membrane-Forming Compounds: This material shall conform to AASHTO M 148 and be a product listed in the QPL-65. Types shall be Type 2 white-pigmented or Type 1-D, clear or translucent with a fugitive dye, as specified.
  2. Burlap Cloth shall conform to AASHTO M 182, Class 3.
  3. Waterproof Paper shall conform to AASHTO M 171.
  4. White Polyethylene Sheeting shall conform to AASHTO M 171.
  5. Combined Burlap and White Polyethylene Sheeting shall conform to AASHTO M 171.
  6. Set-Accelerating Admixtures: These admixtures shall conform to DOTO TR 224.
- M. Applied Finish Coating: This material shall be a product listed in the QPL-14 and shall provide a uniform, fine-textured finish.

Material shall consist of a water-based coating containing pigments, texturizers, resins and water. Coating shall contain fungicides to prevent growth of mildew, mold, etc. No field additions to coating will be permitted.

- N. Dowel Bars: Dowel bars shall be plain steel bars conforming to Subsection 1006-1 (a), (b) or (c). Dowels shall have a uniformly round cross section and shall be saw cut, smooth and free of burrs and projections. Dowel bars shall be uncoated with an adhesive and given an outer coat of polypropylene or polyethylene. The coated dowel bar shall conform to AASHTO M 254.

### **PART 3 - EXECUTION**

#### **3.1 GENERAL**

- A. ROADBED PREPARATION: After the roadbed has been graded and compacted, the grade shall be trimmed to the correct elevation, extending the work at least 1 foot beyond each edge of the proposed pavement and to a greater width as necessary when the slip form paving is used.
- B. FORMS: Forms shall be metal and headers shall be timber. They shall be set firm and true to line and grade for a distance of at least 1 day's run of concrete in advance of placing the pavement. They shall be oiled immediately prior to placing concrete and shall remain in place for at least 12 hours after concrete has been placed, but must be removed before the work is accepted.

C. Joints:

Longitudinal Joint (Type CJ): The longitudinal joint shall be constructed such that the transverse joint is continuous across the slab. Deformed steel tie bars shall be placed perpendicular to longitudinal joints by approved mechanical equipment or rigidly secured by chairs or other approved supports. Tie bars shall not be coated with asphalt or other material or enclosed in tubes or sleeves. With split-slab construction, only Grade 40 tie bars may be bent at right angles against the form of the first lane constructed and straightened into final position before concrete of the adjacent lane is placed.

Tie bars which break or show evidence of fracture upon straightening shall be replaced by using an adhesive anchor system listed in Section 2h.

The joint shall be formed by either of the following methods:

1. Sawing: Sawing shall begin as soon as concrete has reached sufficient strength to support sawing equipment and tearing of concrete does not occur. Sawing shall be completed within 10 hours of placing concrete.

The joint sealant shall conform to Section 2.

After each joint is sawed, the saw cut and adjacent concrete surfaces shall be cleaned of materials removed during sawing.

No equipment, other than the sawing machine, will be permitted on the pavement during sawing. Sufficient back-up equipment shall be provided at the jobsite to continue sawing operations in case of a breakdown of primary sawing equipment.

During paving operations, joint locations shall be clearly marked.

2. Preformed Filler: Joint filler material conforming to Section 2 shall be inserted in a groove formed by a "T" iron wheel or other device that will ensure a groove that is true in both vertical and horizontal alignment. Grooves shall be cut in such manner that the concrete surface will not be depressed or otherwise disturbed. After insertion, the top edge of the strip shall be flush with the pavement surface and the surface floated.
3. Longitudinal Construction Joint (Type CJ): Longitudinal construction joints shall be constructed when adjacent lanes are constructed separately. Hand vibrators shall be used to consolidate concrete adjacent to joints. Joints shall include tie bars. Tie bars shall be protected from being coated with curing compound.
4. Transverse Expansion Joint (Type EJ): Filler shall be wood conforming to Section 2B, and sealer shall be a pourable or extrudable sealer conforming to Section 2C.

The wood filler shall be saturated with water before installation.

Dowel bars shall provide bracing adequate to hold wood filler in a vertical position.

5. Transverse Dummy Joint (Type DJ):
  - a. Sawing: Sawing shall begin as soon as concrete has reached sufficient strength to support sawing equipment and tearing of concrete does not occur. Sawing shall be completed within 10 hours of placing concrete. When

joint cannot be sawed to pavement edge due to form, an insert shall be placed in the 6" adjacent to form.

Saw cut and adjacent concrete surfaces shall be cleaned of materials removed during sawing.

No equipment, other than the saw machine, will be permitted on the pavement during sawing. Sufficient back-up equipment shall be provided at the jobsite to continue sawing operations in case of a breakdown of primary sawing equipment.

Joints shall be sealed with pourable or extrudable sealer conforming to Section 2C.

- b. Combination Former/Sealer: A groove shall be made in the fresh concrete at the joint location with a "T" iron or other suitable device. A combination joint former/sealer conforming to Section 2C shall be immediately installed and the concrete vibrated on each side. Top cap of the former/sealer shall remain in place until after final clean-up.

- 6. Transverse Construction Joint (Type CJ): A transverse construction joint shall be constructed when concreting is interrupted for over 1 hour, provided it is not within 10 feet of another transverse joint. If joint would be within 10 feet of another transverse joint, concrete shall be removed back to preceding joint.

Transverse construction joints shall include dowel bars and shall be formed and sealed as specified in Heading (e).

- 7. Dowel Bars: Dowels may be placed by a mechanical device equipped with means to control depth and alignment of bars. Dowel bars shall be positioned parallel to pavement centerline and surface and held in position by the mechanical device until concrete has been consolidated around bars.

Dowel bar assemblies shall have an expansion tube on each bar in expansion joints. Sleeve shall fit bar tightly and closed end shall be watertight.

- D. Placing Concrete: Subgrade or base shall be sprinkled to dampen the surface, but method of sprinkling shall not form mud or pools of water. Concrete shall be deposited in such manner as to require as little rehandling as possible. Placing shall be continuous between transverse joints without the use of intermediate bulkheads.

- E. Necessary hand spreading shall be done with shovels or other approved tools, excluding rakes and vibrators. Workers shall not walk in freshly mixed concrete with boots coated with dirt or foreign substances.

When concrete is to be placed adjacent to newly constructed pavement and equipment will be operated on the new pavement, the new pavement shall have attained an age of at least 10 days or a compressive strength of 3,000 psi.

When only finishing equipment is carried on newly constructed pavement, paving of adjoining pavement will be permitted after 1 day.

Concrete shall be placed as near to joints as possible without disturbing them.

Rain Protection: During paving operations, the contractor shall have at the jobsite sufficient polyethylene sheeting (18" minimum overlap) to protect the last hour's concrete from rain damage.

Cold Weather Protection: When air temperature is expected to reach the freezing point during the curing period, straw or other approved protective material shall be spread over the pavement to a sufficient depth to prevent concrete from freezing.

F. Consolidation and Finishing: Concrete shall be vibrated for the full width and depth of slab. Vibrators shall be operated no longer than 15 seconds in one location. Care shall be taken to assure consolidation of concrete against joint material and around dowel bars and tie bars.

1. Screeding: Concrete shall be screeded with an approved portable screed moved forward on forms with a combined longitudinal and transverse shearing motion! moving in the direction in which work is progressing and so manipulated that neither end is raised from side forms. This shall be repeated until the surface is of uniform texture true to grade and cross section and free from porous areas. The screed shall be controlled to maintain a uniform roll of concrete ahead of the screed.
2. Floating: Floating to provide the final surface will be required using a machine float. Following machine floating! long-handled floats may be used to smooth and fill open-textured areas. Long-handled floats shall not be used to float the entire pavement surface in lieu of machine floating unless the pavement crown will not permit use of the machine float.
3. Straightedging: Excess water and laitance shall be removed from the pavement surface by a steel straightedge. The entire plastic concrete surface shall be tested for trueness with a straightedge held in contact with the surface in successive positions parallel to pavement centerline. Depressions shall be immediately filled with freshly mixed concrete struck off and refinished. High areas shall be cut down and refinished.
4. Final Texturing: After surface irregularities have been removed and a satisfactorily smooth surface obtained! concrete shall be textured with a metal tine device. Final texturing as specified herein will not be required for pavement that will be overlaid with asphalt concrete.
5. Grooves shall be produced transverse to the roadway centerline on 1/2" centers and shall be 1/8" wide and 1/8" to 3/16" deep.
6. Edging: After drag finishing and before concrete has reached initial set! pavement edges and joint edges requiring rounding shall be tooled. Tool marks adjacent to joints shall be removed by brooming.
7. Hand Finishing: Concrete shall be hand finished only in the following cases:
  - a. In case of breakdown of mechanical finishing equipment, concrete already placed may be hand finished.
  - b. Pavement widths less than 15 feet.
  - c. Areas of irregular dimensions.
  - d. Pavement to be overlaid with asphalt concrete.

- 3.2 SLIP-FORMING PAVING: Slip-form paving equipment shall be provided with traveling side forms of sufficient dimensions! shape and strength to support the concrete laterally for a sufficient length of time during placement to produce pavement of the required cross section, and it shall satisfactorily spread, consolidate, screed and float the fresh concrete.

The full width of concrete paving shall be internally vibrated. Vibratory placement of dowel bars and tie bars shall occur within trailing forms. Vibration shall be stopped when slip-form paver stops. Pavement edges shall not deviate more than 1/2" from specified alignment. Edges shall not slump more than 1/4". [Need to tighten/better define prior two sentences, i.e. vertical and horizontal references].

- A. When concrete is placed adjacent to existing pavement, that part of equipment supported on existing pavement shall have rubber tires or shall have protective pads on crawler tracks, offset to run a sufficient distance from pavement edge to avoid breaking the edge.

Concrete shall be given the final surface finish in accordance with Subsection 502-7(e).

- B. CURING AND PROTECTION:

1. Curing: Concrete shall not be left exposed for more than 1/2 hour during the curing period. Curing shall be maintained for 72 hours. The pavement surface shall be uniformly sprayed with curing compound immediately after completion of surface finishing and as soon as surface water evaporates. Curing compound shall not be applied during rainfall.

Curing compound shall be applied under pressure by mechanical sprayers at the rate recommended by the manufacturer but no less than 1 gallon/100 SF. Spraying equipment shall be of the fully atomizing type equipped with a tank agitator. During application, compound shall be stirred continuously by mechanical methods. Hand spraying of irregular shapes and surfaces exposed by form removal will be permitted provided compound has been agitated prior to placing in sprayer. Compound shall not be applied to inside faces of joints to be sealed. In split slab construction, compound shall be so applied as to prevent spraying exposed tie bars.

When side forms are removed before the end of the curing period, exposed sides of slabs shall be immediately protected by applying curing compound.

- C. SEALING JOINTS: Joints shall not be sealed until at least 7 days after concrete is placed. Pavement may be opened to traffic prior to sealing provided insert has not been removed or sawed. After sealing joints, the pavement shall be closed to traffic until the next day.

Joints shall be sandblasted immediately prior to sealing. Joint faces shall be dry and dust free prior to sealant installation. Air temperature at time of placement shall be at least 500 F. Backer material shall be placed as shown in the plans.

The material shall be forced against joint walls by approved methods.

- D. ACCEPTANCE REQUIREMENTS

1. General: Sampling and testing for acceptance will be conducted on each lot of pavement for thickness, compressive strength and surface tolerance. Any pavement that is obviously deficient shall be satisfactorily corrected or removed and replaced.

A concrete pavement lot is an identifiable area of approximately 4,000 square yards paid under the same item. The final area of pavement placed will be considered as a lot if it is at least 2,000 square yards; otherwise, it will be included in the previous lot.

**Thickness and Compressive Strength:** Strength and thickness of pavements will be determined from hardened concrete cores in accordance with DOTO TR 225. Each lot will be divided into 5 equal segments and 1 core will be obtained from each segment.

Core holes shall be patched by the contractor using an approved mixture. Surface of the patch shall be finished to match surrounding pavement.

- a. **Thickness:** Average thickness of the pavement lot shall not be less than the specified thickness. If the thickness of a sample core is deficient by more than 1", the core shall be discarded and the segment recorded. If the thickness of the second core is deficient by more than 1", the pavement segment shall be removed and replaced.
- b. **Compressive Strength:** The compressive strength of cores will be determined after a minimum of 28 days. Average compressive strength for the lot shall be at least 3,800 psi. If the compressive strength of a sample core is less than 3,000 psi, the core shall be discarded and the segment recorded. If the compressive strength of the second core is less than 3,000 psi, the pavement section shall be removed and replaced.
- c. **Small Projects:** Projects with less than 2,000 square yards of pavement may be cored as required in Headings (1) and (2) above, or may be accepted on the basis of compressive strength cylinders and thickness measurements taken by the engineer.

2. **Surface Tolerance:**

- a. **General:** Pavement travel lanes will be tested using an approved Ames California Type 25-foot Profilograph over each wheel path of each lane except that the outside wheel path will not be tested on projects which have drain inlets and curb along the outside edge of pavement. The resulting profile trace will be evaluated to determine the location of high points in excess of specification limits and to determine the pavement's Average Profile Index. The Average Profile Index is defined as the arithmetic average of the Profile Indexes of the wheel paths for each test section.

Shoulders, turnouts, turn lanes, crossovers and the 25-foot areas of new travel lanes in tie-in areas shall be tested with a 10-foot metal static straightedge.

The operation of the profilograph, including evaluation of the profile trace, determination of the Profile Index for each wheel path in each travel lane, calculation of the Average Profile Index for each roadway and determination of high points in excess of specification limits shall be in accordance with DOTO TR 641. The operation of the profilograph and evaluation of the profile trace shall be by trained personnel.

The Blanking Band Template for determining the Profile Index shall be 0.2". The Bump Template for determining high points in excess of specification limits shall be 0.4" in 25 feet or less. The pavement profile determination will terminate approximately 25 feet from each bridge approach slab or existing pavement that is

joined by new pavement. Obvious deficient areas, as determined by the engineer, shall be corrected before profilograph testing.

- b. Requirements: Surface finish testing will be conducted in the longitudinal direction. Deficiencies shall be isolated in both the longitudinal and transverse directions.

Pavement travel lanes with surface deviations represented by high points in excess of 0.4" in 25 feet or less shall be corrected. A report as required in DOTO TR 641 of each profile trace performed by the contractor shall be supplied to the engineer for review. Pavement surface shall have an Average Profile Index of not more than 20.0" per mile per lot. Pavement tie-in areas with surface deviations in excess of 1/4" in 10 feet shall be corrected. Pavement shoulders, turnouts, turn lanes and crossovers with surface deviations in excess of 1/2" in 10 feet shall be corrected.

- c. Corrections: Corrections shall be made using an approved profiling device or by removing and replacing the pavement as directed. In cases where corrections are made using an approved profiling device the contractor shall re-establish transverse grooving by sawing to provide a uniform texture conforming to Subsection 502-7 (e). Corrective work will be at no direct pay and shall be completed prior to determination of pavement thickness.

- 3.3 PAYMENT: Payment for Portland cement concrete pavement will be made as a part of the lump sum price for the project.

**END OF SECTION 32 1000**

**SECTION 32 1123 – SAND CLAY GRAVEL BASE COURSE**

**PART 1 - GENERAL**

**1.1 SCOPE OF WORK**

- A. Furnish all labor, materials, equipment and incidentals required to construct the base course foundation for concrete paving as shown on the Drawings and specified herein.
- B. The base course shall consist of a Sand Clay Gravel foundation placed in accordance with the Project Geotechnical Report.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

A. Base Course Aggregates:

- 1. Sand Clay Gravel: This aggregate shall be a mixture of sand, clay and either gravel, stone, or crushed concrete.

The mixture, as determined by visual inspection, shall be free from vegetation or other foreign matter. The mixture shall conform to the following gradation:

<u>U.S. Sieve</u>	<u>% Passing</u>
2½"	100
1½"	95-100
No. 4	40-65
No.40	20-50
No.200	10-25

Material passing No. 40 sieve shall conform to the following:

	<u>Maximum</u>
Liquid Limit	25
Plasticity Index	6

**PART 3 - EXECUTION**

**3.1 CONSTRUCTION**

Base course material shall be transported and spread by methods that do not damage the subgrade. Any damaged subgrade shall be repaired before base course is placed thereon. Base material shall be shaped and compacted to at least 95% of maximum density at Optimum Moisture Content according to ASTM D-698A.

**3.2 PAYMENT:**

The cost of this item shall be included in the lump sum price for the entire project.

**END OF SECTION 32 1123**



**SECTION 32 1700 - PAINTED PAVEMENT STRIPING AND MISCELLANEOUS SIGNING**

**PART 1 - GENERAL**

**1.1 SCOPE OF WORK**

- A. This work consists of furnishing and placing pavement striping and signage in accordance with the plans, specifications, and the Manual of Uniform Traffic Control Devices (MUTCD).

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. **Traffic Paint:** Material shall be alkyd or water-borne traffic paint. Each container shall bear a label with name and address of manufacturer, trade name or trade mark, type of paint, number of gallons, batch number and date of manufacture.

Paints shall be products listed in the LA DOTD QPL, shall show no excessive settling, caking or increase in viscosity during 6 months of storage, and shall be readily stirred to a suitable consistency for spray application.

- 1. Alkyd Traffic Paint: Material shall be a rapid-setting compound suitable for use with hot application equipment. The material shall meet the following requirements:

<u>PROPERTY</u>	<u>TEST METHOD</u>	<u>REQUIRMENTS MIN. / MAX.</u>
Weight, lb/gal	ASTM D 1475	12.0
Viscosity@ 77DF, Krebs Units	ASTM D 562	85 115
Drying Time, s	ASTM D 711	--- 180
Directional Reflectance, %	ASTM D 97	80 ---
White		50 ---
Yellow		
Bleeding	Fed. Spec. TT-P-115	Pass
Total Solids, % by weight	ASTM D 1644, Method A	70 ---
Film Shrinkage <sup>1</sup>		Pass
Hiding Power <sup>2</sup>		Pass
Pigment, %	ASTM D 2371 50	50 ---
Nonvolatiles in Vehicle, % by wt	ASTM D 215	35 ---
Flexibility		Pass
Pigment Composition <sup>3</sup>	Fed. Spec. TT-P-1952	Pass

<sup>1</sup> Film Shrinkage: Cast a wet film 30 mils thick over a glass plate. Allow sample to cure at room condition for 4 to 5 hours. Cured film shall have a minimum thickness of 12 mils.

<sup>2</sup> Hiding Power: Paint shall have a wet hiding power of at least 350 square feet per gallon. Compound shall have sufficient hiding power to cover any pavement when applied at wet film thickness of mils.

<sup>3</sup> Pigment Composition: White paint shall contain at least 1.5 pounds of TiO<sub>2</sub> pigment per gallon with at least 92% TiO<sub>2</sub> content. The TiO<sub>2</sub> shall conform to ASTM D 476. Yellow paint shall contain at least 1.3 pounds of medium chrome yellow pigment per gallon (ASTM D 211, Type III).

2. Water Borne Traffic Paint: Material shall be a rapid-setting waterborne compound suitable for use with hot application equipment. Material shall meet the following requirements:

PROPERTY	TEST METHOD	REQUIRMENTS MIN. / MAX.
Weight, lb/gal	ASTM D 1475	12.0
Viscosity@ 77DF, Krebs Units	ASTM D 562	85 115
Drying Time, s	ASTM D 711	--- 180
Directional Reflectance, %	ASTM D 97	80 ---
White		50 ---
Yellow		
Bleeding	Fed. Spec. TT-P-115	Pass
Total Solids, % by weight	ASTM D 1644, Method A	70 ---
Film Shrinkage <sup>1</sup>		Pass
Hiding Power <sup>2</sup>		Pass
Pigment, %	ASTM D 2371	50 ---
Nonvolatiles in Vehicle, % by wt	ASTM D 215	35 ---
Flexibility		Pass
Pigment Composition <sup>3</sup>	Fed. Spec. TT-P-1952	Pass
<sup>1</sup> Paint applied at 15 mils wet on road surface with paint heated to 120-150DF shall not show tracking when vehicle crosses at 3 minutes. <sup>2</sup> Paint shall show no excessive setting, caking or increase in viscosity during 12-month storage and shall be readily stirred to a consistency for use in striping of mils. <sup>3</sup> Yellow shall match Federal Test Standard No. 595, Color 13538. White shall be a clean, bright, untinted binder. <sup>4</sup> White paint shall contain at least 1.0 lb of TiO <sub>2</sub> per gallon conforming to ASTM D 476.		

**B. Glass Beads For Drop-On Application:** Glass beads shall be colorless, clean and transparent, and free from milkiness or excessive air bubbles. The contractor may furnish moisture-proof beads.

1. Shape: At least 70% of beads on each screen shall be true spheres as determined by microscopic Examination.
2. Refractive Index: Glass beads shall have a Refractive Index of 1.5 to 1.6 when tested by liquid immersion method at 77DF. Size and quality of beads shall be such that performance requirements for retroreflective pliant polymer film will be met.
3. Gradation: Beads shall conform to the following gradation when tested by DOTO TR 634:

<u>U.S. Sieve</u>	<u>% Retained</u>
No. 20	0
No. 30	10 – 20
No. 50	30 – 75
No. 80	9 – 32 <sup>1</sup>

<sup>1</sup> No more than 15% shall pass No. 80 sieve.

4. Acid Resistance: Approximately 100 beads shall be placed on a microscope slide and immersed in a 3N-H<sub>2</sub>SO<sub>4</sub> solution. After 10 minutes immersion, not more than 20 % of beads by count shall show a hazed surface, and there shall be no popping or bursting of beads.
5. Sodium Sulfide Resistance: Place approximately 1 gram of beads in glass container with stopper and cover with a solution of 50% Na<sub>2</sub>S, 48% distilled

water, and 2% Aerosol OL or similar wetting agent. Shake container frequently and examine beads after 1 hour. Beads shall show no darkening.

**C. Handicapped Parking**

1. Screen Printed Signs
  - a. 18 Gage bonderized steel with blue baked enamel finish and white screen-printed copy.
2. Copy and Size
  - a. "Handicapped Parking Only" – 12 inches by 18 inches.
  - b. "Van Accessible" – 12 inches by 6 inches.
3. Post: Galvanized pipe column minimum 9 feet long.

**D. Temporary Signs and Barricades:** The contractor shall furnish and install temporary construction signs and barricades before construction begins. When construction signs are in place and approved, existing permanent signs that are in conflict with construction signs shall be covered or removed. That contractor shall furnish and install additional signs as necessary during construction, relocate signs on the project when required, maintain signs by cleaning or replacing as necessary, and remove construction signs upon completion of the work.

**E. Permanent Roadside Signs:** Removal of existing signs shall always be coordinated with new sign construction to provide adequate signing.

1. Posts: The contractor shall determine length of post required at each sign location. Post shall be driven vertical by methods that will not damage posts. Minimum ground penetration shall be 2 feet for delineator and object marker signs, and 3 feet for other signs.
2. Sign Faces: Signs shall be mounted 7 feet above pavement edge to bottom of sign, except that a secondary sign below another sign shall be mounted 4 feet from pavement edge to bottom of sign. Signs shall have a lateral clearance of 2 feet from pavement edge (or face of curb) to edge of sign, except that delineators and object markers on open ditch sections shall have a lateral clearance of 2 feet from shoulder edge to sign.

### **PART 3 - EXECUTION**

- 3.1 PAINTED STRIPING:** Paint shall be applied at approximately 130°F to a thickness of 15 dry mils or 22 wet mils. Glass beads shall be applied immediately to wet paint at rate of 10 lb/gal of paint by compressed air.
- 3.2 PROTECTING OF STRIPING:** Traffic shall be prevented from crossing a wet stripe by use of flaggers or other methods. Stripes which have been marred or picked up by traffic shall be repaired, and pavement outside striping cleaned.
- 3.3 INSTALLATION:** Install signs plumb, level and square and in proper planes with other work, at heights as indicated. Attach as recommended by sign manufacturer.
- 3.4 EXTERIOR INSTALLATION – PARKING SIGNS:** mount posts in 12-inch round by 2'-6" deep concrete footing.
- 3.5 PAYMENT:** Payment for pavement striping will be made as a part of the lump sum price bid for the entire project.

**END OF SECTION 32 1700**

## **SECTION 33 1000 – WATER PIPING - MATERIALS AND STRUCTURES**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION OF WORK**

- A. The work covered by this section consists of all labor, materials, equipment, and incidentals necessary to completely furnish, install, test, and clean all water piping, valves, fittings, hydrants, services and accessories indicated on the drawings and/or specified herein including all appurtenances necessary to make the water system complete and fully operational.

#### **1.2 REFERENCED STANDARDS**

- A. American Petroleum Institute (API), 5L Specification for Line Pipe.
- B. American Railroad Engineering Association Manual for Railroad Engineering.
- C. American Standards Association
  - 1. ASA 816.1, American National Standard for Cast Iron Flanged Fittings and Flanges.
- D. American Society of Testing Materials
  - 1. ASTM A 120, Standard Specification for Black and Hot Dipped Zinc Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses.
  - 2. ASTM A338, Standard Specification for Malleable Iron Flanges, Pipe Fittings and Valve Parts for Railroad, Marine, and other Heavy Duty Service at Temperatures up to 650 Degrees F.
  - 3. ASTM B88, Standard Specification for Seamless Copper Water Tube.
  - 4. ASTM C127, Standard Test for Thermal Conductivity of materials by Means of the Guarded Hot Plate.
  - 5. ASTM D256, Standard Test for Impact Resistance of Plastics and Electrical Insulating Materials.
  - 6. ASTM D635, Standard Test for Flammability of Self-Supporting Plastics.
  - 7. ASTM D638, Standard Test for Tensile Properties of Plastic.
  - 8. ASTM D648, Standard Test Deflection Temperature of Plastics under Flexural Load.
  - 9. ASTM D696, Standard Test for Coefficient of Linear Thermal Expansion of Plastics.
  - 10. ASTM D746, Standard Test of Brittleness Temperature of Plastics by Means of a Cantilever Beam.
  - 11. ASTM D792, Standard Test for Specific Gravity and Density of Plastics by Displacement.
  - 12. ASTM D1238, Measuring Flow Rates of Thermoplastics by Extrusion Platometer.
  - 13. ASTM D1248, Standard Specification for Polyethylene Plastic Molding and Extrusion Materials.
  - 14. ASTM D1525, Standard Test for Vicat Softening Point of Plastics.
  - 15. ASTM D1693, Standard Test for Environmental Stress Cracking of Ethylene Plastic.
  - 16. ASTM 01784, Standard Specification for Rigid Poly (Vinyl Chloride) Compounds and Chlorinated Poly (Vinyl Chloride) Compounds.
  - 17. ASTM D2240, Standard Test for Indentation Hardness of Rubber and Plastics by Means of a Durometer.

18. ASTM D2241, Standard Specification for Poly (Vinyl Chloride)(CPVC) Plastic Pipe (SDR-PR).
  19. ASTM D2837, Obtaining Hydrostatic Design Basis for ThermoPlastic Pipe Materials.
- E. American Water Works Association
1. AWWA C101, American National Standard for Thickness Design of Cast Iron Pipe (ASA 21.1).
  2. AWWA C104, American National Standard for Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water (ASA 21.4).
  3. AWWA C106, American National Standard for Gray-Iron Pipe Centrifugally Cast in Metal Molds, for Water and Other Liquids (ASA 21.6).
  4. AWWA C108, American National Standard for Cast Iron Pipe Centrifugally Cast in Sand-lined Molds, for Water or Other Liquids (ASA 21.8).
  5. AWWA C110, American National Standard for Gray-Iron and Ductile Iron Fittings 3" through 48", for Water and Other Liquids (ASA A21.10)
  6. AWWA C111, American National Standard for Rubber Gasket Joints for Ductile Iron and Gray-Iron Pressure Pipe and Fittings (ASA A21.11).
  7. AWWA C150, American National Standard for the Thickness Design of Ductile Iron Pipe (ASA A21.50)
  8. AWWA C151, American National Standard for Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-lined Molds, for Water or Other Liquids (ASA A21.51)
  9. AWWA C153 Short Body Full Flow Ductile Iron Fittings 3" through 24" for Water and Other Liquids (AAS A21.10).
  10. AWWA C500, Standard for Gate Valves, 3" through 48" NPS, for Water and Sewage Systems.
  11. AWWA C502, Standard for Dry-Barrel Fire Hydrants.
  12. AWWA C504, Standard for Rubber-seated Butterfly Valves.
  13. AWWA C600, American National Standard for Installation of Gray and Ductile Cast-Iron Water Mains and Appurtenances.
  14. AWWA C601, Standard for Disinfecting Water Mains.
  15. AWWA C700, Standard for Cold-water Meters - Displacement Type.
  16. AWWA C800, Standard for Threads for Underground Service Line Fittings with Appendix on Collected Standards for Service Line Material.
  17. AWWA C900, Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4" through 12", for Water.
  18. AWWA C901, Standard for Polyethylene (PE) Pressure Pipe, Tubing, and Fittings, 2" through 3", for Water.
  19. AWWA C905, Standard for Polyvinyl Chloride (PVC) Pressure Pipe 14" through 36".
- F. National Fire Protection Association
1. NFPA No. 194, Standard for Screw Threads and Gaskets for Fire Hose Couplings.
- G. Louisiana Standard Specification for Roads and Bridges
- H. American National Standards/National Sanitation Foundation Standard for Drinking Water System Components (ANSI/NSF 61)

### **1.3 GENERAL**

- A. Contract Drawings: The contract drawings indicate the general design, arrangement and extent of the piping system. It is desired that the indicated positions be followed as closely as possible. Do not scale drawings for roughing in measurements nor use as shop drawings. Prepare shop drawings per Paragraph 1.04, Submittals, herein. The exact location of the various items is subject to construction, and the actual materials and equipment furnished by the Contractor. The Contractor shall verify the location of all items furnished, installed, or connected to by him. Coordinate work with other specification divisions.
  - 1. Piping systems shall be located from dimensions given on drawings or all implied locations shall be determined after field measurements have been taken.
  - 2. Should interferences or discrepancies prevent the installation of any part of the work, the Engineer shall be notified, and he will determine the steps necessary to complete the true development of the intent of the drawings and specifications.
  
- B. Materials
  - 1. General
    - a. Unless otherwise specified or shown, pipe, fittings, and general-purpose valves for each piping system shall be as shown in the drawings.
    - b. If there are any conflicts in the specifications, use the stronger pipe class. Contractor shall submit calculations with shop drawings where specified.
    - c. All piping shall have a minimum cover of 30 inches unless otherwise shown on the drawings.

### **1.4 SUBMITTALS**

- A. General: Shop drawings and product data shall be submitted in accordance with the General Requirements.
  
- B. Product data shall include all manufacturer's literature, catalog cuts and other descriptive literature to fully substantiate the conformance with specifications of materials and equipment submitted. Mark product-data to indicate exactly those items that are to be provided and cross out unrelated or nonapplicable items.
  
- C. Shop drawings shall include Contractor prepared plans, sections and details fully dimensioned showing all piping systems and appurtenances to be installed and with system designations as indicated herein. Show all

### **1.5 JOB CONDITIONS**

- A. Schedule of Work: Arrange work to comply with schedule of construction. In scheduling, anticipate means of installing equipment through available openings in structure.
  
- B. Coordination Of Work: The Contractor shall coordinate all trades whose work is adjacent, in order to avoid field interference and delay in execution of the work of all trades. Furnish detailed advance information regarding all requirements related to work by others. Furnish sizes and accurate data and location of any and all foundations, pits, chases, holes through beams, floors, walls, ceilings and roof, and other special openings required for this contract work.

- C. Inserts: Prior to the execution of each step in the general construction work, determine that all chases and holes required for the specified work are properly located and sized and supervise the setting of all sleeves, inserts and other required build-in items. If this preliminary work is not properly performed and should cutting be required to install the specified work, the Contractor shall bear all expense of cutting and restoring the construction to its original condition.
- D. Cutting: The work shall be carefully laid out in advance and any cutting of construction shall be done only with the written permission of the Engineer. Cutting shall be carefully done, and any damage to the building, piping, wiring and equipment as a result of the cutting shall be repaired by persons skilled in the particular trade.

## **1.6 MANUFACTURER**

- A. Pipe and fittings shall be manufactured by a firm regularly engaged in the successful manufacture of the type of pipe furnished AU water piping specified shall be NSF approved and all piping shall bear the NSF stamp of approval. (ANSI/NSF 61)

## **1.7 HANDLING OF PIPE**

- A. The pipe shall not be dropped or subjected to any unnecessary jar, impact or other treatment that might damage the pipe. Any unit of pipe that in the opinion of the Engineer is damaged beyond repair by the Contractor shall be replaced by another unit. Any pipe that is damaged and repairable shall be repaired in the field, or at the direction of the Engineer shall be returned to the manufacturing plant for repair.

## **PART 2 - PRODUCTS**

### **2.1 DUCTILE IRON PIPE AND FITTINGS**

- A. Manufacture. Ductile Iron pipe shall be manufactured in the U.S.A. in accordance with the latest revision of ANSI/AWWA C151/A21.51. All ductile iron pipe shall be hydrostatic pressure tested at the plant of the manufacturer to 500 psi.
- B. Design. Ductile iron Pipe shall be designed in accordance with the latest revision of ANSI/AWWA C150/A21.50. The design shall include a minimum working pressure of 150 psi plus a 150 psi surge allowance. A two to one safety factor shall be applied to the sum of the working pressure plus the surge allowance. A two to one safety factor shall also be applied to the bending stress and deflection design for a Type 3 to Type 5 laying condition with the depth of cover as required per the plans.
- C. Unless noted otherwise on the plans, the minimum pressure classes for ductile iron pipe shall be as follows: PC 350 for 8" 12" pipe, PC 250 for 14" - 20" pipe, PC 200 for 24" pipe and PC 150 for 30" and larger pipe.
- D. Coating and Lining. Pipe shall have a standard asphaltic coating on the exterior. Pipe shall have a cement mortar lining on the interior in accordance with the latest revision of ANSI/AWWA C104/A21.4.



- E. Joints. All in plant ductile iron piping shall be restrained joint. "Fast-Grip", "Flex-Grip", "Field Flex-Ring", "Lok-Ring" or approved equal shall be used.
- F. Flanged Pipe. All above ground or exposed pipe shall be ductile iron and shall comply with ANSI/AWWA C115/A21.15. The pipe barrel shall be made in accordance with ANSI/AWWA C151/A21.51, and shall have a thickness of no less than special thickness Class 53. All flanges shall be ductile iron and rated for a working pressure of 250 psi. Flange pipe and fittings shall be cement lined as specified above and shall be shop primed on the outside diameter with either TNEMEC 37H77 Chem Primer for an alkyd-phenolic primer or TNEMEC 140-1211 Pota-1211 Pota-Pox Plus for high solids epoxy primer.
- G. Outlets. Welded on outlets may be provided in lieu of trees and crosses. Outlets shall be fabricated from centrifugally cast ductile iron pipe, manufactured and tested in accordance with the latest revision of ANSI/AWWA C151/A21.51, using a high nickel content weld such as tJi-Rod #55. Welding shall be performed in the pipe manufacturer's shop only. Outlets shall not be more than 70% of the size of the parent pipe. Minimum walls for the parent and outlet pipes shall be as published by American Ductile Iron Pipe or other approved manufacturer.

## 2.2 POLYVINYL CHLORIDE (PVC) PIPING:

All PVC piping shall meet the requirements of ASTM D2241 and conform to one of the paragraphs as designated on the Drawings.

- A. AWWA C900, Plastic pipe designated as C900 shall be made of rigid polyvinyl chloride (PVC) compounds conforming to ASTM D1784 for Type 1, Grade 1 (PVC 1120). The pipe shall be standard sizes 1" through 12" in pressure class 100, 150 and 200 conforming with the outside diameter (OD) of cast-iron (CI) and with the wall thickness of dimension ratio DR series 25, 18 and 14 as indicated on the Drawings. Standard laying
- B. SDR 21 and 26. Plastic pipe designated as SDR 21 or 26 shall be made of rigid polyvinyl chloride (PVC) compounds conforming to ASTM D1784 for Type 1, Grade 1 (PVC 1120). The pipe shall be standard sizes 4n through 12" in pressure classes 160 (SDR-26) and 200 (SDR-21). The standard length shall be twenty feet (2ff) or forty feet (40').
- C. Polyvinylchloride (PVC) material for pipe, fittings, and couplings shall conform to ASTM D1784, Type 1, Grade 1, with 2,000 psi design stress. Pipe shall be Schedule 40 or 80 and shall be in accordance with ASTM D1785. Thickness schedule shall be as specified on pipe specifications sheets. PVC fittings shall be socket type conforming to ASTM D2466/2467. Solvent cement shall comply with ASTM D2564.
- D. Joints:  
  
Joints shall be rubber ring and made to manufacturer's specifications. Rubber rings shall be securely locked into the bell.
- E. Fittings:  
  
Fittings shall be the same type and grade, pressure rating and manufacturer of the pipe, and conform to the pipe specifications AWWA 900 or AWWA 905; or shall be ductile iron as specified herein under ductile iron pipe, except that fittings shall have all connections of standard AWWA dimensions or dimensions as required or with adapters of the proper class for the size of plastic pipe laid. Fittings 3" and smaller shall be PVC equal. Fittings 4" through 36" shall be ductile iron meeting C-153 specifications of AVVVVA. Where new water main is being cut into existing water main, only ductile iron fittings, all sizes, will be accepted.

F. **Manufacturer's Representative:**

The pipe manufacturer must furnish a trained representative for not less than one (1) eight (8) hour day on the job site to instruct and supervise the contractor in the proper method for installation of pipe and pipe fittings.

### **2.3 HIGH DENSITY POLYETHYLENE PRESSURE PIPE**

- A. High density polyethylene pipe shall be made from polyethylene resin compound that meet the for Type III, Category 5, Class C, Grade P34 as defined in ASTM D1248.
- B. The pipe produced from this resin shall have a classification of 345434C in accordance with ASTM D 3350 and shall have a Plastic Pipe Institute (PPI) rating of PE 3408.
- C. The material shall be of virgin quality and contain a minimum of 2% well dispersed carbon black. The workmanship shall be of the highest level compatible with current commercial practice. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same specification and from the same raw material supplier. The polyethylene pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions or other injurious defects. It shall be uniform in color, opacity, density and other physical properties.
- D. The pipe shall have a manufacturer's recommended hydrostatic design stress rating of 800 psi based on a material with a 1,600-psi design basis determined in accordance with ASTM 02837. The pipe shall conform to the dimensions, wall thickness, testing, marking and all other provisions of ASTM F 714 for the dimension ratios as shown on the drawings or on the bid form
- E. Pipe shall be marked at 5-foot intervals with a coded number which identifies the manufacturer, SOR; size, PPI rating, manufacturing standard reference and production code form which date and place of manufacture can be determined.
- F. Flange adaptors shall be manufactured by the same manufacturer as the pipe using the same resin as the pipe. Each flange adaptor shall be furnished with a ductile iron convoluted backup ring drilled to match a standard ANSI bolt pattern for welded steel pipe.
- G. The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions or other injurious defects. It shall be uniform in color, opacity, density and other physical properties.
- H. Butt fusion of the pipe and fittings shall be performed by the thermal butt fusion system. Polyethylene pipe lengths, fittings and flange adaptor connections to be fused shall be of the same type, grade and class of polyethylene compound and supplied by the same raw material supplier.

### **2.4 STEEL PIPE AND FITTINGS**

- A. Steel pipe shall meet the requirements of ASTM A 53 Grade B and shall be standard weight. Steel pipe specified to meet the requirements of A'NVVA C200 shall be designed to the maximum internal pressure given in the specifications.
- B. The minimum wall thickness for steel pipe 4 inches and up to and including 36 inches shall be 1/4 inch.

- C. Exposed pipe shall have grooved or shoulder type joints complying with AWWA C606 unless flanged ends or plain ends for flexible couplings are shown on the drawings are required. Flanged ends shall conform to AWWA C207 Class B with rubber gaskets.

Pipe used with groove and couplings shall be not less than standard weight and at least as thick as the minimum recommended by the coupling manufacturer or shall be provided with double fillet or butt welded collared ends to meet requirements. Laying length shall be as specified by the Contractor. Bends, fittings, and special fittings for pipe 14 inches and larger shall meet the requirements of AWWA C 208 and the same stress and load conditions required for pipe meeting the requirements of AWWA C 200 specified above. The Contractor shall determine and provide reinforcements or additional shell thickness as required to keep the combined stresses within the specified maximum.

- D. Coatings for steel pipe and fittings shall be hot applied coal tar enamel with Kraft paper wrap in accordance with AWWA C203, or coal tar epoxy per AWWA C210 or fusion epoxy coating per AWWA C213. Other steel pipe and fittings shall be factory cleaned and primed and field painted.
  - 1. Lining for steel pipe and fittings shall be cement mortar lining per AWWA C205.
  - 2. All field repair work shall conform to one of the following as applicable. Welding per AWWA C206, cement mortar lining per AWWA C602, and cold applied coal tar coating per AWWA C209.
- E. The manufacturer shall provide an affidavit of compliance as described in AWWA C200. tests of steel pipe and fittings, as specified in AWWA C200, are required.

**2.5 CASING PIPE**

- A. Pipe:

Casing pipe shall be steel having a minimum yield strength of 35,000 psi, conforming to A.P.I. Specification 5L. Casing shall have the following minimum wall thicknesses:

<u>Size (Non. Diam., In.)</u>	<u>Thickness (Inches)</u>
Under 12" I.D.	0.250
14 and 16 O.D.	0.281
18 O.D.	0.313
20 O.D.	0.344
24 O.D.	0.375
26 O.D.	0.438
28 and 30 O.D.	0.469
32 O.D.	0.500
34 and 36 O.D.	0.532
38, 40 and 42 O.D.	0.563

Both the interior and exterior of the pipe shall have a bituminous coating.

B. Joints:

Joints shall be butt welded. Coatings shall be continuous at the joints.

C. Carrier Runners:

The carrier pipe shall be supported by utilizing three way to concentric casing cradle as manufactured by T. D. Williamson, Inc., Pipeline Seal and Insulator Company, APS Casing Spacers or equal.

D. Casing Seal:

Casing seals, which seals the annulus between the casing and carrier pipe, shall be made of cement grout or bituminous material.

## 2.6 PLASTIC SERVICE PIPE

A. Polyethylene Pipe:

Polyethylene service pipe shall conform to AWWA Standard C901 and be approved by the National Sanitation Foundation. The pipe shall have a standard dimension ration (SDR) of 9, and pipe shall conform to PE 3306, Type III, Grade 3, Class C.

B. Service Pipe Connections:

Only compression type couplings with inserts or flared couplings will be acceptable. Hot flared or hose connections are not permitted. The pipe must be continuous from water main to meter.

## 2.7 MECHANICAL COUPLINGS

A. Flexible Couplings: Flexible (sleeve) couplings shall be of the full sleeve type, split sleeve type, or flanged adaptor type, as shown on the Drawings, specified herein, or as otherwise permitted by the Engineer. The coupling shall provide the requisite pipe flexibility without jeopardizing pipe integrity due to hydraulic thrust, and shall have the same pressure-rating as the pipe. Couplings shall have all metal bearing surfaces and shall be provided with galvanized steel bolts and nuts. Flexible couplings shall be restrained unless the Engineer has given his approval to omit this feature for specific cases.

1. Full Sleeve Type Couplings shall be properly gasketed and shall be of a diameter to fit the pipe. Each coupling shall consist of a steel middle ring, 2 steel followers, 2 gaskets and the necessary steel bolts and nuts to compress the gaskets. The couplings shall be Dresser Style 38, Smith-Blair Type 411, or equal. Couplings to be installed underground shall have a hot-dipped galvanized sleeve with corrosion resistant bolts conforming to ASTM A-193 (type 316 stainless steel).
2. Split Sleeve Type Couplings shall consist of one gasket, 2 housing clamps, and 2 bolts and nuts to obtain the flexibility for connecting the piping. Steel shoulders shall be provided and welded to the pipe ends to accommodate the couplings. The couplings shall be Kuhns, Ductile Iron Pipe Lock Coupling;
3. M.B. Skinner Seal; or equal.
4. Flexible Flanged Coupling Adaptors shall be of the sleeve type, consisting of steel middle ring, steel followers, gaskets, and steel bolts and nuts to compress

the gaskets. The couplings shall contain anchor studs of strength adequate to hold the pipe together under a pull equal to the longitudinal strength of the pipe at a tensile stress of 20,000 psi, and shall be Smith-Blair No. 913, Dresser Style 128, or equal. Couplings to be installed underground shall have a hot-dipped galvanized steel with corrosion resistant bolts conforming to AWWA C-111 (type 316 stainless steel).

All gauges shall employ valves or gauge cocks to facilitate cleaning and changing.

**2.8 NEW SERVICE ASSEMBLY WITH METER SETTING**

New water service assemblies with meter setting where called for on the Plans or in the Proposal, shall each include a plastic meter box with cast iron reading lid, service tap clamps or fittings, curb stop, corporation stop, and the required connectors and service pipe. All equipment shall be bronze. Water meters shall be furnished by the Contractor, except in the case where it is designated on the Plans or in the Special Conditions that meters will be purchased by the Owner, and furnished to the Contractor, in which case the Contractor will set the meters. These items, in place and accepted, shall together form a pay item for service assemblies of the various sizes. All connectors shall comply with A.VV.VV.A. Standard C800.

A. Service Assembly and Corresponding Service Pipe Size:

<u>SERVICE ASSEMBLY</u>	<u>SERVICE PIPE SIZE</u>
5/8" x 3/4" small res. & comm. (up to 2 baths)	3/4"
5/8" x 3/4" large res. & comm. (more than 2 baths)	1"
3/4" or 2-5/8" x 3/4"	1 1/2"
1" or 2-3/4"	1 1/2"
1 1/4" or 2-3/4"	2"
1 1/2" or 2-1"	2 1/2"
2"	3"
3"	4"

B. Water Meters

Water meters shall be cold water rotating disc type with hermetically sealed and magnetically driven registers as manufactured by AMCO Water Metering Systems, Inc., Ocala, Florida or an approved equal. Meters shall be first line quality of the manufacturer. The latest specifications of the A.W.W.A. Standard C700 shall be complied with, except in cases of conflict with these Specifications.

1. Main Cases:  
The main case shall be high grade waterworks bronze with hinged single lid cover and raised characters cast on them to indicate the direction of number stamped on the lid. The working pressure shall be 150 psi. Standard, Southern or non-frost proof bottoms shall be furnished unless noted otherwise on the Plans or in the Special Conditions. Non-ferrous strainers shall be provided which fit tightly against the main case. Meters 1 1/2" and larger shall be flanged.
2. Measuring Chamber:  
The measuring chamber shall be of 85-5-5-5 bronze alloy composition and stainless steel or monel trimmed. The moving unit shall be hard rubber rotating disc type. The disc shall be preferably the three-piece and the chamber shall be the two-piece type employing a thrust roller and insert.
3. Register:

The register shall be straight reading in gallons. The unit shall be completely encased, hermetically sealed, and driven by permanent magnets. There shall be a test index circle which shall be divided into one hundred (100) equal parts and red test hand.

- C. Corporation stops shall be of bronze or brass and shall be designed and manufactured in accordance with AWWA C800, except as modified herein.
- D. Corporation stops shall have Mueller inlet threads except that corporation stops for use with service clamps shall have IPS threads. Where corporation stops are used with plastic pipe, a brass companion flange shall be provided on the outlet of each corporation stop.
- E. Curb stops shall be similar to corporation stops as manufactured by Crane; Ford; McDonald or equal.
- F. All service taps shall be threaded couplings or strap clamps for A.V.V.W.A threads. Thread couplings for galvanized pipe shall not be permitted.

Maximum Size Threaded Coupling  
Permitted in Ductile Iron Pipe

<u>Pipe Size</u>	<u>Tap Size</u>	<u>Pipe Size</u>	<u>Tap Size</u>
2"	1/2"	8"	1 1/4"
3"	1/2"	10"	1 1/2"
4"	3/4"	12"	2"
6"	1"		

Where it is necessary to provide a service larger than the allowable ductile tap size, multiple taps shall be employed by staggering the taps around the pipe and spacing the taps at least twelve (12) inches apart and twelve (12) inches from the end of the pipe length, or service clamps shall be used.

Service strap clamps shall be galvanized malleable or ductile iron or bronze with rubber gasket. Clamps shall be Smith-Blair, Mueller, Dresser, Nappco or approved equal.

Maximum Size Service Clamp Permitted

<u>Pipe Size (Inches)</u>	<u>Size</u>	<u>Ductile Iron</u>	<u>Plastic and Galvanized</u>
			<u>Size</u>
2		1"	3/4"
2 1/2		1 1/4"	1"
3		1 1/2"	1 1/2"
4		2"	1 1/2"
6		2"	1 1/2"
8		3"	1 1/2"
10		3"	1 1/2"
12		4"	1 1/2"

## **PART 3 - EXECUTION**

### **3.1 LAYING WATER PIPE**

#### **A. General:**

Grading, excavation, and earthwork required in laying water pipe shall conform to Section 02315 of these Specifications. Installation of water pipe shall be in conformance with provisions of A.W.A.J.A. Standard C605, Installation of PVC pressure pipe for water mains, except in cases of conflict with these Specifications, in which case these specifications will govern.

When work is suspended either for the night or for any other reason, open ends of the pipe shall be securely capped or plugged to prevent the entrance of mud, water, animals, or any obstruction.

Dead ends of pipe and unused branches of crosses, tees, valves, etc., shall be closed with a plug suitable to the type of pipe used.

Proper and suitable tools and appliances for the safe and convenient handling and laying of pipe shall be used, and care shall be taken to prevent damage to pipe coating. If required by the size pipe being used, mechanical pullers (or spreaders) shall be used in conformance with the pipe manufacturer' instructions.

While pipe laying is in progress, the trench shall be kept free of water.

While suspended in the sling and before lowering in the trench, the pipe shall be swabbed dean and inspected for defects and tapped, with a light hammer to detect cracks. Defective, damaged, or unsound pipe shall not be used.

#### **B. Excavation and Bedding:**

The width of the trench at the top of the pipe for water pipe installation shall not exceed the external diameter of the barrel of the pipe plus nine inches (9") on each side.

Trenches for water lines shall be of a depth to provide a thirty inch (30") minimum cover over the top of the pipe.

Where sanitary sewer, storm sewer, or other subsurface utilities are encountered in trenching for water line, it will be permitted to lay pipe above the obstruction if a minimum cover of twenty-four inches (24") can be obtained while providing a cushion between the bottom of the pipe and the top of the obstruction of at least six inches (18") in thickness. Otherwise, the obstruction will have to be by-passed or tunneled under. Approval must be sought by the Department of Health in these situations.

Mechanical excavation shall be stopped so that the pipe may be laid on a firm, undisturbed, continuous native earth bed. Prior to laying the pipe, the trench shall be manually excavated so that it is flat, true to grade, and provides continuous contact with the pipe barrel. Bell holes shall be spaced as required providing two inches (2") minimum between earth and the pipe coupling.

If over digging occurs, the trench bottom must be brought back to grade with compacted select material, and the cost borne by the Contractor.

Where the bottom of the trench is rock, water bearing soil, or unstable material, the Resident Project Representative may direct that the pipe be bedded in granular material, a concrete cradle, or granular material on timber runners, and paid for as separate items. The pipe shall be bedded as provided above, but in no case shall the bedding provide less than eighteen-inch (18") cushion below and at the sides of any part of the pipe.

Granular material, where required, shall be sand, crushed stone, or gravel, and shall not exceed 3/4 inch maximum size.

Concrete for pipe foundations, where required, shall be proportioned as required hereinbefore for thrust blocking concrete. Other excavation and trenching requirements as specified hereinbefore (Section 2) shall be complied with.

C. Backfilling:

The initial backfill under the pipe haunches, around the pipe, and over the top of the pipe shall be manually placed in layers, each layer being thoroughly hand tamped. The thickness of each layer, prior to compaction, shall be six inches (6"). Special laying instructions of any pipe manufacturer shall be rigidly followed.

Where a Contractor uses a trenching machine for the excavation, the initial backfill shall be brought to not less than one foot (1') above the top of the pipe, as hereinafter specified. Should the Contractor elect to use a backhoe, dragline clam shell bucket or equipment other than a trenching machine, then the initial backfill shall be brought to not less than two feet (2') above the top of the

Other backfill requirements as specified hereinbefore in Section 2 of the Specifications shall be complied with.

### **3.2 PLACING VALVES AND FITTINGS**

A. Valves and fittings shall be placed in the location indicated on the Plans and as directed by the ENGINEER.

All underground valves shall be set vertically. Boxes shall be set with covers flush with the surface.

Before being placed in the trenches, all valves, meters, fittings, etc., shall be carefully examined to see that they are in good working order and are clean.

### **3.3 JACKING AND BORING PIPE**

A. General:

Where pipe is to be laid beneath railroads, Federal Highways, State Highways, and concrete pavement, jacking and boring is required. The Contractor will not be permitted to open cut.

The requirements of the approving agency; such as railroad or State Highway Department, shall govern over these Specifications and Plans.

Sub-surface operations resulting in damage to the tracks or pavement, shall be the responsibility of the Contractor and shall be repaired at no cost to the OWNER.



B. Jacking and Boring Casting Pipe:

Installing of steel casing pipe shall conform to the A.R.E.A. Manual for Railway Engineering and Louisiana Standard Specifications for Roads and Bridges, Sections 7 and 8, latest edition.

Where the ends of pipe used as casing for other pipe are below ground, the ends shall be sealed.

The barrel of the carrier pipe shall be supported within the casing. Supports or carrier runners shall be spaced as recommended by the manufacturer, or as directed by the ENGINEER.

3/4" diameter service lines not permitted to be jack and bored. Contractor must use 1" minimum service line.

**3.4 CONNECTING EXISTING PIPE LINES TO NEW WATER MAINS**

- A. On 3" and smaller water mains these connections shall be made each with the required number and size of corporation cocks, goosenecks, and branch connection. Valves and cast-iron fittings and pipe shall be paid for separately and in addition to this item. On 4" and larger water mains, tapping valves and tees will be required. These shall be a separate pay item.

**3.5 TESTING WATER PIPING**

- A. No pressure tests shall be made until all concrete thrust blocks are at least forty-eight (48) hours old.
- B. Before any water lines will be accepted by the Engineer, all lines shall be subjected to a hydrostatic pressure of 1.5 times the working pressure and shall not exceed the pressure rating of the pipe for a period not less than two (2) hours and any defective work revealed by the test shall be repaired or replaced by the Contractor and the system re-tested.
- C. the pressure test, a separate 24-hour leakage test shall be conducted. Leakage shall not exceed =

133,200

L= allowance in gallons per hour S = length of pipe tested in feet

D = nominal diameter of the pipe in inches

P = average test pressure during the hydrostatic test in lbs/in<sup>2</sup> (gauge).

All visible leaks shall be stopped, defects corrected, and pipe shall be re-tested. The Contractor shall submit to the Engineer test results in a neat, tabular form.

- D. The Contractor shall furnish all taps, pumps, piping, gauges, and measuring devices for performing all pressure and leakage tests.
- E. Where cement lined ductile iron pipe is used, the pipe shall be filled twenty-four (24) hours in advance of the pressure test

### **3.6 STERILIZATION**

- A. Following the pressure and leakage tests, all lines shall be flushed at a velocity of not less than 2.5 FPS and sterilized in accordance with A.W.W.A. Standard C601.
- B. All new potable water lines, including pipe, valves, etc. shall be sterilized prior to being placed in use with a solution of HTH Liquid Chlorine, or other approved disinfectant containing no less than fifty (50) parts per million of available chlorine.
- C. For this work, the Contractor shall furnish suitable plugs or caps for the pipe, injection pumps, pipe connections, and other equipment together with all labor required.
- D. While the disinfectant is being applied to any section of the system, the water shall be allowed to escape at all extremities of this section until an orthotolidin test shows a deep orange color. The disinfectant shall be allowed to remain in the pipe for twenty-four (24) hours, after which the lines shall be thoroughly flushed. Each section of the system shall be sterilized and re-sterilized until bacteriological approval has been obtained from the appropriate health agency.

### **3.7 CLEAN UP AND REPAIR**

- A. General: The Contractor shall maintain his operations in a neat and orderly manner causing as little inconvenience as possible. Within 10 working days from the time a trench is opened aii roadside ditches, culverts, etc, shall be repaired and surfaces thoroughly cleaned. All excess excavation shall be removed from the trench side and disposed of at the Contractor expense. The work area shall be then thoroughly cleaned.
- B. Clean-up and repair shall conform to the applicable requirements of Section 02315, Excavation, Backfilling and Compacting.

### **3.8 ACCEPTANCE**

- A. Final acceptance of the project will not be made until the CONTRACTOR has completed the total project and all tests, restoration, and clean-up have been performed to the satisfaction of the ENGINEER.

**END OF SECTION 33 1000**

## **SECTION 33 3100 – SANITARY SEWERAGE SYSTEMS**

### **PART 1 - GENERAL**

#### **1.1 SCOPE**

- A. The Contractor shall furnish all labor, equipment, materials, and incidentals, and shall construct gravity sewers, complete, as shown on the Drawings and as herein specified.
- B. The work shall include furnishing, laying, and testing gravity sewer pipe.

#### **1.2 SUBMITTALS DURING CONSTRUCTION**

- A. Submittals during construction shall be made in compliance with Section 01340, Shop Drawings, Project Data, and Samples.
- B. The Contractor shall submit within thirty (30) days after the date of the Notice to Proceed, a list of materials to be furnished, the names of suppliers and an expected schedule of delivery of materials to the site.
- C. Furnish in duplicate to the Engineer sworn certificates that all tests and inspections required by the Specifications under which the pipe is manufactured have been satisfied.
- D. The Pipe manufacturer shall inspect all pipe joints for out-of-roundness and pipe ends for squareness. The manufacturer shall furnish to the Engineer a notarized affidavit stating all pipe meets the requirements of ASTM ASCE, ANSI, etc., these Specifications, and the joint design with respect to square ends and out-of-round joint surfaces.

#### **1.3 INSPECTION AND TESTS**

- A. All pipe and accessories to be installed under this Contract shall be inspected and tested at the place of manufacture by the manufacturer as required by the Standard Specifications to which the material is manufactured.
- B. Each length of pipe shall be subject to inspection and approval at the factory, point of delivery, and site of work. Sample of pipe to be tested shall be selected at random by the Engineer or the testing laboratory and shall be delivered by the Contractor to the testing laboratory approved by the Engineer.
- C. When the specimens tested conform to applicable standards, all pipe represented by such specimens shall be considered acceptable based on the test parameters measured. Copies of test reports shall be submitted to the Engineer before the pipe is installed in the project. Acceptable pipe will be stamped with an appropriate monogram under the supervision of the testing laboratory.
- D. In the event that any of the test specimens fail to meet the applicable standards, all pipe represented by such tests shall be subject to rejection. The Contractor may furnish two additional test specimens from the same shipment or delivery for each specimen that failed and the pipe will be considered acceptable if all of these additional specimens meet the requirements of the applicable standards.
- E. Pipe which has been rejected by the Engineer shall be removed from the site of the work by the Contractor and replaced with pipe which meets these specifications.

- F. Other testing requirements specific to the type of pipe are included under the appropriate paragraph in Part 2, below.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. Sizes and strength classification of gravity sewer pipe to be used in all locations are indicated on the Drawings.
- B. Each length of pipe shall bear the name or trademark of the manufacturer, the location of the manufacturing plant, and the class or strength classification of the pipe. The markings shall be plainly visible on the pipe barrel.

### **2.2 POLYVINYL CHLORIDE (PVC) GRAVITY SEWER PIPE**

- A. Smooth wall pipe and fittings in sizes 4" through 15" shall be manufactured in accordance with the requirements of ASTM 03034 SOR 35 and 18" and larger shall be manufactured in accordance with ASTM F679, T-I wall Type 1, SOR 35. P.V.C. pipe shall be manufactured from PVC compound having a minimum cell classification of 12454C as described in ASTM D1784. The pipe shall be joined with an integral bell; bell and spigot; type rubber gasket joint. Each integral bell joint shall be of the push-on type meeting the requirements of ASTM D3212 and shall consist of a formed bell complete with a single rubber gasket. The rubber gasket shall conform to the requirements of ASTM F477 and shall be held in place in the bell by mechanical means.
- B. If pipe type is not indicated on the drawings, profile wall PVC pipe shall only be used with special permission from the Engineer. Profile wall PVC pipe in sizes 4" through 18" shall be manufactured in accordance with ASTM F794 and shall have a minimum pipe stiffness of 60 lbs./in./in. at five percent deflection when tested in accordance with ASTM D2412. Fittings for profile wall P.V.C. pipe shall be as those specified for smooth wall PVC pipe with use of appropriate adapters to make the connections. Profile wall PVC pipe and adapters shall be manufactured from PVC compound meeting a minimum cell classification of 12454C as described in ASTM D1784. The pipe shall be joined by either integral bell or coupling rubber gasket joints. The joint shall be of the push-on type meeting the requirements of ASTM 03212. The rubber gasket shall conform to the requirements of ASTM F477 and shall be held in place, either in the integral bell or coupling or on the pipe spigot, by mechanical means.
- C. if pipe type is not indicated on the drawings, profile wall PVC pipe shall only be used with special permission from the Engineer. This specification includes materials, test methods and installation requirements for 4 to 36-inch diameter polyvinyl chloride (PVC) corrugated pipe with a smooth interior. The requirements of this specification are intended to provide pipe and fittings suitable for underground use in non-pressure applications for sanitary sewers.

PVC corrugated pipe with a smooth interior shall conform to the requirements of ASTM Designation F949-99 (or latest revision). Pipe and fittings shall be homogenous throughout and free from visible cracks, holes, foreign inclusions or other injurious defects. The pipe shall be made of PVC compound having a minimum cell classification of 124548 as defined in ASTM Specification 01784.

All fittings for PVC corrugated sewer pipe with a smooth interior shall conform to ASTM F9494-99 Section 5.23.3. To

insure compatibility, the pipe manufacturer shall provide all fittings.

All joints shall be made with integrality-formed bell and spigot gasketed connections. The manufacturer shall provide documentation showing no leakage when gasketed pipe joints are tested in accordance with ASTM Test Method 03212. Elastomeric seals (gaskets) shall meet the requirements of ASTM Designation F477.

### **2.3 PVC PIPE JOINTS**

- A. The P.V.C. joints shall be of the push-on type so that the pipe and fittings may be connected on the job without the use of solvent cement or any special equipment. The joint seal shall be effected by a single rubber joint gasket designed to be assembled by the positioning of the continuous, molded rubber ring gasket in an annular recess and the forcing of the spigot end of the joining pipe into the socket, shall compress the gasket radially. the gasket and annular recess shall be designed and shaped so that the gasket is locked in place against displacement by mechanical means. Systems in which the gasket is held in place only by means of an adhesive agent shall not be
- B. considered equal to the mechanical anchorage and shall not be allowed. The rubber ring joint shall be designed for
- C. thermal expansion or contraction with a total temperature change of at least 75° F and shall meet the requirements of ASTM 03212. Lubricant furnished for lubricating joints shall be nontoxic, shall not support the growth of bacteria, shall have no deteriorating effects on the gasket or pipe material.

### **2.4 JOINTS FOR DISSIMILAR PIPE**

- A. Joints between pipes of different materials shall be made with a flexible mechanical compression coupling with No. 305 stainless steel bands as manufactured by Joints, Inc. of Gardena, California; Fernco Sealer Co., Ferndale, Michigan, or equal, or a concrete closure collar as directed by the Engineer.

### **2.5 PIPE BEDDING AND PIPE COVER MATERIALS**

- A. Pipe bedding material and trench backfill material shall be as specified in Section 02200.

### **2.6 STEEL PIPE AND FITTINGS**

- A. Steel pipe shall meet the requirements of ASTM A 53 Grade Band shall be standard weight. Steel pipe specified to meet the requirements of AWWA C200 shall be designed to the maximum internal pressure given in the specifications.
- B. 8. The minimum wall thickness for steel pipe 4 inches and up to and including 36 inches shall be 1/4 inch.

- C. Exposed pipe shall have grooved or shoulder type joints complying with AWWA C606 unless flanged ends or plain ends for flexible couplings are shown on the drawings are required. Flanged ends shall conform to AWWA C207 Class B with rubber gaskets.
- D. Pipe used with groove and couplings shall be not less than standard weight and at least as thick as the minimum recommended by the coupling manufacturer or shall be provided with double fillet or butt welded collared ends to meet requirements. Laying length shall be as specified by the Contractor. Bends, fittings, and special fittings for pipe 14 inches and larger shall meet the requirements of AWWA C 208 and the same stress and load conditions required for pipe meeting the requirements of AWWA C 200 specified above. The Contractor shall determine and provide reinforcements or additional shell thickness as required to keep the combined stresses within the specified maximum.
- E. Coatings for steel pipe and fittings shall be hot applied coal tar enamel with Kraft paper wrap in accordance with AWWA C203, or coal tar epoxy per AWWA C210 or fusion epoxy coating per AWWA C213. Other steel pipe and fittings shall be factory cleaned and primed and field painted.
- F. Lining for steel pipe and fittings shall be cement mortar lining per AWWA C205.
- G. All field repair work shall conform to one of the following as applicable. Welding per AWWA C206, cement mortar lining per AWWA C602, and cold applied coal tar coating per AWWA C209.
- H. The manufacturer shall provide an affidavit of compliance as described in AWWA C200. Shop hydrostatic tests of steel pipe and fittings, as specified in AWWA C200, are required.

**2.7 CASING PIPE**

- A. Pipe:

Casing pipe shall be steel having a minimum yield strength of 35,000 psi, conforming to AP.I. Specification 5L. Casings shall have the following minimum wall thicknesses:

<u>Size</u> <u>(Nom. Diam. • in.)</u>	<u>Thickness</u> <u>(Inches)</u>
Under 12" I.D.	0.250
14 and 16 O.D.	0.281
18 O.D.	0.313
20 O.D.	0.344
24 O.D.	0.375
26 O.D.	0.438
28 and 30 O.D.	0.469
32 O.D.	0.500
34 and 36 O.D.	0.532
38, 40 and 42 O.D.	0.563

Both the interior and exterior of the pipe shall have a bituminous coating.

B. Joints:

Joints shall be butt welded. Coatings shall be continuous at the joints.

C. Carrier Runners

The carrier pipe shall be supported by utilizing three way to concentric casing cradle as manufactured by T. D. Williamson, Inc., Pipeline Seal and Insulator Company, APS Casing Spacers or equal.

D. Casing Seal:

Casing seals, which seals the annulus between the casing and carrier pipe, shall be made of cement grout or bituminous material.

### **PART 3 - EXECUTION (Not Used)**

#### **3.1 PIPE DISTRIBUTION**

- A. Distribute material on the job no faster than it can be used to good advantage. Unload pipe which cannot be physically lifted by workers from the trucks, by a forklift, or other approved means. Do not drop pipe of any size from the bed of the truck to the ground. Do not distribute more than one week's supply of material in advance of laying, unless otherwise approved by the Engineer.

#### **3.2 PIPE PREPARATION AND HANDLING**

- A. Inspect all pipe and fittings prior to lowering into trench to insure no cracked, broken, or otherwise defective materials are being used. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.
- B. Use proper implements, tools, and facilities for the safe and proper protection of the work. Lower pipe into the trench in such a manner as to avoid any physical damage to the pipe. Remove all damaged pipe from the jobsite. Do not drop or dump pipe into trenches under any circumstances.

#### **3.3 LINE AND GRADE**

- A. Do not deviate from line and grade, as established by the Engineer, more than 1/2-inch for line and 1/4-inch for grade, provided that such variation does not result in a level or reverse sloping invert. To account for permissible variation in the pipe wall thickness, the measurement for grade shall be at the pipe invert, not at the top of the pipe. The Contractor shall furnish and set the line and grade boards at maximum intervals of 25 feet. If grade boards prove impractical because of trench or other conditions, other methods of controlling line and grade (including laser beam) may be submitted to the Engineer for approval.

- B. A substantial stake shall be driven on each side of the trench on a line at right angles to each stake of the primary line. A straight and even-edged 2-inch by 6-inch board shall be nailed or clamped to the stakes in a level position and at some even foot height above the grade line of the proposed sewer. The centerline of the proposed sewer
- C. shall be located by measurement from the primary line stake and marked upon the board. Not less than three such line and grade boards shall be set and immediately checked visually for errors in line and grade. As each additional board is placed, it shall be checked visually for error in line and grade. At least three boards shall be maintained at all times. During the laying of the pipe, a stout twill line shall be fastened to the boards at the center of alignment marks and pulled sufficiently tight to remove any noticeable or measurable sag. The line and grade of each pipe shall be obtained by measuring down from the string line by means of a plumbed grade pole.
- D. The Contractor may use the laser beam method of maintaining line and grade upon approval of the Engineer. Prior to approval, the Contractor shall submit evidence to the Engineer that a qualified operator will handle the equipment during construction. A "Caution-Laser Light" placard shall be mounted in a conspicuous place. When "in the pipe" method is used, grade boards will be required to install the first 50 feet of pipe, and the Contractor shall check the line and grade at any additional points at which offset stakes have been placed wherever so requested by the Engineer. If bending of the beam due to air temperature variations becomes apparent with "in the pipe" units, a fan shall be provided to circulate the air. However, air velocity shall not be so excessive as to cause pulsating or vibrating of the beam. If, in the opinion of the Engineer, the beam cannot be accurately controlled, this method of setting line and grade shall be discontinued. When the above ground method is used, the set-up shall be checked with three grade boards including one set at the upstream manhole. If the laser has a gradient indicator, two boards may be used to check the set-up. The grade board at the upstream manhole shall be retained to be used as a check as pipe laying progresses.

**3.4 PREPARATION OF TRENCH**

- A. Provide pipe bedding material under all pipe for the full width of the trench. Minimum depth of bedding material below the pipe barrel shall be as follows

Pipe Size	Minimum Depth of Bedding Under Pipe Barrel
Up to 24 inches	6 inches
Over 24 inches	9 inches

- B. Hand-grade bedding to proper grade ahead of pipe laying operation to provide continuous and unyielding support along the entire pipe length.
- C. If the trench has been excavated below the required depth for pipe bedding material placement, fill the excess depth with pipe bedding material as specified in these specifications to the proper subgrade. Compensation for excess or extra depth excavation and refill with bedding material ordered by the Engineer shall be as provided in the bid documents and Section 02316.
- D. Excavate bell holes at each joint to permit proper assembly and inspection of the entire joint.



### **3.5 DEWATERING**

- A. Prevent water from entering the trench during excavation and pipe laying operations to the extent required to properly grade the bottom of the trench and allow for proper compaction of the backfill. Pipe shall be laid in the dry.

### **3.6 LAYING AND JOINTING CONCRETE PIPE AND FITTINGS**

- A. Pipe laying shall proceed upgrade with spigot ends pointing in direction of flow. After a section of pipe has been lowered into the prepared trench, clean the end of the pipe to be joined, the inside of the joint, and, if applicable, the rubber ring immediately before joining the pipe. Make assembly of the joint in accordance with the recommendations of the manufacturer of the type of joint used. Provide all special tools and appliances required for the joint assembly.
- B. All pipe shall be laid uniformly to line and grade so that the finished sewer will present a uniform bore. Variations from line and grade in excess of the tolerances specified under LINE AND GRADE will be considered sufficient cause for rejection of the work.
- C. Check pipe for alignment and grade after the joint has been made. The pipe bedding shall form a continuous and uniform bearing and support for the pipe barrel between joints. Apply sufficient pressure in making the joint to assure that the joint is "home" as defined in the standard installation instructions provided by the pipe manufacturer. Place sufficient pipe cover material to secure the pipe from movement before the next joint is installed to assure proper pipe alignment and joint makeup.
- D. Pipe 21-inches and smaller intended to be in straight alignment shall be laid so the inside joint space does not exceed 3/8 inch in width. If interior joints on 24 inch and larger pipe laid either in straight alignment or on a curve are greater than 3/8 inch, thoroughly clean the joint surfaces, and fill and seal the entire joint with premixed mortar conforming to ASTM C-387 only after the trench has been backfilled, unless otherwise approved by the Engineer. Trowel smooth on the inside surface. Water shall not be allowed to rise in or around or pass over any joint before it has substantially set.
- E. When pipe is laid within a movable trench box, take all necessary precautions to prevent pipe joints from pulling apart when moving the box ahead.
- F. Prevent excavated or other foreign material from getting into the pipe during the laying operation. Close and block the open end of the last laid section of pipe to prevent entry of foreign material or creep of the gasketed joints when laying operations are not in progress, at the close of the day's work, or whenever the workers are absent from the job.
- G. Plug or close off pipes which are stubbed off for manhole construction or for connection by others with temporary plugs as specified in Section 01040 - Project Coordination.
- H. Take all necessary precautions to prevent the "uplift" or floating of the line prior to the completion of the backfilling operation.
- I. Make connections of non-reinforced pipe to manholes or concrete structures, so that a standard pipe joint is located not more than two feet from the outside edge of the structure.

- J. When field cutting and/or machining the pipe is necessary, use only tools and methods recommended by the pipe manufacturer and approved by the Engineer.
- K. After the pipe has been laid and sufficient backfill placed to prevent movement of the pipe, welding of the PVC liner at the joints of the concrete pipe may begin. All PVC liner shall be welded and tested in accord with the requirements stated herein prior to performing any leakage testing.

### **3.7 LAYING PLASTIC PIPE**

- A. Plastic (PVC) piping shall be installed in accordance with the details shown on the Drawings and applicable requirements of ASTM D-2321, "Standard Practice for Underground Installation of Flexible Thermoplastic Pipe" and the manufacturer's recommendations. Pipe Bedding as specified in Section 02200 will be used for PVC pipe unless directed otherwise by the Engineer. The pipe shall be backfilled with granular material and thoroughly compacted to 12-inches above the top of the pipe and thereafter backfilled as specified in Section 02200.
- B. The Contractor shall use care in handling, storage, and installation of pipe. Storage of pipe on the job site shall be done in accordance with the pipe manufacturer's recommendation. Under no circumstances shall pipe be dropped into the trench.

### **3.8 BACKFILL IN THE PIPE ZONE**

- A. The pipe zone shall be considered to include the full width of the excavated trench from the bottom of the trench to a point above the top outside surface of the barrel of the pipe.
- B. Particular attention must be given to the area of the pipe zone from the flow line to the spring line of the pipe to insure that firm support is obtained to prevent any lateral movement of the pipe during the final backfilling of the pipe zone.
- C. Care shall be taken to insure that the pipe does not rest directly on the bell or pipe joint but is uniformly supported on the barrel throughout its entire length.
- D. After the pipe is laid to line and grade, place and carefully compact pipe bedding material for the full width of the trench as required by the pipe bedding details. Place the material around the pipe in 6-inch layers and thoroughly hand tamp with approved tamping sticks supplemented by "walking in" and slicing with a shovel to assure that all voids are filled.
- E. Backfill and carefully compact the area above the bedding material with pipe cover material to a point 12-inches above the top outside surface of the pipe barrel. Pipe bedding material may, at the Contractor's option, be substituted for pipe cover material.

### **3.9 EXCESS TRENCH WIDTH**

- A. Normal trench width shall be as defined on the Drawings. Where the normal trench width below the top of the pipe is exceeded for any reason, the Contractor shall, unless the Engineer determines that the pipe being used is strong enough for the actual trench width, furnish an

adequate support for the pipe. This may be accomplished by furnishing a stronger pipe or a concrete cradle only when approved in writing by the Engineer and as described below.

- B. The thickness of concrete under the pipe shall be one-third of the nominal diameter of the pipe, but not less than four inches. Concrete block or brick may be used for adjusting and maintaining proper grade and elevation of pipe. After the pipe is laid to line and grade, place 3,000 psi concrete under the pipe and for the full width of the trench to form a cradle of the required length and thickness with the concrete brought up to a level equal to 1/4 of the inside pipe diameter below the spring line of the pipe. Start and terminate the concrete cradle at the face of a pipe bell or collar. Do not encase pipe joints at the ends of the concrete cradle.
- C. After the concrete has taken initial set, cover material shall be placed and compacted over the concrete cradle and up to a level 12 inches above the pipe barrel and for the full width of the trench. Cover material shall be placed by hand or by equally careful means.

### **3.10 CONNECTING DISSIMILAR PIPE MATERIALS**

- A. Connect dissimilar pipe materials by means of a flexible coupling or a concrete closure collar as directed by the Engineer. Install couplings in strict accordance with the manufacturer's recommendations.
- B. Use concrete closure collars only when approved by the Engineer, and then only to make connections between dissimilar pipe when standard rubber gasketed joints or flexible couplings are impractical. Before the closure collars are poured, wash the pipe to remove all loose material and soil from the surface on which the concrete will be placed. Prepare PVC pipe by painting a minimum four-inch-wide band that will be in contact with the concrete with a thin coat of solvent cement and embed a layer of concrete or masonry sand in the cement before it sets to create a bonding surface. Wet nonmetallic, except PVC, pipe thoroughly prior to pouring the collars. Wrap and securely fasten a light gauge of sheet metal or building-felt around the pipe to insure that no concrete shall enter the line. Place reinforcement as shown on the Plans. Make entire collar in one pour using 3,000 psi concrete and extend a minimum of 12 inches on each side of the joint. The minimum thickness around the outside diameter of the pipe shall be six inches. No collar shall be poured in water. After the collars are poured and have taken their initial set, cure by covering with well-moistened earth.

### **3.11 PIPE BULKHEADS**

- A. All tees, wyes, sockets, and bell-and-spigot pipe sewers 18 inches in diameter or smaller shall be bulk headed with caps or disc stoppers with factory-fabricated resilient joints. The disk or cap shall be banded or otherwise secured to withstand all test pressures without leakage.
- B. Connections 21 inches and 24 inches in diameter shall be bulk headed with a four-inch brick wall, using clay brick or concrete brick. The wall shall be capable of withstanding all test pressures without leakage.

### **3.12 JACKING AND BORING PIPE**

- A. General:

Where pipe is to be laid beneath railroads, Federal Highways, State Highways, and concrete pavement, jacking and boring is required. The Contractor will not be permitted to open cut.

The requirements of the approving agency, such as railroad or State Highway Department, shall govern over these Specifications and Plans

Sub-surface operations resulting in damage to the tracks or pavement, shall be the responsibility of the Contractor and shall be repaired at no cost to the OWNER.

B. Jacking and Boring Casing Pipe:

Installing of steel casing pipe shall conform to the A.R.E.A. Manual for Railway Engineering and Louisiana Standard Specifications for Roads and Bridges, Sections 7 and 8, latest edition.

Where the ends of pipe used as casing for other pipe are below ground, the ends shall be sealed.

The barrel of the carrier pipe shall be supported within the casing. Supports or carrier runners shall be spaced as recommended by the manufacturer, or as directed by the ENGINEER

3/4" diameter service lines not permitted to be jack and bored. Contractor must use 1" minimum service line.

**3.13 LEAKAGE TESTS FOR GRAVITY SEWERS – GENERAL**

- A. Gravity sewers shall be required to pass a leakage test before acceptance. Leakage tests may be by the infiltration test or exfiltration test, depending on the level of the groundwater table or by the low-pressure air test all as described below. All testing shall be conducted in the presence of the Engineer or his designated representative.
- B. Water infiltration or exfiltration or air loss rates will be measured with equipment supplied by the Contractor and shall be observed by the Engineer. The tests shall be performed by the Contractor under the observation of the Engineer.
- C. The groundwater height for all test methods above the installed pipe shall be determined by attaching a transparent plastic tube to a pipe nipple in the manhole and using the plastic tube as a manometer.
- D. The ends of branches, laterals, tees, wyes, and stubs to be included in a test section shall be plugged to prevent water or air leakage. All plugs shall be secured to prevent blowout due to internal pressure. A test section is defined as the length of sewer between manholes.
- E. The Contractor shall repair all visible leaks in manholes and pipe, even though the leakage test requirements are met.

**3.14 LEAKAGE TEST- INFILTRATION METHOD**

- A. The water infiltration test shall not be considered a valid leakage test unless the top surface of the groundwater level is at least seven feet (7') above the pipe crown during the test measurement. The rate of infiltration of water into the sewers, including manholes and appurtenances, shall not exceed 125 gallons per day per inch diameter per mile of sewer. In the

event groundwater does not submerge the pipe as specified, the Contractor shall conduct an exfiltration test described hereinafter.

- B. A visual inspection and an infiltration test will be conducted on all completed sewers 30 inches in diameter or larger when they are submerged by groundwater as specified above. The Contractor shall provide facilities to stop inflow from adjacent sections of sewer and to provide pondage to permit measurement of infiltration. Visible leaks, defective joints, and defective pipe shall be satisfactorily repaired or replaced.

### **3.15 LEAKAGE TEST- EXFILTRATION METHOD**

- A. Sewers not submerged by groundwater shall be tested for exfiltration or, if approved, by low-pressure air method. The Engineer reserves the right to waive the exfiltration test on any section of sewer based on his evaluation of the results of previous tests.
- B. The hydrostatic head for test purposes shall be seven feet (7') above the sewer crown at the upstream end. The water level in the sewer shall be adjusted so that the hydrostatic head is seven feet minimum above the ground water level when the ground water level is higher than the pipe crown. Any arrangement of testing equipment which will provide observable and accurate measurement of water leakage under the specified conditions will be permitted. The rate of exfiltration of water out of the sewers, including manholes and appurtenances, shall not exceed 125 gallons per day per inch diameter per mile of sewer. Visible leaks, defective joints, and defective pipe shall be satisfactorily repaired or replaced.
- C. The sewer test section may be filled 24 hours prior to time of exfiltration testing, if desired, to permit normal absorption into the sewer pipe walls to take place.

### **3.16 LEAKAGE TEST - LOW-PRESSURE AIR METHOD**

- A. Test Procedure. The following test procedures shall be used in making each test:
  1. The section of sewer line to be tested shall be flushed and cleaned prior to conducting the low-pressure air test to clean out any debris, wet the pipe, and produce more consistent results.
  2. Isolate the section of sewer line to be tested by means of inflatable stoppers or other suitable test plugs. Each plug shall have an inlet/outlet tap, or other provision for connecting a hose to a portable air source at one plug and bleeding the air pressure off at the other plug.
  3. If the test section is below the groundwater level, determine the height of the groundwater above the spring line of the pipe at each end of the test section and compute the average. For every foot of groundwater above the pipe spring line, increase the gauge test pressure by 0.43 pounds per square inch.
  4. Connect the air hose to the inlet tap and a portable air source. The air equipment shall consist of necessary valves and pressure gauges to control the rate at which air flows into the test section and to enable monitoring of the air pressure within the test section. The testing apparatus shall be equipped with a pressure relief device to prevent the possibility of loading the test section with the full capacity of the compressor.
  5. Add air slowly to the test section until the pressure inside the pipe is raised to 4.0 psig greater than the average back pressure of any groundwater that may be over the pipe.
  6. After a pressure of 4.0 psig above the groundwater back-pressure is obtained, regulate the air supply so that the pressure is maintained between 3.5 and 4.0

psig (above the average groundwater Sack pressure) for a period of two minutes to allow the air temperature to stabilize in equilibrium with the temperature of the pipe walls.

7. Determine the rate of air loss by the time pressure-drop method. After the two-minute air stabilization period, disconnect the air supply and adjust the pressure to 3.5 psig above the average groundwater back pressure. The time required for the test pressure to drop from 3.5 psig to 2.5 psig shall be determined by means of a stopwatch and this time interval will be compared to the required time in the tables to determine if the rate of air loss is within the allowable time limit. If the time is equal to or greater than the times indicated in the tables, the pipeline shall be deemed acceptable.
8. The pressure shall be monitored by a recording type pressure gauge and a copy of the strip chart shall be given to the Engineer upon completion of the test. The chart shall show the initial pressurization of the sewer, the two minute stabilization time, the test period, and the bleed-off of the pressure at the completion of the test.
9. Upon completion of the test, the air pressure in the sewer shall be bled off slowly and from the end of the test section opposite to the location of the test pressure gauge. The reduction in air pressure shall be shown on the recording of the pressure test as described above.

- B. For sewer diameter between 6 inches and 24 inches inclusive, the Pipe shall be tested between adjacent manholes.

### **3.17 LAMP TESTING**

- A. Prior to final acceptance all sewers laid on a straight alignment shall be lamp tested. The test shall be performed by placing a bright source of light at one end of a manhole run and observing the light at the other end. The image of light projected through the sewer shall be a full or nearly full circular section. Pipe segments not passing this test shall be relayed to the correct alignment.

### **3.18 MANDREL TEST**

- A. At the option of the Engineer, the Contractor shall run a "Go-No-Go" rigid mandrel deflection test on PVC sewer mains. The Contractor shall furnish an approved mandrel suitable for accurately measure the maximum deflection of the main. The deflection shall be five (5) percent maximum at job acceptance. Any main which has deflection in excess of maximum shall be rejected and removed and replaced by the Contractor with sufficient bedding to meet the deflection requirements at no cost to the Owner.

### **3.19 MANHOLE AIR VACUUM TEST**

- A. All manholes installed in gravity flow sanitary sewerage systems shall be tested using an inflatable compression band, vacuum pump and appurtenances specifically designed for vacuum testing manholes. Test procedures shall be in accordance with the test equipment manufacturer's recommendations. Test equipment to be manufactured by peter A. Glazier & Associates, worchester, MA, or approved equal.
- B. Manholes may be tested by vacuum test immediately after assembly of the manhole and connecting pipes and before any backfill is placed around the manholes. However, the final test

and acceptance shall be based only upon a test after the manhole is backfilled and the cover frame castings are grouted in place.

- C. All pipes entering the manhole shall be plugged, taking care to securely brace the piugs and pipe.
- D. After the testing equipment is in place, a vacuum of ten inches (10") of Hg shall be drawn on the manhole. The manhole will be considered to have passed the test if the vacuum does not drop more than one inch (1") of Hg in one minute.
- E. If the manhole fails the initial test, the Contractor shall locate the point(s) of leakage and make proper repairs, and retest until a satisfactory test result is obtained.
- F. After the manholes have been backfilled, the cover frame casting sealed in place, vacuum tested, and prior to final acceptance of the project, any signs of leaks or weeping visible from the inside of the manhole shall be repaired and the manhole made watertight and retested in accordance with this specification.
- G. The vacuum test shall be monitored by a recording type pressure/vacuum gauge and a copy of the strip chart shall be given to the Engineer upon completion of the test. The chart shall show the initial vacuum draw down, the test period, and a slow, controlled release of the vacuum.

### **3.20 FINAL ACCEPTANCE**

- A. Prior to final acceptance and final manhole-to-manhole inspection of the sewer system by the Engineer, flush and clean all parts of the system. Remove all accumulated construction debris, rocks, gravel, sand, silt, and other foreign material from the sewer system at or near the closest downstream manhole. if necessary, use mechanical rodding or bucketing equipment.
- B. Upon the Engineer's final manhole-to-manhole inspection of the sewer system, if any foreign matter is still present in the system, reflush and clean the section and portions of the lines as required.

**END OF SECTION 33 3100**

## SECTION 33 4000 – DRAINAGE PIPE AND STRUCTURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Furnish all labor, materials, equipment and incidentals required to install drainage pipe and drainage structures as shown on the Drawings and specified herein.
- B. Tie-in proposed site drainage pipe to existing drainage structures.

### PART 2 - PRODUCTS

#### 2.1 Materials shall conform to the following Sections and Subsections:

- A. **BEDDING MATERIAL:** Bedding materials shall be a sand-aggregate mixture. Aggregate in the mixture shall be gravel, stone or crushed concrete. The mixture shall be free of foreign matter and shall be graded as follows

<u>U.S. Sieve</u>	<u>% Passing</u>
1 ½"	95-100
No. 4	30-50
No. 10	20-45
No. 200	0-10

- B. **Backfill Sand:** Sand for backfilling trenches and structures shall be nonplastic siliceous material, graded as follows:

<u>U.S. Sieve</u>	<u>% Passing</u>
½"	100
No. 10	75-100
No. 200	0-10

- C. **Pipe:**

1. **Reinforced Concrete Pipe.** Pipe shall conform to ASTM C 76, Class III. Gasket material shall be rubber gasket conforming to AASHTO M 315, LA DOTD QPL-4
2. **Plastic Pipe:** Pipe may be of any of the following types and shall be products listed in the QPL. Joints shall be bell and spigot type with rubber gaskets conforming to AASHTO M 252
  - a. **POLYVINYL CHLORIDE (PVC) PIPE:** Pipe shall conform to ASTM F 794 or ASTM F 949, Series 46 with UV inhibitors or AASHTO M 304 minimum pipe stiffness 46. The resin shall have a minimum cell classification of 12454-C in accordance with ASTM D 1784.



D. Portland Cement Concrete: Reference Section 32 1000

E. Geotextile Fabric

Geotextile fabric shall be a product listed in the QPL 61 and shall be composed of at least 85% by weight of polyolefins, polyesters or polyamides. Fabric shall be resistant to chemical attack, rot and mildew and shall have no tears or defects which adversely alter its physical properties. When required, fabric shall contain stabilizers or inhibitors to make filaments resistant to deterioration due to ultraviolet and heat exposure. Edges of fabric shall be finished to prevent outer yarn from pulling away from fabric. Fibers of other composition may be woven into fabric for reinforcing. Durability of these fibers shall be equivalent to that of the geotextile fabric.

Geotextile fabric rolls shall have an opaque, waterproof wrapping. Each roll shall be labeled with manufacturer's name, date of manufacture, batch number and name of product.

Geotextile fabric shall be utilized as follows:

<u>Drainage:</u> Underdrains Pipe and Precast Box Culvert Joints Weep Holes Bedding Fabric Approach Slabs	A, B, C or D A, B, C or D A, B, C or D B, C or D D
<u>Stabilization:</u> Bulkheads Flexible Revetments Rip Rap Railroad Crossings Soil Stabilization	C or D C or D D D C, D or S
<u>Silt Fencing:</u> Wire Supported Self-Supported	F G

### PART 3 - EXECUTION

#### 3.1 PIPE:

A. Trenching and Bedding: Trenches shall be excavated to specified width; if not specified, trenches shall be excavated to a width of at least 18" on each side of conduit. Trenches shall be excavated to the depth required accommodate placement of bedding material. Bedding material shall be placed and mechanically compacted in lifts not more than 6" thick (compacted) to at least 95% of maximum density determined by AASHTO T 99. If foundation is stable, bedding material shall be placed as follows:

1. Concrete Pipe or Box Culvert: Bedding material shall be placed in trench bottom.
2. Plastic Pipe or Steel Pipe:
  - a. Pipe Under or Within 5 Feet of Pavement: Bedding material shall be placed up to 12" above pipe.

- b. Pipe More Than 5 Feet From Pavement: Bedding material shall be placed up to the top of the pipe.

If unstable material is encountered at the trench bottom, unstable material shall be excavated as directed and replaced with bedding material at no additional cost to the owner.

- 3. Laying Conduit: Laying shall begin at downstream end of line. Conduit shall be in contact with foundation throughout its length. Bell or groove ends of conduit and outside circumferential laps of corrugated steel pipe shall be placed facing upstream. When existing pipe is to be re-laid, pipe shall be removed by methods that will not damage pipe and re-laid as specified for new pipe.

- 4. Jointing Conduit:

- a. General: Joints shall be capable of withstanding at least 10 psi hydrostatic pressure without leakage.

Joints without coupling bands shall be wrapped with geotextile fabric for at least 12" on each side of joints for conduits up to and including 36", and at least 18" on each side of joints for larger conduits.

Joints with coupling bands shall be wrapped with geotextile fabric for at least 12" on each side of joints for conduits up to and including 36", and at least 18" on each side of joints for larger conduits.

Ends of fabric shall be lapped at least 10" and ends and edges secured.

- b. Concrete Pipe: For conduits less than 48", sections shall be joined by methods which fully seat joints without damaging conduit. For larger conduits, sections shall be joined with a mechanical puller.

- 1) Round Pipe: Gaskets shall be rubber O-rings. Just prior to jointing, O-rings and gasket seat shall be cleaned of dirt and other foreign matter and coated with a flax soap lubricant. Pipe section shall then be joined tightly to previously laid pipe.

- 2) Pipe Arch: Conduit ends shall be cleaned of dirt and other foreign matter and shall be dry. A uniform and adequate thickness of plastic gasket material shall be placed on the entire circumference of gasket seat. In temperatures below 60°F, gasket material shall be heated prior to placement. Conduit section shall then be joined tightly to previously laid conduit.

- c. Plastic Pipe:

- 1) Bell and Spigot Joints: Gaskets shall be rubber O-rings. Just before jointing, O-ring and gasket seat shall be cleaned of dirt and other foreign material and coated with a flax soap lubricant. Pipe sizes less than 48" may be joined by any method which fully seats joints without damaging pipe; larger pipe sizes shall be joined with a mechanical puller.

5. Backfill: Backfill shall be placed and mechanically compacted in lifts not more than 12" thick (loose). Cast-in-place box culverts shall not be backfilled until concrete has attained at least 2500 psi compressive strength.
  - a. Conduits Under or Within 5 Feet of Pavement: Backfill shall be sand or sand-gravel compacted to at least 95% of maximum density determined by AASHTO T 99; however, the top 12" of backfill for conduits not under pavement shall be select excavated material or borrow material.
  - b. Conduits More Than 5 Feet From Pavement: Backfill may be sand, sand-gravel, select excavated material or borrow material; however, the top 12" shall be select excavated material or borrow material. Backfill shall be compacted to at least the density of undisturbed surrounding ground.
  - c. Detection Tape: For plastic pipe, a metallic detection tape shall be installed just above pipeline.
6. Drainage Structures:
  - a. General: This work consists of constructing and adjusting storm drain manholes, inlets and junction boxes.
  - b. Execution
    - 1) General: Excavation shall extend 18" from outside of structure on all sides. Structures shall be set on a 6" compacted thickness of bedding material if foundation soil is stable; if foundation soil is unstable, unstable soil shall be removed as directed and replaced with bedding material. Bedding material shall be placed in lifts and compacted in lifts not exceeding 6" thick to at least 95% of maximum density determined by AASHTO T99. At time structure is placed, excavation shall be dry.

Pipes shall be flush with inside walls of structure. Completed new or adjusted structures shall be cleaned of dirt and debris.
    - 2) Cast-in-Place Concrete Structures:
      - a) Earth on which concrete is placed shall be firm and free from water. Ground water shall be kept below foundation grade until concrete has set. When foundation is in dry earth, it shall be moistened with water from a spray nozzle immediately before concrete is placed.
      - b) Forms shall be of type, size, shape, quality and strength to enable construction as designed. Forms shall be true to line and grade, mortar tight and sufficiently rigid to resist distortion. Responsibility for their adequacy shall rest with the contractor.
      - c) Dirt, chips, sawdust, nails and other foreign matter shall be removed from forms before concrete is placed. Surfaces of forms shall be smooth and free from irregularities, dents, sags and holes. Forms previously used shall be cleaned of dirt, mortar and foreign matter before being re-used. Before concrete is placed, inside surfaces of forms shall be treated with a release agent that will not discolor concrete.

- d) Forms for exposed surfaces shall be made of surfaced lumber or material which will provide a surface equally satisfactory. Wood forms for copings and curbs shall have a thickness not less than 1-5/8" and a width not less than depth of coping or curb. Forms shall be so constructed that portions where finishing is required may be removed without disturbing portions of forms to remain. Forms shall be so constructed that form marks will conform to general lines of structure.
- e) Approved form clamps or bolts shall be used to fasten forms. Use of twisted wire loop
- f) ties or wood spreaders to hold forms in position will not be permitted. Clamps or bolts
- g) shall be of sufficient strength and number to prevent spreading of forms. They shall be of such type that they can be entirely removed or cut back 1/2" below finished surface of concrete. Forms for outside surfaces shall be constructed with stiff wales at right angles to studs and form clamps shall extend through and fasten such wales.
- h) Forms for surfaces requiring a Class 2 finish shall be removed not less than 1 nor more than 2 days after concrete placement. Other non-supporting forms may be removed after concrete has been in place for at least 1 day.
- i) Supporting forms and falsework may be removed as soon as concrete has attained at least 75% of required 28-day compressive strength.

3) Reinforcement

- a) Placing Reinforcement: Reinforcing bars shall be securely held in position by wiring at intersections and elsewhere as necessary to prevent shifting of bars, with wire not smaller than No. 16, and by using concrete or metal chairs, spacers, metal hangers or other approved devices. Metal chairs in contact with exterior surfaces shall be plastic-coated or stainless steel. Layers of bars shall be separated by approved devices. Use of pebbles, broken stone or brick, metal pipe and wood blocks will not be permitted,
- b) Before placing steel in forms, steel shall be thoroughly cleaned of mortar, oil, dirt, loose mill scale, loose or thick rust and coatings that would reduce the bond. No concrete shall be deposited until placing of reinforcing steel has been inspected and approved.
- c) Reinforcement shall be Grade 60 furnished in full lengths indicated on the plans. Splicing of bars, except where shown on the plans, will not be permitted without approval. Splices shall be staggered as far as possible. Minimum length of splice lap shall be as follows:

Lap Splice Lengths (inches)

<u>Bar Size</u>	<u>Grade 60 Steel</u>
3	18

4	24
5	30
6	39
7	53
8	59
9	88
10	111
11	137

d) Welding of reinforcement steel will not be permitted

Bends and hooks in bars shall be made as prescribed in the Concrete Reinforcing Steel institute's "Manual of Standard Practice." Bars shall not be bent nor straightened in a manner that will damage the material. Bars with kinks or unspecified bends shall not be used. (n Welded Wire Fabric: Fabric shall be held firmly in place. Fabric shall be spliced not less than 2 meshes.

Joints between precast concrete units shall be sealed with flexible plastic gasket material. Prior to installing gasket materials, the gasket seat shall be cleaned of dirt and other foreign matter and shall be dry. At temperatures below 60DF, gasket material shall be heated before installation.

e) Pipe Connections: At pipe connections with structure, a 1/2" diameter bead of hydrophilic elastic sealant shall be placed around pipe at center of structure wall and also along center of wall opening. Space between pipe and wall shall then be grouted up from both sides of wall.

f) Adjusting Structures: If grade adjustment of existing structures is required, frames, covers and gratings shall be removed and structure walls reconstructed as specified for new work. Frames, covers and grates shall be cleaned and placed in good repair (or replaced, if specified).

Structures may also be adjusted with metal adjusting rings connected to existing ring by either welding at least 30% of circumference or by using an epoxy system designed for metal-to-metal adhesion.

g) Placing Concrete: Horizontal sections shall not be placed until concrete in supporting vertical sections has been consolidated.

h) The work shall be so prosecuted that construction joints occur at specified locations. The contractor shall complete, by continuous depositing of concrete, sections of the work between such joints. Joints shall be kept moist until adjacent concrete is placed.

Construction joints at bottom of walls or arches, at top of walls, and longitudinal construction joints having a keyed, stepped or roughened surface shall be cleaned by sandblasting or other approved methods prior to pouring adjacent concrete.

Cleaning operations shall be continued until unsatisfactory concrete, laitance, coating, stains, debris and other foreign materials are removed. Concrete surface shall be washed thoroughly to remove loose material. Method of disposing of wash water shall be such that waste water will not discolor exposed surfaces of structures.

Horizontal construction joints and those on slight slopes shall be covered with mortar.

Expansion joints shall be formed where shown on the plans or as directed. Such joints shall have smooth abutting surfaces. No reinforcement shall be extended through joints, except where shown on the plans.

Hardened concrete surfaces of vertical construction joints shall be blast cleaned and coated with a Type II, Grade C epoxy resin listed in the QPL 32 in accordance with the manufacturer's instructions immediately prior to placing adjacent concrete.

- i) Weather Limitations: Concrete shall not be placed on frozen ground nor while air temperature is below 40 ° F and falling nor resumed until temperature is above 35 ° F and rising. Concrete shall be protected from freezing for at least 5 days after placing.

Placing concrete shall be stopped when rainfall is sufficient to cause a flow or wash the surface.

Concrete which has become damaged shall be replaced by and at the expense of the contractor.

- j) Pumping: Pumping equipment shall be so arranged that no vibrations result which might damage freshly placed concrete. Pipes carrying concrete to placing area shall be laid out with a minimum of bends and no unauthorized change in size. A grout mortar, or concrete with coarse aggregate omitted, shall be pumped through equipment ahead of regular concrete to provide lubrication to start pumping operations. This material shall not be used in placement

Operation of pump shall be such as to provide a continuous stream of concrete without air pockets. When pumping is completed, concrete remaining in pipes, if used, shall be ejected in such manner that there will be no contamination or segregation of concrete.

- k) Curing: Immediately after finishing, exposed concrete surfaces shall be covered with curing materials.

Surfaces requiring a Class 2A finish shall be cured with wet burlap. Bridge decks shall be cured with a Type 2 curing compound. All other surfaces shall be cured with either wet burlap or a Type 1-D curing compound. When burlap is used, surface shall be covered with 2 layers of burlap kept wet and in contact with concrete for at least 5 days.

When curing compound is used, it shall be applied in accordance with Subsection 502-9. Reinforcing steel and joints shall be covered or shielded to prevent contact with curing compound.

l) Surface Finishes: Surface finishes shall be as follows:

Class 1	Ordinary Surface Finish
Class 2A	Special Surface Finish
Class 4	Sandblast Finish
Class 6	Bridge Deck Finish
Class 7	Sidewalk Finish
Class 8	Precast – Prestressed Concrete Finish

All exposed concrete shall be given Class 1, Ordinary Surface Finish, in addition to other type of finish specified.

The following surfaces shall be given a Class 2A finish: exposed faces of wing walls, retaining walls, railings and parapets; outside faces of caps and columns. Wing walls shall be finished from top to 1 foot below finish slope lines on exposed face and from top for a depth of 1 foot below top on backfill sides.

When a Rubbed Finish is specified, a Class 2 finish shall be used.

m) Class 1 Ordinary Surface Finish: Immediately after removal of forms, fins and irregular projections shall be removed from all surfaces except those which will not be exposed to view. Cavities produced by form ties and other holes, honey-combed spots, broken corners or edges and other defects shall be cleaned and, after having been kept saturated with water, shall be pointed and trued with a mortar of cement and fine aggregate.

Mortar used in pointing shall be not more than 1 hour old. Joints shall be free of mortar and concrete. Joint filler shall be left exposed for its full length with clean and true edges.

Surfaces shall be true and uniform. Surfaces which cannot be satisfactorily repaired shall be coated as specified for Class 2 finish. Exposed surfaces not protected by forms shall be struck off with a straightedge and finished with a wood float to a true, even surface. Use of additional mortar to provide a grout finish will not be permitted.

n) Class 2A, Special Surface Finish: Coating shall be applied in accordance with the manufacturer's recommendations after all work which might mar surface is complete and finish application can be done in a continuous operation for the structure.

o) Class 4, Sandblast Finish: After 28 days, concrete surface shall be sandblasted to produce a surface in which mortar has been cut away, leaving aggregate exposed.

4) Frames, Covers and Grates: Frames shall be set in a full mortar bed. Nongalvanized parts shall be coated with metalwork paint.

- 5) Backfill: Backfill shall be select excavated material or borrow material; sand will not be permitted. Backfill shall be placed in lifts not more than 12" thick (loose).
  - a) Paved Areas: Backfill shall be compacted to at least 95% of maximum density determined by AASHTO T 99.
  - b) Nonpaved Areas: Backfill shall be compacted to at least the density of undisturbed surrounding ground.
- 6) Payment: Payment shall be made as part of the lump sum price bid for the entire project.

**END OF SECTION 33 4000**





## **Geotechnical Engineering Report**

**Cypress River Apartments  
Baton Rouge, Louisiana**

June 8, 2018

Terracon Project No. EH185012

**Prepared for:**

Partners Southeast  
Baton Rouge, Louisiana

**Prepared by:**

Terracon Consultants, Inc.  
Baton Rouge, Louisiana

[terracon.com](http://terracon.com)

The Terracon logo, consisting of the word "Terracon" in a white, bold, sans-serif font, set against a dark red rectangular background.

Environmental



Facilities



Geotechnical



Materials

June 8, 2018

Partners Southeast  
4731 North Blvd  
Baton Rouge, Louisiana 70806



Attn: Mr. Jim Daniels  
P: 225-923-8128  
E: [jdaniels@partnerssoutheast.com](mailto:jdaniels@partnerssoutheast.com)

Re: Geotechnical Engineering Report  
Cypress River Apartments  
Oklahoma Street & Duane Street  
Baton Rouge, Louisiana  
Terracon Project No. EH185012

Dear Mr. Daniels:

We have completed the Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with our proposal number PEH185012 dated January 22, 2018. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations, floor slabs and pavements for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,  
**Terracon Consultants, Inc.**

Brenda Novoa, P.E.  
Project Engineer

Lynne Roussel, P.E.  
Principal

# REPORT TOPICS

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**Note:** This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the logo will bring you back to this page. For more interactive features, please view your project online at [client.terracon.com](http://client.terracon.com).

# ATTACHMENTS

- EXPLORATION AND TESTING PROCEDURES**
- SITE LOCATION AND EXPLORATION PLAN**
- EXPLORATION RESULTS (Boring Logs)**
- SUPPORTING INFORMATION (General, USCS and CPT Notes)**

# Geotechnical Engineering Report

Cypress River Apartments  
Oklahoma Street & Duane Street  
Baton Rouge, Louisiana  
Terracon Project No. EH185012  
June 8, 2018

## INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed new apartment buildings to be located at Oklahoma Street & Duane Street in Baton Rouge, Louisiana. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Site preparation and earthwork
- Excavation considerations
- Dewatering considerations
- Foundation design and construction
- Floor slab design and construction
- Seismic site classification per IBC
- Lateral earth pressures
- Pavement design and construction

The geotechnical engineering scope of services for this project included the advancement of 13 test borings and 4 Cone Penetrometer Test soundings (CPTs) to depths ranging from approximately 6 to 50 feet below existing site grades.

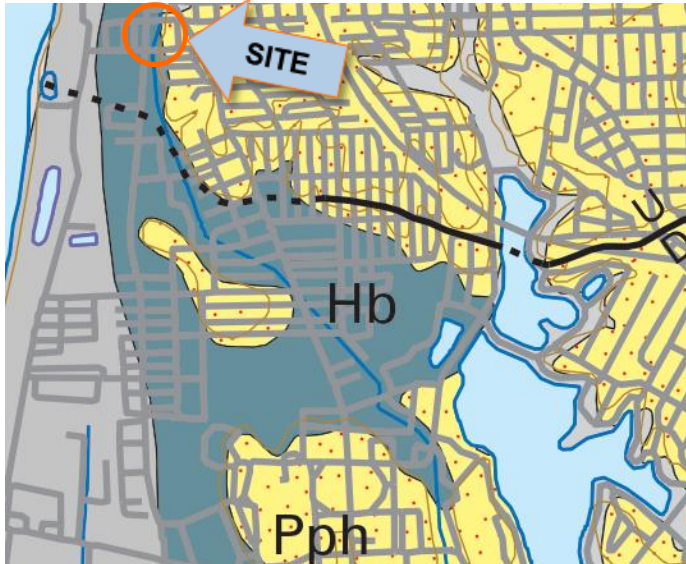
Maps showing the site and boring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs in the **Exploration Results** section of this report.

## SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The project is located at Oklahoma Street & Duane Street in Baton Rouge, Louisiana. Approximate Coordinates: Latitude: 30.435361, Longitude: -91.186452 See <b>Site Location</b>

<b>Item</b>	<b>Description</b>
<b>Existing Improvements</b>	Concrete sidewalks. Based upon aerial photographs, it appears that a building was located on the site at one time. Pavement areas were also located around the site.
<b>Current Ground Cover</b>	Grass, a few trees and concrete sidewalk to the east of the property.
<b>Existing Topography</b>	Each individual lot is relatively flat but the lots' elevation increases to the east. The change of elevation from west to east is about 13 feet.

Item	Description
<p><b>Geology</b></p>	<p>Part of the property, to the east of Duane Street, is located within an area of the Hammond Alloformation (Pph). These Pleistocene Age deposits of middle to late Wisconsin Coastal Plain streams include flood-plain deposits of the late Pleistocene Mississippi River exposed in the eastern valley wall of the modern Mississippi River alluvial valley. The unit is blanketed by Peoria Loess, which in places is underlain by Sicily Island Loess. The deposits typically consist of an upper very silty clay or silt overlying medium stiff to very stiff tan and light gray silty clays and clays with silt and sand layering. The soils within the Prairie Terrace typically provide good foundation support for relatively light to moderately loaded structures, are overconsolidated, and normally only marginally compressible. In some areas that are very dry and desiccated, the potential for expansive properties exists, but these conditions are not typical of the Prairie Terrace deposits.</p> <p>The west part of the property, to the west of Duane Street, is located within an area of Holocene Age Backswamp deposits (<b>Hb</b>) of Mississippi River. These deposits consist of fine-grained soils, usually clayey, and often organically rich sediments that underlie flood basins between meander belts. Organic matter, ranging from vegetative fragments to tree stumps, is often encountered in these deposits. Backswamp deposits are somewhat variable, typically normally consolidated, and relatively weak and compressible. It is common to encounter a stiff and overconsolidated clay “crust” near the ground surface that has formed from the effects of seasonal drying/desiccation. The sediments underlying the stiff surface ‘crust’ typically consist of relatively soft clays and loose silts with layers of organic matter and wood.</p>  <p>Baton Rouge 30x60 Minute Geologic Quadrangle, Louisiana Geologic Survey (2000)</p>

## PROJECT DESCRIPTION

The following paragraphs present the project information that was available at the time this report was prepared. Should this information be incorrect, or changed, please contact our office so that we could reevaluate our analysis and recommendations.

Item	Description
<b>Information Provided</b>	Partners Southeast provided a plat map and conceptual design drawings for the proposed apartment buildings via email on January 16, 2018.
<b>Project Description</b>	The project consists of a new apartment complex and associated parking and driveways.
<b>Proposed Structures</b>	The project includes four 3-story buildings with a footprint area of about 1,700 square feet each. The buildings will be slab-on-grade (non-basement).
<b>Building Construction</b>	The buildings will be wood-framed with load-bearing masonry walls and a slab-on-grade.
<b>Finished Floor Elevation</b>	Unknown at the time this report was written.
<b>Maximum Loads</b>	<ul style="list-style-type: none"> <li>■ Columns: 40 kips maximum</li> <li>■ Walls: 5 kips per linear foot maximum</li> <li>■ Slabs: 150 pounds per square foot maximum</li> </ul>
<b>Grading/Slopes</b>	Less than 2 feet of fill are anticipated to reach proposed finished floor elevation.
<b>Free-Standing Retaining Walls</b>	A retaining wall is expected to be constructed as part of the site development at the back of Buildings A and B. The exact wall length and its height are unknown at the time this report was written.
<b>Pavements</b>	<p>Paved driveway and parking will be constructed around the buildings. We assumed both rigid (concrete) and flexible (asphalt) pavement sections would be considered.</p> <p>Anticipated traffic is as follows:</p> <ul style="list-style-type: none"> <li>■ Autos/light trucks: 100 vehicles per day</li> <li>■ Light delivery and trash collection vehicles: 2 vehicles per week</li> <li>■ Tractor-trailer trucks: 1 vehicle per week</li> </ul> <p>The pavement design period is 20 years.</p>

## GEOTECHNICAL CHARACTERIZATION

### Subsurface Profile

Subsurface conditions at the boring locations can be generalized as follows:

## Geotechnical Engineering Report

Cypress River Apartments ■ Baton Rouge, Louisiana

June 8, 2018 ■ Terracon Project No. EH185012



Stratum	Approximate Depth to Bottom of Stratum (feet)	Material Description <sup>1</sup>	Consistency/Density <sup>1</sup>
Surface	0.2 to 0.4	Topsoil: brown, friable and contained significant organic matter	N/A
1	2 to 6	Lean Clay	Very Stiff to Hard <sup>2</sup>
2	10	Fat Clay	Stiff to Very Stiff
Notable Variations	<sup>1</sup> The CPT soundings indicate the presence of similar materials with similar consistencies to a depth of about 50 feet. <sup>2</sup> The 'crust' in the upper 2 feet is hard.		

Conditions encountered at each boring location are indicated on the individual boring/CPT logs shown in the **Exploration Results** section and are attached to this report. Stratification boundaries on the boring logs represent the approximate location of changes in native soil types; in situ, the transition between materials may be gradual.

### Groundwater Conditions

The boreholes were observed while drilling for the presence and level of groundwater. Groundwater was typically encountered at a depth of about 18 feet below grade in Boring B-05. The drilling operations were suspended for about 15 minutes to observe the change in water level over that time period. The water level rose to a depth of about 17.5 feet below the ground surface in the boring. The groundwater level was also estimated in the CPT soundings with the pressure transducer response. The groundwater was estimated to be at depths of about 6 to 8 feet in the CPTs. The water levels observed in the boreholes can be found on the boring/CPT logs in **Exploration Results**.

Groundwater was not observed in the remaining borings while drilling, or for the short duration the borings could remain open. However, this does not necessarily mean the borings terminated above groundwater, or the water levels summarized above are stable groundwater levels. Due to the low permeability of the soils encountered in the borings, a relatively long period may be necessary for a groundwater level to develop and stabilize in a borehole. Long term observations in piezometers or observation wells sealed from the influence of surface water are often required to define groundwater levels in materials of this type.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.



This site is located approximately 1,200 feet from the landward toe of the Mississippi River levee. The sand layering was not encountered in the borings/CPTs performed for this project. However, it may be present below the explored depths and is assumed to be hydraulically connected to the Mississippi River. Since they are hydraulically connected, potentiometric levels within this formation will reflect changes in the level of the Mississippi River. The river routinely rises to water level elevations that can be 10 feet or more above the ground surface elevation. This fluctuation is routinely reflected by potentiometric surfaces within the sand formation that rise above the ground level in this area. Any aspects of this construction that include excavations to depths of 6 feet or more should take into consideration the impact that such changes in potentiometric surface may have upon the design or the constructability of the excavation and design feature.

## **GEOTECHNICAL OVERVIEW**

In general, the near surface soils encountered at the project site consist of very stiff to hard lean clays. Most of the clays exhibited relatively low plasticity suggesting relatively high silt content. Silty soils are expected to become unstable with typical earthwork and construction traffic, especially after precipitation events; therefore, effective drainage should be completed early in the construction sequence and maintained after construction. If possible, the clearing and grading should be performed during the warmer and drier time of the year. If clearing and grading is performed during the winter months, or at times with persistent rain, an increased risk for possible undercutting and replacement of unstable subgrade will persist. A budget for some undercut and replacement, perhaps as much as 4 feet, of possible unstable upper silty soils should be included in the project. Cement treatment (3 to 4% by volume) of the top 10 inches of subgrade may also be considered to establish a working platform for construction traffic during some times of the year.

The near surface lean clays at the site were very dry at the time of the exploration, and are most likely being influenced by relatively dry weather conditions at the time of the exploration. The moisture content in the upper 12 inches of existing grade should be evaluated at the time of the site preparation. If dry conditions are identified, the subgrade soils should be moisture conditioned prior to placing new fill or pavement construction. If moisture conditioning is deemed necessary, the upper 12 inches of dry subgrade soils within the buildings and pavements footprint should be scarified, wetted to 2 to 3 percent above the optimum moisture, and compacted to a minimum of 95 percent of standard Proctor.

Additional site preparation recommendations including subgrade improvement and fill placement are provided in the **Earthwork** section.

The proposed three-story buildings may be supported on a shallow foundation system bearing in the stiff to very stiff native stable clays or new engineered fill. The **Shallow Foundation** section addresses shallow foundation support of the buildings. If unstable soft soils are present below the anticipated bottom of foundation, the measures described in **Foundation Construction Considerations** should be implemented.

Typically, clays exhibit potential for shrink-swell movements with changes in moisture. In particular, clays that are identified as being dry and desiccated are considered more susceptible to potential swell movements if moisture were to increase. The near surface native soils at the site consists of a thin veneer of dry low to medium plasticity lean clays overlying high plasticity fat clays. In general, the clays in this region are considered to exhibit moderate to high potential for shrink-swell movements with changes in moisture. The Potential Vertical Rise (PVR) approach is a very common method used to predict vertical movements in plastic clays. The basis for the PVR method was developed by Chester McDowell (1956) using soil data from Texas and has been widely used with little revision since its inception. The methodology is based on a correlation between the plasticity index (PI) of the soil and the percent volumetric change. Once the plasticity index and moisture content of a soil is measured, the percent volumetric change is then predicted for the overburden pressure at incremental depths within the soil profile of interest. Considering the average soil conditions at the project site, an assumed seasonal moisture change zone of 8 feet, we predict PVR to be approximately 1-1/2 to 2 inches at this site.

To reduce the potential for post construction swell, it is recommended that a minimum 4 feet of low volume change buffer be provided between the bottom of slab and the underlying fat clays. This "buffer" should extend a minimum of five feet beyond the footprint of the building. This buffer can be comprised of undercutting the existing fat clay and replacing with engineered lean clay fill or increasing the grade of the site above the prevailing grades, or a combination of both. The data suggests there is at least 2 feet of lean clay present, so if finished grade is elevated a minimum 2 feet above current site grades, then the minimum recommended buffer will have been established.

Based upon our experience with similar clays and groundwater conditions in the region, it is our opinion that a lightly loaded floor slab placed over a minimum of 48 inches of low volume change buffer, as described above, over 12 inches of moisture conditioned existing clays can be constructed with an anticipated PVR of about 1 inch.

This report provides recommendations to help mitigate the effects of soils swell and shrinkage. However, even if these procedures are followed, some movement and at least minor cracking in the structure could still occur. The severity of cracking and other cosmetic damage such as uneven floor slabs will probably increase if any modification of the site results in excessive wetting or drying of the high-volume change soils, including utility leaks, roof drain influences, etc. Eliminating the risk of movement and cosmetic distress to the structure may not be feasible, but

it may be possible to further reduce the risk of movement if significantly more expensive measures are used during construction. This would usually consist of providing additional thickness of low volume change buffer or perhaps use of post tensioning or other structural measures. We would be pleased to discuss other construction alternatives with you upon request.

Based on our experience with similar projects, both rigid and flexible pavement systems are suitable for this site. The **Pavements** section addresses the design of pavement systems.

The **General Comments** section provides an understanding of the report limitations.

## **EARTHWORK**

Earthwork will include clearing and grubbing, proof-rolling, excavations and fill placement. The following sections provide recommendations for use in the preparation of specifications for the work. Recommendations include critical quality criteria as necessary to render the site in the state considered in our geotechnical engineering evaluation for foundations, floor slabs, and pavements.

### **Site Preparation**

Prior to proof-rolling, existing vegetation and the root mat should be removed. Complete stripping of the topsoil should be performed in the proposed building areas. Stripped materials consisting of vegetation and organic materials should be wasted off site or used to vegetate landscaped areas. Top soil measurements were made at the boring locations; however, stripping depths at or between our boring locations and across the site could vary considerably. If roots are encountered, the entire root ball should be excavated such that the remaining roots measure 1 inch in diameter or less.

After stripping, the subgrade should be proof-rolled with an adequately loaded vehicle such as a loaded scraper or fully loaded tandem axle dump truck. The vehicle should weigh between 15 and 20 Tons (total vehicle weight). The proof-rolling should be performed under the direction of the Geotechnical Engineer. Proof-rolling should be performed after a suitable period of dry weather to avoid degrading an otherwise acceptable subgrade and to reduce the amount of undercutting/remedial work required. Areas excessively deflecting under the proof-roll should be delineated and subsequently addressed by the Geotechnical Engineer. Such areas should be undercut, replaced with engineered fill and compacted. Widespread instability may require chemical treatment as specified by the Geotechnical Engineer at the time of construction. Excessively wet or dry material should either be removed or moisture conditioned and recompacted.

## Fill Material Types

Engineered fill should meet the following material property requirements:

FILL TYPE <sup>1</sup>	USCS CLASSIFICATION	ACCEPTABLE LOCATION FOR PLACEMENT
Imported Low Plasticity Lean Clay <sup>2</sup> , Sandy Clay	CL (LL<45, 10<PI<25)	All locations and elevations
On-site soils	CL	On-site lean clay soils may be suitable for use as fill; however, if they do not meet the above plasticity import criteria, they should not be utilized within 12 inches of finished grade beneath building and paving areas.

1. Controlled, compacted fill should consist of approved materials that are free of organic matter and debris. A sample of each material type should be submitted to the geotechnical engineer for evaluation.
2. Delineation of fat clays and lean clays should be performed in the field by a qualified geotechnical engineer or their representative, and could require additional laboratory testing.

## Fill Compaction Requirements

Engineered fill should meet the following compaction requirements:

ITEM	DESCRIPTION
<b>Fill Lift Thickness</b>	9 inches or less in loose thickness when heavy, self-propelled compaction equipment is used 4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used
<b>Compaction Requirements <sup>1</sup></b>	Minimum 95% of the standard Proctor maximum dry density (ASTM D 698)
<b>Moisture Content of Cohesive Soil</b>	Within the range of -2 to +2 percent of optimum moisture content value as determined by the standard Proctor test at the time of placement and compaction with stability present.
<b>Moisture Content of Granular Material <sup>2</sup></b>	Workable moisture levels

ITEM	DESCRIPTION
1.	The moisture content and compaction should be measured for each lift of engineered fill during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved. The zone of fill compacted to meet these criteria should extend at least 5 feet horizontally beyond the building footprint.
2.	Specifically, moisture levels should be maintained low enough to allow for satisfactory compaction to be achieved without the cohesionless fill material pumping when proofrolled.

### Utility Trench Backfill

For low permeability subgrades, utility trenches are a common source of water infiltration and migration. Utility trenches penetrating beneath the building should be effectively sealed to restrict water intrusion and flow through the trenches, which could migrate below the building. The trench should provide an effective trench plug that extends at least 5 feet from the face of the building exterior. The plug material should consist of cementitious flowable fill or low permeability clay. The trench plug material should be placed to surround the utility line. If used, the clay trench plug material should be placed and compacted to comply with the water content and compaction recommendations for structural fill stated previously in this report.

### Grading and Drainage

All grades must provide effective drainage away from the building during and after construction and should be maintained throughout the life of the structure. Water retained next to the building can result in soil movements greater than those discussed in this report. Greater movements can result in unacceptable differential floor slab and/or foundation movements, cracked slabs and walls, and roof leaks. The roof should have gutters/drains with downspouts that discharge onto splash blocks at a distance of at least 10 feet from the building.

To the extent practical, exposed ground should be sloped and maintained at a minimum 10 percent away from the building for at least 10 feet beyond the perimeter of the building, where possible. Locally, flatter grades may be necessary to transition ADA access requirements for flatwork or due to site grading drainage restraints. After building construction and landscaping, final grades should be verified to document effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted as necessary as part of the structure’s maintenance program. Where paving or flatwork abuts the structure a maintenance program should be established to effectively seal and maintain joints and prevent surface water infiltration.

## **Earthwork Construction Considerations**

Shallow excavations, for the proposed structure, are anticipated to be accomplished with conventional construction equipment. Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to construction of floor slabs. Construction traffic over the completed subgrades should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over, or adjacent to, construction areas should be removed. If the subgrade desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted, prior to floor slab construction.

The groundwater table could affect over-excavation efforts. A temporary dewatering system consisting of sumps with pumps could be necessary to achieve some deeper excavations.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local, and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety, or the contractor's activities; such responsibility shall neither be implied nor inferred.

## **Construction Observation and Testing**

The earthwork efforts should be monitored under the direction of the Geotechnical Engineer. Monitoring should include documentation of adequate removal of vegetation and top soil, proof-rolling and mitigation of areas delineated by the proof-roll to require mitigation.

Each lift of compacted fill should be tested, evaluated, and reworked as necessary until approved by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill in the building areas and 5,000 square feet in pavement areas. One density and water content test for every 50 linear feet of compacted utility trench backfill.

In areas of foundation excavations, the bearing subgrade should be evaluated under the direction of the Geotechnical Engineer. If unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the

continuity to maintain the Geotechnical Engineer’s evaluation of subsurface conditions, including assessing variations and associated design changes.

## SHALLOW FOUNDATIONS

If the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for shallow foundations.

### Design Parameters – Compressive Loads

Item	Description
<b>Maximum Net Allowable Bearing pressure</b> <sup>1, 2</sup>	2,000 psf (foundations bearing within structural fill or stable undisturbed soils)
<b>Required Bearing Stratum</b> <sup>3</sup>	Stable stiff clays or compacted low volume change engineering fill. Bearing stratum should be verified by the Geotechnical Engineer.
<b>Minimum Foundation Dimensions</b>	Columns: 24 inches Continuous: 16 inches
<b>Ultimate Passive Resistance</b> <sup>4</sup> (equivalent fluid pressures)	250 pcf (cohesive backfill)
<b>Ultimate Coefficient of Sliding Friction</b> <sup>5</sup>	400 psf (native lean clays or compacted engineering fill)
<b>Minimum Embedment below Finished Grade</b> <sup>6</sup>	Exterior footings: 24 inches Interior footings: 18 inches
<b>Estimated Total Settlement from Structural Loads</b> <sup>2</sup>	Less than about 1 inch
<b>Estimated Differential Settlement</b> <sup>2</sup>	About 1/2 inch between adjacent columns or in 30 feet along wall footings.



Item	Description
<ol style="list-style-type: none"> <li>1.</li> <li>2.</li> <li>3.</li> <li>4.</li> <li>5.</li> <li>6.</li> </ol>	<p>The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. An appropriate factor of safety has been applied. These bearing pressures can be increased by 1/3 for transient loads unless those loads have been factored to account for transient conditions. Values assume that exterior grades are no steeper than 20% within 10 feet of structure.</p> <p>Values provided are for maximum loads noted in <b>Project Description</b>.</p> <p>Unsuitable or soft soils should be over-excavated and replaced per the recommendations presented in <b>Earthwork</b>.</p> <p>Use of passive earth pressures require the sides of the excavation for the spread footing foundation to be nearly vertical and the concrete placed neat against these vertical faces or that the footing forms be removed and compacted structural fill be placed against the vertical footing face.</p> <p>Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Should be neglected for foundations subject to net uplift conditions.</p> <p>Embedment necessary to minimize the effects of frost and/or seasonal water content variations. For sloping ground, maintain depth below the lowest adjacent exterior grade within 5 horizontal feet of the structure.</p>

### Design Parameters - Uplift Loads

Uplift resistance of spread footings can be developed from the effective weight of the footing and the overlying soils. As illustrated on the subsequent figure, the effective weight of the soil prism defined by diagonal planes extending up from the top of the perimeter of the foundation to the ground surface at an angle,  $\theta$ , of 20 degrees from the vertical can be included in uplift resistance. The maximum allowable uplift capacity should be taken as a sum of the effective weight of soil plus the dead weight of the foundation, divided by an appropriate factor of safety. A maximum total unit weight of 120 pcf should be used for the backfill. This unit weight should be reduced to 58 pcf for portions of the backfill or natural soils below the groundwater elevation.

### Foundation Construction Considerations

As noted in **Earthwork**, the footing excavations should be evaluated under the direction of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed.

If unsuitable bearing soils are encountered at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils, and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. This is illustrated on the sketch below.



Over-excavation for structural fill placement below footings should be conducted as shown below. The over-excavation should be backfilled up to the footing base elevation with low volume change engineering fill placed as recommended in the **Earthwork** section.

The following precautions are essential to the satisfactory performance of shallow foundations:

- Provide positive drainage away from the foundations, both during and after construction.
- Avoid excavations during inclement weather and place concrete within the excavations within 24 hours after completion of the excavations.
- Verify that the excavations are completely within the required bearing stratum or engineered fill and remove and replace any unacceptable soils as discussed herein.
- Maintain adequate moisture levels in exposed excavation and slab subgrades, but do not allow the areas to become saturated.
- Place a “mudmat” of lean concrete to seal the bearing stratum in the event wet conditions are experienced or expected.
- Minimize traffic in excavations to only that necessary to place the steel and concrete for the footings.
- Remove free water in the excavations prior to placing concrete.

## SEISMIC CONSIDERATIONS

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7-10. The Site Class types are listed below:

- A. Hard Rock
- B. Rock
- C. Very dense soil and soft rock
- D. Stiff soil
- E. Soft clay soil
- F. Soils vulnerable to potential failure or collapse under seismic loading

Description	Value
<b>International Building Code Site Classification (IBC) <sup>1</sup></b>	D <sup>2</sup>
<b>Site Latitude</b>	30.435361° N
<b>Site Longitude</b>	-91.186452° W
<b>S<sub>DS</sub> Spectral Acceleration for a Short Period <sup>3</sup></b>	0.113g

Description	Value
<b>S<sub>D1</sub> Spectral Acceleration for a 1-Second Period</b> <sup>3</sup>	0.090g
<ol style="list-style-type: none"> <li>1. Seismic site classification in general accordance with the 2015 <i>International Building Code</i>, which refers to ASCE 7-10.</li> <li>2. The 2015 International Building Code (IBC) uses a site profile extending to a depth of 100 feet for seismic site classification. Borings/CPTs at this site were extended to a maximum depth of 50 feet. The site properties below the boring/CPT depth to 100 feet were estimated based on our experience and knowledge of geologic conditions of the general area. Additional deeper borings/CPTs or geophysical testing may be performed to confirm the conditions below the current boring depth.</li> <li>3. These values were obtained using online seismic design maps and tools provided by the USGS (<a href="http://earthquake.usgs.gov/hazards/designmaps/">http://earthquake.usgs.gov/hazards/designmaps/</a>).</li> </ol>	

The site is located approximately 5.5 miles south from the Denham Springs-Scotlandville faults and approximately 0.7 miles north from the Baton Rouge fault. These faults of East Baton Rouge Parish are active but have not been demonstrated to be seismic (they do not generate detectable earthquakes). Rather, the faults have been shown to cause damage to road, pavement, and building structures in vicinity of the faults gradually, over periods of decades. Due to the low seismicity in the region and absence of soils prone to liquefaction, such as loose sands, the soils at the site are not considered a risk for liquefaction.

## FLOOR SLABS

### Floor Slab Design Parameters

Item	Description
<b>Floor Slab Support</b>	48-inch compacted, low volume change buffer over 12-inch stable proof-rolled moisture conditioned subgrade.
<b>Estimated Modulus of Subgrade Reaction</b> <sup>1</sup>	100 pounds per square inch per inch (psi/in) for point loads
<b>Aggregate Base Course/Capillary Break</b>	Approximately 2 to 4 inches of free draining granular material (sand with maximum 10% passing the No. 200 sieve) can be used as a leveling course for the slab.

1. Modulus of subgrade reaction is an estimated value based upon our experience with the subgrade condition, the requirements noted in Earthwork, and the floor slab support as noted in this table. It is provided for point loads. For large area loads the modulus of subgrade reaction would be substantially lower.

The use of a vapor retarder should be considered beneath concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder,

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the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or cracks should be sealed with a water-proof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

### **Floor Slab Construction Considerations**

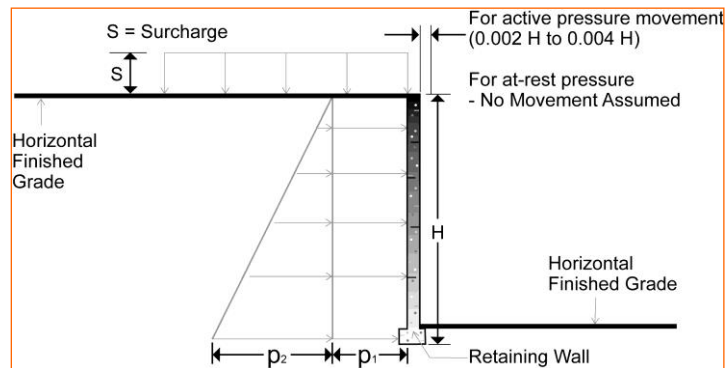
Finished subgrade within and for at least 10 feet beyond the floor slab should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become damaged or desiccated prior to construction of floor slabs, the affected material should be removed and structural fill should be added to replace the resulting excavation. Final conditioning of the finished subgrade should be performed immediately prior to placement of the floor slab support course.

The Geotechnical Engineer should approve the condition of the floor slab subgrades immediately prior to placement of the floor slab support course, reinforcing steel and concrete. Attention should be paid to high traffic areas that were rutted and disturbed earlier, and to areas where backfilled trenches are located.

## LATERAL EARTH PRESSURES

### Design Parameters

Structures with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to the values indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction and the strength of the materials being restrained. Two wall restraint conditions are shown. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The "at-rest" condition assumes no wall movement and is commonly used for basement walls, loading dock walls, or other walls restrained at the top. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls (unless stated).



Lateral Earth Pressure Design Parameters				
Earth Pressure Condition <sup>1</sup>	Coefficient for Backfill Type <sup>2</sup>	Surcharge Pressure <sup>3, 4, 5</sup> $p_1$ (psf)	Effective Fluid Pressures (psf) <sup>2, 4, 5</sup>	
			Unsaturated <sup>6</sup>	Submerged <sup>6</sup>
Active ( $K_a$ )	Granular - 0.31	$(0.31)S$	$(40)H$	$(80)H$
	Fine Grained - 0.41	$(0.41)S$	$(50)H$	$(85)H$
At-Rest ( $K_o$ )	Granular - 0.47	$0.47S$	$(55)H$	$(90)H$
	Fine Grained - 0.58	$(0.58)S$	$(70)H$	$(95)H$
Passive ( $K_p$ )	Granular - 3.25	---	$(390)H$	$(250)H$
	Fine Grained - 2.46	---	$(295)H$	$(205)H$

1. For active earth pressure, the wall must rotate about the base, with top lateral movements of  $0.002 H$  to  $0.004 H$ , where  $H$  is the wall height. For passive earth pressure, the wall must move horizontally to mobilize resistance.
2. Uniform, horizontal backfill, compacted to at least 95 percent of the ASTM D 698 maximum dry density, rendering a maximum unit weight of 120 pcf. Granular assumes material does not have more than 10% passing the No. 200 sieve.
3. Uniform surcharge, where  $S$  is surcharge pressure.
4. Loading from heavy compaction equipment is not included.
5. No safety factor is included in these values.

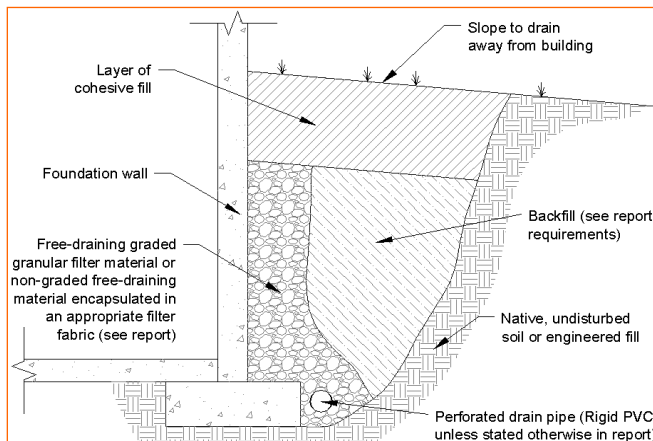
Lateral Earth Pressure Design Parameters				
Earth Pressure Condition <sup>1</sup>	Coefficient for Backfill Type <sup>2</sup>	Surcharge Pressure <sup>3, 4, 5</sup> $p_1$ (psf)	Effective Fluid Pressures (psf) <sup>2, 4, 5</sup>	
			Unsaturated <sup>6</sup>	Submerged <sup>6</sup>

6. In order to achieve “Unsaturated” conditions, follow guidelines in **Subsurface Drainage for Below Grade Walls** below. “Submerged” conditions are recommended when drainage behind walls is not incorporated into the design.

Backfill placed against structures should consist of granular soils or low plasticity cohesive soils. For the granular values to be valid, the granular backfill must extend out and up from the base of the wall at an angle of at least 45 and 60 degrees from vertical for the active and passive cases, respectively.

### Subsurface Drainage for Below Grade Walls

A perforated rigid plastic drain line installed behind the base of walls and extends below adjacent grade is recommended to prevent hydrostatic loading on the walls. The invert of a drain line around a below-grade building area or exterior retaining wall should be placed near foundation bearing level. The drain line should be sloped to provide positive gravity drainage to daylight or to a sump pit and pump. The drain line should be surrounded by clean, free-draining granular material having less than 5 percent passing the No. 200 sieve, such as No. 57 aggregate. The free-draining aggregate should be encapsulated in a filter fabric. The granular fill should extend to within 2 feet of final grade, where it should be capped with compacted cohesive fill to reduce infiltration of surface water into the drain system.



As an alternative to free-draining granular fill, a pre-fabricated drainage structure may be used. A pre-fabricated drainage structure is a plastic drainage core or mesh which is covered with filter fabric to prevent soil intrusion, and is fastened to the wall prior to placing backfill.

## PAVEMENTS

### General Pavement Comments

Pavement designs are provided for the traffic conditions and pavement life conditions as noted in **Project Description**. A critical aspect of pavement performance is site preparation. The

pavement designs noted in this section must be applied to the site that has been prepared as required in the **Earthwork** section.

Designs for minimum thicknesses for new pavement sections for this project have been based on the procedures outlined in the 1993 Guideline for Design of Pavement Structures by the American Association of State Highway and Transportation Officials (AASHTO-1993). Pavement design methods are intended to provide structural sections with adequate thickness over a particular subgrade such that wheel loads are reduced to a level the subgrade can support. The support characteristics of the subgrade for pavement design do not account for shrink/swell movements of a clay subgrade such as the soils encountered on this project. Thus, the pavement may be adequate from a structural standpoint, yet still experience cracking and deformation due to shrink/swell related movement of the subgrade. In order to minimize shrink/swell subgrade movements, the existing surficial clays should be moisture modified as outlined in this report.

Pavement performance is affected by its surroundings. In addition to providing preventive maintenance, the civil engineer should consider the following recommendations in the design and layout of pavements:

- Final grade adjacent to paved areas should slope down from the edges at a minimum 2%;
- The subgrade and pavement surface should have a minimum 2% slope to promote proper surface drainage;
- Install below pavement drainage systems surrounding areas anticipated for frequent wetting;
- Install 2-ft wide strips of non-woven geotextile fabric at each planned control and construction joint to limit long term migration of fines through pavements;
- Install joint sealant and seal cracks immediately;
- Seal all landscaped areas in or adjacent to pavements to reduce moisture migration to subgrade soils;
- Place compacted, low permeability backfill against the exterior side of curb and gutter; and,
- Place curb, gutter and/or sidewalk directly on clay subgrade soils rather than on unbound granular base course materials.

## Asphaltic Cement Concrete Thickness

MINIMUM ACC PAVEMENT SECTION (INCHES)					
TRAFFIC AREA	ALTERNATIVE	ASPHALT SURFACE <sup>1</sup>	ASPHALT BINDER <sup>1</sup>	AGGREGATE BASE <sup>2</sup>	SOIL CEMENT BASE <sup>3</sup>
Automobile Parking	AC-AGG	1½	1½	6	--
	AC-SC	1½	1½	--	9
Drive Lanes	AC-AGG	1½	2	6	--
	AC-SC	1½	2	--	9

1. Design and construction of asphaltic or bituminous concrete should be in accordance with Louisiana Department of Transportation Specifications for Roads and Bridges 2006 (LSSRB).
2. Aggregate base course should be a No. 610 limestone or similarly graded recycled concrete compacted to 100% of its max dry density as determined by ASTM D-698, Standard Proctor Test with stability present.
3. A soil cement base should be constructed in general accordance with Section 305 of the 2006 LSSRB. The lime and cement addition rates should be based upon classification testing performed on the actual proposed soils at the time of construction in accordance with Section 305.04(a). The lean clay soils in the upper 12 inches of existing grade are considered generally conducive for construction of a cement treated base without the need for initial lime treatment.

A jointed Portland cement concrete pavement can be placed directly over the site lean clays provided they are moisture conditioned, compacted and stable at the time of construction. Depending on the weather pattern at the time of pavement construction, it may be necessary to treat the subgrade with cement (3 to 5% by volume) to achieve suitable support conditions. It is important that 2-ft wide strips of non-woven geotextile fabric be placed below the pavements at each planned control and expansion joint to prevent migration of fines through the joints. Alternatively, a 4-inch layer of compacted 610 limestone could be installed over the subgrade to reduce pumping of fines, and reduce shrink/swell affects for the concrete pavement applications.

## Portland Cement Concrete Thickness

MINIMUM PCC PAVEMENT SECTION (INCHES)	
TRAFFIC AREA	PORTLAND CEMENT CONCRETE <sup>1,2</sup>
Automobile Parking	5
Drive Lanes	7
Entrance/Exit Panels	7
Dumpster Pad <sup>3</sup>	8

1. 4,000 psi at 28 days, 4-inch maximum slump and 5 to 7 percent air entrained. PCC pavements are recommended for trash container pads and in any other areas subjected to heavy wheel loads and/or turning traffic.
2. Standard design and construction details for rigid pavements are contained in ACI330R-08. It is recommended that the design engineer refer to this document for more detailed information. A critical aspect of concrete pavements for facilities of this nature is joint spacing and related details. ACI330R-08 addresses these important details.
3. The trash container pad should be large enough to support the container and the tipping axle of the collection truck.



## **Pavement Drainage**

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base section. Appropriate sub-drainage or connection to a suitable daylight outlet should be provided to remove water from the granular subbase.

## **Pavement Maintenance**

The pavement sections represent minimum recommended thicknesses and, as such, periodic maintenance should be anticipated. Therefore, preventive maintenance should be planned and provided for through an on-going pavement management program. Maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment. Maintenance consists of both localized maintenance (e.g. crack and joint sealing and patching) and global maintenance (e.g. surface sealing). Preventive maintenance is usually the priority when implementing a pavement maintenance program. Additional engineering observation is recommended to determine the type and extent of a cost-effective program. Even with periodic maintenance, some movements and related cracking may still occur and repairs may be required.

## **GENERAL COMMENTS**

Our services are conducted with the understanding of the project as described in the proposal, and will incorporate collaboration with the design team as we complete our services to verify assumptions. Revision of our understanding to reflect actual conditions important to our services will be based on these verifications and will be reflected in the final report. The design team should collaborate with Terracon to confirm these assumptions and to prepare the final design plans and specifications. This facilitates the incorporation of our opinions related to implementation of our geotechnical recommendations. Any information conveyed prior to the final report is for informational purposes only and should not be considered or used for decision-making purposes.

Our analysis and opinions are based upon our understanding of the geotechnical conditions in the area, the data obtained from our site exploration and from our understanding of the project. Variations will occur between exploration point locations, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in the final report, to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services



## Geotechnical Engineering Report

Cypress River Apartments ■ Baton Rouge, Louisiana

June 8, 2018 ■ Terracon Project No. EH185012



on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our scope of services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third party beneficiaries intended. Any third party access to services or correspondence is solely for information purposes only. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

## **ATTACHMENTS**

## EXPLORATION AND TESTING PROCEDURES

### Field Exploration

Number of Locations	Type of Exploration	Depth (feet) <sup>1</sup>	Planned Location
4	CPT	50	Planned building areas
4	Boring	10	Planned building areas
1	Boring	20	Planned retaining wall area
8	Boring	6	Planned parking/driveway area

1. Below ground surface

**Boring Layout and Elevations:** Locations of soil borings/CPTs are provided on the **Exploration Plan**. The locations of field exploration points were established in the field by Terracon's exploration team using a hand-held GPS unit to establish boring/CPT locations with reference to known points. The accuracy of the exploration point locations is usually within 10 feet of the noted location. The ground surface elevations are estimated from the most recent USGS topographic maps and/or Google Earth™ imagery, and the accuracy of the ground surface at each point is probably about 2 feet.

**Subsurface Exploration Procedures:** soil borings were performed with a track-mounted drill rig using continuous flight augers (solid stem). In cohesive materials, we primarily obtained thin-walled tube samples to secure relatively undisturbed samples. Shelby tube samples were obtained hydraulically by pushing a seamless steel tube with a sharpened cutting edge into the boring to obtain a relatively undisturbed sample of cohesive soil. We reported the sampling depths and penetration distances values on the boring logs. In the field, we placed the samples into containers, sealed them, and returned them to the laboratory for observation, testing and classification.

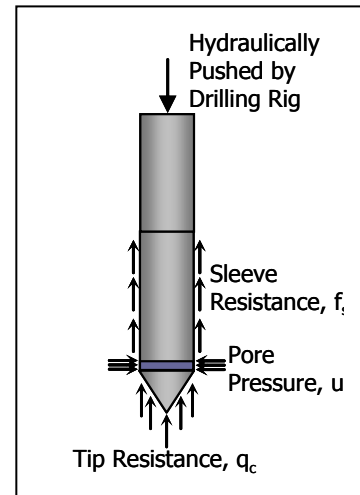
## Geotechnical Engineering Report

Cypress River Apartments ■ Baton Rouge, Louisiana

June 8, 2018 ■ Terracon Project No. EH185012



At each designated location, a CPT test was performed by pushing a 10-square centimeter electric cone penetrometer at an approximate rate of 20 millimeters/second using the hydraulic cylinders of the drilling rig. The cone penetrometer is equipped with electronic load cells to measure tip resistance and sleeve resistance, and a pressure transducer is measure the generated ambient pore pressure, as illustrated in the insert diagram.



Digital data representing the tip resistance, the sleeve penetration, the pore pressure and the CPT sounding inclination are typically measured at 50 mm intervals during penetration using a CPT data acquisition system or logger. These data are transferred to an on-site computer using a cable transmission system. This process allowed continuous monitoring of the data as the cone is advanced in a real-time fashion.

Upon completion of the test, the data collected were downloaded directly from the CPT data logger to an on-site computer. The collected data were then interpreted using a software package provided by the cone manufacture to provide the cone and sleeve resistance, pore pressure and inclination. The software also allows interpretation of soil types (clay, silt, sand, etc.), soil unit weight, and selected soil parameters, such as undrained shear strength, overconsolidation ratio, and equivalent standard penetration resistance. The conventional field data from the soil boring and the available laboratory test results can also correlate with the interpreted CPT data for a particular site. The testing and calibration of the CPT device was conducted in general conformance with ASTM D 5778.

Our exploration team prepared field boring logs as part of the drilling operations. These field logs include visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in the laboratory. Final CPT logs were also created with the data collected by the CPT data acquisition system.

## Laboratory Testing

The project engineer reviewed the field data and assigned various laboratory tests to better understand the engineering properties of the various soil strata as necessary for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

## Geotechnical Engineering Report

Cypress River Apartments ■ Baton Rouge, Louisiana

June 8, 2018 ■ Terracon Project No. EH185012



- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM D2166/D2166M Standard Test Method for Unconfined Compressive Strength of Cohesive Soil

The laboratory testing program often includes examination of soil samples by an engineer. Based on the material's texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System.

## **SITE LOCATION AND EXPLORATION PLANS**



**SITE LOCATION**

Cypress River Apartments ■ Baton Rouge, LA  
May 22, 2018 ■ Terracon Project No. EH185012

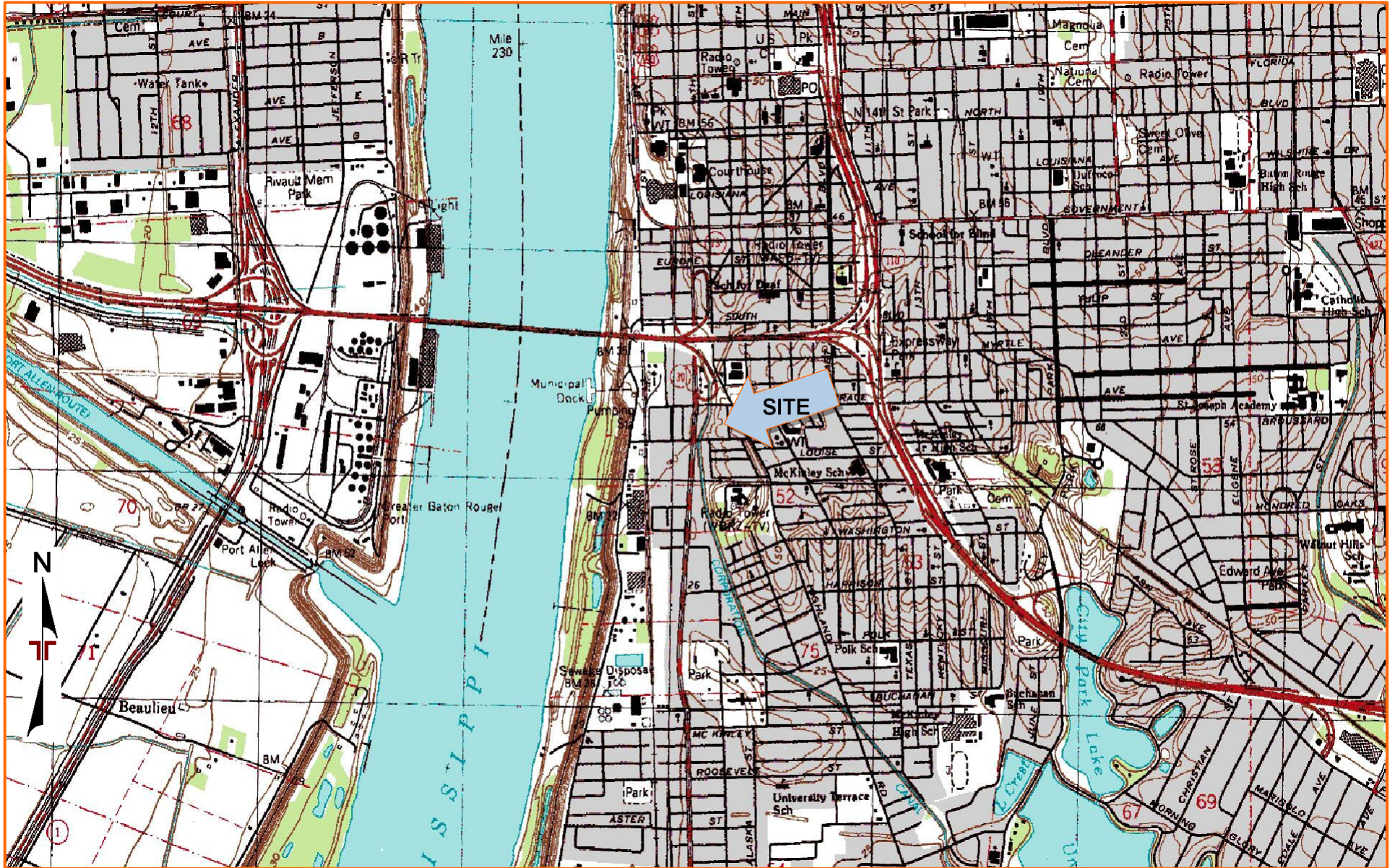


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY  
QUADRANGLES INCLUDE: BATON ROUGE WEST, LA (1/11/1995).



**EXPLORATION PLAN**

Cypress River Apartments ■ Baton Rouge, LA  
June 1, 2018 ■ Terracon Project No. EH185012

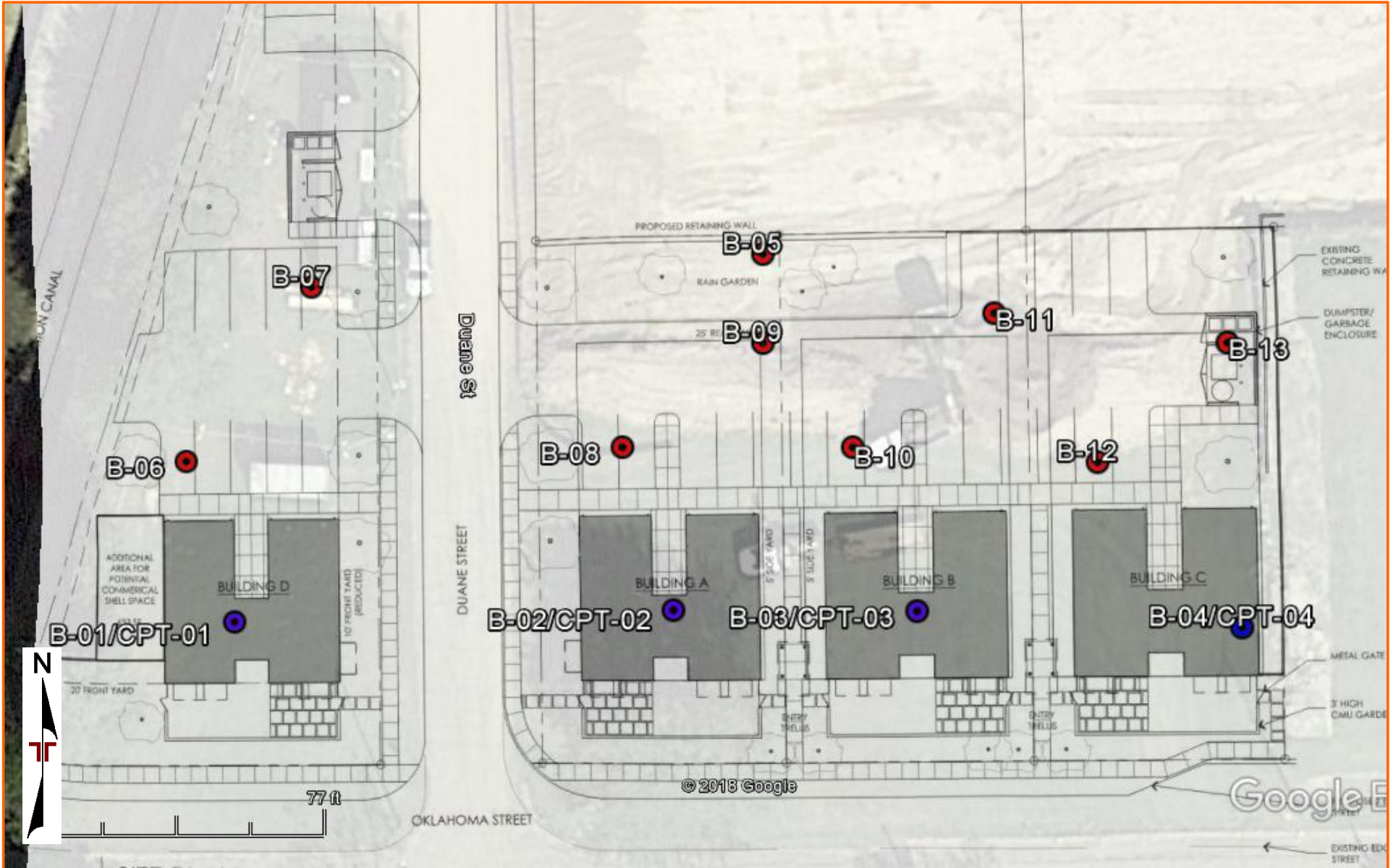


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY GOOGLE EARTH.



## **EXPLORATION RESULTS**

# BORING LOG NO. B-01

**PROJECT:** Cypress River Apartments

**CLIENT:** Partners Southeast  
Baton Rouge, LA

**SITE:** Oklahoma Street & Duane Street  
Baton Rouge, LA

GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 30.4352° Longitude: -91.1866°  Approximate Surface Elev: 33 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST			WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS
						TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)			LL-PL-PI
0.2	<b>2" TOPSOIL</b>	0.2			-				14		30-17-13
2.0	<b>FAT CLAY (CH)</b> , tan, very stiff, with ferrous nodules	2.0			--	UC	2.67	5.7	19	106	54-13-41
4.0	<b>LEAN CLAY (CL)</b> , brown and tan, stiff to very stiff, -failure at low strain at 4'	4.0			4.50 (HP)	UC	1.77	2.9	19	103	
	-tan below 6'				4.00 (HP)	UC	2.30	8.5	20	103	41-14-27
10.0	<b>Boring Terminated at 10 Feet</b>	10.0			3.25 (HP)						

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:  
0'-10' Continuous Flight Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Boring backfilled with auger cuttings upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevation based on Google Earth.

**WATER LEVEL OBSERVATIONS**

*No free water observed*



2822 Oneal Ln, Bldg B  
Baton Rouge, LA

Boring Started: 05-22-2018

Boring Completed: 05-22-2018

Drill Rig: GP #891

Driller: G. Triplette

Project No.: EH185012

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_EH185012.GPJ TERRACON DATATEMPLATE.GDT 6/5/18

# BORING LOG NO. B-02

**PROJECT:** Cypress River Apartments

**CLIENT:** Partners Southeast  
Baton Rouge, LA

**SITE:** Oklahoma Street & Duane Street  
Baton Rouge, LA

GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 30.4352° Longitude: -91.1863°  Approximate Surface Elev: 38 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST			WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS
						TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)			
0.2	<b>2" TOPSOIL</b>	38+/-									
4.0	<b>LEAN CLAY (CL)</b> , tan, hard, with roots to 2' -failure at low strain at 0'  -brown and red, with sand below 2'				4.50 (HP)	UC	4.27	3.8	13	110	43-15-28
4.0					4.50 (HP)				18		
10.0	<b>FAT CLAY (CH)</b> , brown and gray, stiff, with ferrous nodules -slickensided at 4'	34+/-			4.50 (HP)	UC	1.15	1.5	27	93	72-20-52
10.0					4.50 (HP)						
10.0					4.50 (HP)	UC	1.19	1.7	27	92	71-17-54
	<b>Boring Terminated at 10 Feet</b>	28+/-									

Stratification lines are approximate. In-situ, the transition may be gradual.

<p>Advancement Method: 0'-10' Continuous Flight Auger</p>	<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (if any).</p> <p>See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p> <p>Elevation based on Google Earth.</p>	<p>Notes:</p>
<p>Abandonment Method: Boring backfilled with auger cuttings upon completion.</p>		
<p><b>WATER LEVEL OBSERVATIONS</b></p> <p><i>No free water observed</i></p>	<p>2822 Oneal Ln, Bldg B Baton Rouge, LA</p>	<p>Boring Started: 05-23-2018</p> <p>Drill Rig: GP #891</p> <p>Project No.: EH185012</p>
		<p>Boring Completed: 05-23-2018</p> <p>Driller: G. Triplette</p>

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_EH185012.GPJ TERRACON\_DATATEMPLATE.GDT 6/5/18

# BORING LOG NO. B-03

**PROJECT:** Cypress River Apartments

**CLIENT:** Partners Southeast  
Baton Rouge, LA

**SITE:** Oklahoma Street & Duane Street  
Baton Rouge, LA

GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 30.4352° Longitude: -91.186°  Approximate Surface Elev: 40 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST			WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS	
						TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)			LL-PL-PI	
0.2	<b>2" TOPSOIL</b>				-							
4.0	<b>LEAN CLAY (CL)</b> , brown  -stiff to very stiff below 2' -failure at low strain at 2'				3.75 (HP)	UC	1.34	4.8	18	109		34-15-19
4.0	<b>FAT CLAY (CH)</b> , light gray and brown, stiff to very stiff, with ferrous nodules to 6' -slickensided at 4'	5			3.50 (HP)	UC	1.39	2.9	32	86		78-21-57
6.0	-light gray, brown and red below 6' -slickensided at 6'				3.25 (HP)	UC	1.25	3.2	33	85		
10.0	<b>Boring Terminated at 10 Feet</b>	10			3.50 (HP)							77-23-54

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:  
0'-10' Continuous Flight Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Boring backfilled with auger cuttings upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevation based on Google Earth.

**WATER LEVEL OBSERVATIONS**

*No free water observed*



2822 Oneal Ln, Bldg B  
Baton Rouge, LA

Boring Started: 05-23-2018

Boring Completed: 05-23-2018

Drill Rig: GP #891

Driller: G. Triplette

Project No.: EH185012

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_EH185012.GPJ TERRACON\_DATATEMPLATE.GDT 6/5/18

# BORING LOG NO. B-04

**PROJECT:** Cypress River Apartments

**CLIENT:** Partners Southeast  
Baton Rouge, LA

**SITE:** Oklahoma Street & Duane Street  
Baton Rouge, LA

GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 30.4352° Longitude: -91.1859°  Approximate Surface Elev: 42 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST			WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS
						TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)			LL-PL-PI
0.3	41.5+/-	0.3									
2.0	40+/-	2.0			1.75 (HP)				18		35-18-17
5		5			2.25 (HP)	UC	1.52	6.2	23	101	54-15-39
5		5			2.00 (HP)	UC	1.28	4.2	27	93	
5		5			3.50 (HP)	UC	1.23	1.1	34	87	82-30-52
10	32+/-	10			3.00 (HP)						
<b>Boring Terminated at 10 Feet</b>											

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:  
0'-10' Continuous Flight Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Boring backfilled with auger cuttings upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevation based on Google Earth.

**WATER LEVEL OBSERVATIONS**

*No free water observed*



Boring Started: 02-01-2018

Boring Completed: 02-01-2018

Drill Rig: GP #891

Driller: G. Triplette

Project No.: EH185012

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# BORING LOG NO. B-05

**PROJECT:** Cypress River Apartments

**CLIENT:** Partners Southeast  
Baton Rouge, LA

**SITE:** Oklahoma Street & Duane Street  
Baton Rouge, LA

GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 30.4354° Longitude: -91.1862°  Approximate Surface Elev. 39 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST			WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS  LL-PL-PI
						TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)			
0.2	2" TOPSOIL	0.2			-						
6.0	<b>LEAN CLAY (CL)</b> , brown  -stiff, brown and tan below 2'	6.0			3.00 (HP)	UC	1.65	8.8	18	104	36-18-18
6.0	<b>FAT CLAY (CH)</b> , light gray and brown, stiff to very stiff, with ferrous nodules -slickensided at 6'	6.0			4.00 (HP)						
10.0		10.0			3.50 (HP)	UC	1.41	3.8	35	84	80-25-55
11.0	-light gray and tan from 11' to 14' -slickensided at 11'	11.0			3.75 (HP)						
14.0		14.0			3.50 (HP)	UC	1.31	2.5	31	90	
14.0	-slickensided at 14'	14.0			3.50 (HP)	UC	1.46	1.8	29	92	
19.0		19.0	▽ ▽		2.50 (HP)						
20.0	<b>Boring Terminated at 20 Feet</b>	20.0									

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:  
0'-20' Continuous Flight Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Boring backfilled with auger cuttings upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevation based on Google Earth.

**WATER LEVEL OBSERVATIONS**

▽ Groundwater first encountered  
▽ After 15 minutes



Boring Started: 05-23-2018

Boring Completed: 05-23-2018

Drill Rig: GP #891

Driller: G. Triplette

Project No.: EH185012

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_EH185012.GPJ TERRACON\_DATATEMPLATE.GDT 6/5/18

# BORING LOG NO. B-06

**PROJECT:** Cypress River Apartments

**CLIENT:** Partners Southeast  
Baton Rouge, LA

**SITE:** Oklahoma Street & Duane Street  
Baton Rouge, LA

GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 30.4353° Longitude: -91.1867°  Approximate Surface Elev: 31 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST			WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS
						TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)			
0.2	2" TOPSOIL				-				14		
	LEAN CLAY (CL), dark brown				-				11		
	-brown, very stiff, with ferrous nodules below 4'	5			4.00 (HP)				12		47-18-29
6.0	<b>Boring Terminated at 6 Feet</b>	25+/-									

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:  
0'-6" Continuous Flight Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevation based on Google Earth

**WATER LEVEL OBSERVATIONS**

*No free water observed*



2822 Oneal Ln, Bldg B  
Baton Rouge, LA

Boring Started: 05-22-2018

Boring Completed: 05-22-2018

Drill Rig: GP #891

Driller: G. Triplette

Project No.: EH185012

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_EH185012.GPJ TERRACON\_DATATEMPLATE.GDT 6/5/18

# BORING LOG NO. B-07

**PROJECT:** Cypress River Apartments

**CLIENT:** Partners Southeast  
Baton Rouge, LA

**SITE:** Oklahoma Street & Duane Street  
Baton Rouge, LA

GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 30.4354° Longitude: -91.1866°  Approximate Surface Elev: 32 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST			WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS
						TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)			
0.2	2" TOPSOIL				-						
	<b>LEAN CLAY (CL)</b> , brown								13		
	-dark brown from 2' to 4'				-				12		30-18-12
	-very stiff, with roots below 4'	5			4.00 (HP)				15		
	6.0	26+/-									
<b>Boring Terminated at 6 Feet</b>											

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:  
0'-6" Continuous Flight Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

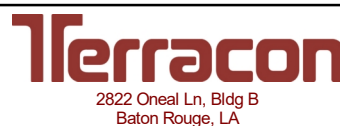
Abandonment Method:  
Boring backfilled with auger cuttings upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevation based on Google Earth.

**WATER LEVEL OBSERVATIONS**

*No free water observed*



Boring Started: 05-22-2018

Boring Completed: 05-22-2018

Drill Rig: GP #891

Driller: G. Triplette

Project No.: EH185012

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_EH185012.GPJ TERRACON\_DATATEMPLATE.GDT 6/5/18



# BORING LOG NO. B-08

**PROJECT:** Cypress River Apartments

**CLIENT:** Partners Southeast  
Baton Rouge, LA

**SITE:** Oklahoma Street & Duane Street  
Baton Rouge, LA

GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 30.4353° Longitude: -91.1863°  Approximate Surface Elev: 37 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST			WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS
						TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)			LL-PL-PI
0.2	<b>2" TOPSOIL</b>	37+/-			-				13		41-16-25
2.0	<b>LEAN CLAY (CL)</b> , brown	35+/-			4.50 (HP)	UC	2.94	3.6	21	104	
6.0	<b>FAT CLAY (CH)</b> , brown, very stiff to hard, with ferrous nodules to 4' -slickensided at 2'  -with gravel below 4'	31+/-			4.00 (HP)				25		68-22-46
<b>Boring Terminated at 6 Feet</b>											

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:  
0'-6" Continuous Flight Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Boring backfilled with auger cuttings upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevation based on Google Earth.

**WATER LEVEL OBSERVATIONS**

*No free water observed*



2822 Oneal Ln, Bldg B  
Baton Rouge, LA

Boring Started: 05-22-2018

Boring Completed: 05-22-2018

Drill Rig: GP #891

Driller: G. Triplette

Project No.: EH185012

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_EH185012.GPJ TERRACON\_DATATEMPLATE.GDT 6/5/18

# BORING LOG NO. B-09

**PROJECT:** Cypress River Apartments

**CLIENT:** Partners Southeast  
Baton Rouge, LA

**SITE:** Oklahoma Street & Duane Street  
Baton Rouge, LA

GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 30.4353° Longitude: -91.1862°  Approximate Surface Elev. 39 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST			WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS
						TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)			
0.2	39+/-										
2.0	37+/-				4.50 (HP)			15			
6.0	33+/-	5			3.50 (HP)			17		56-15-41	
					3.25 (HP)			33			
<b>Boring Terminated at 6 Feet</b>											

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:  
0'-6" Continuous Flight Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Boring backfilled with auger cuttings upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevation based on Google Earth.

**WATER LEVEL OBSERVATIONS**

*No free water observed*



2822 Oneal Ln, Bldg B  
Baton Rouge, LA

Boring Started: 05-22-2018

Boring Completed: 05-22-2018

Drill Rig: GP #891

Driller: G. Triplette

Project No.: EH185012

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_EH185012.GPJ TERRACON\_DATATEMPLATE.GDT 6/5/18

# BORING LOG NO. B-10

**PROJECT:** Cypress River Apartments

**CLIENT:** Partners Southeast  
Baton Rouge, LA

**SITE:** Oklahoma Street & Duane Street  
Baton Rouge, LA

GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 30.4353° Longitude: -91.1862°  Approximate Surface Elev. 39 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST			WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS
						TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)			LL-PL-PI
0.2	2" TOPSOIL				-						
	LEAN CLAY (CL), brown				-				15		33-19-14
	-light brown below 2'				-				16		
	-very stiff, with ferrous nodules below 4'	5			4.00 (HP)				17		43-18-25
	6.0	6.0									
<b>Boring Terminated at 6 Feet</b>											

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:  
0'-6" Continuous Flight Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Boring backfilled with auger cuttings upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevation based on Google Earth.

**WATER LEVEL OBSERVATIONS**

*No free water observed*



2822 Oneal Ln, Bldg B  
Baton Rouge, LA

Boring Started: 05-22-2018

Boring Completed: 05-22-2018

Drill Rig: GP #891

Driller: G. Triplette

Project No.: EH185012

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_EH185012.GPJ TERRACON\_DATATEMPLATE.GDT 6/5/18

# BORING LOG NO. B-11

**PROJECT:** Cypress River Apartments

**CLIENT:** Partners Southeast  
Baton Rouge, LA

**SITE:** Oklahoma Street & Duane Street  
Baton Rouge, LA

GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 30.4354° Longitude: -91.186°  Approximate Surface Elev. 39 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST			WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS  LL-PL-PI
						TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)			
0.2	2" TOPSOIL				-						
6.0	LEAN CLAY (CL), brown  - very stiff below 4'	5			4.00 (HP)				15		
					-				13		40-16-24
	<b>Boring Terminated at 6 Feet</b>								17		

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:  
0'-6" Continuous Flight Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Boring backfilled with auger cuttings upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevation based on Google Earth.

**WATER LEVEL OBSERVATIONS**

*No free water observed*



2822 Oneal Ln, Bldg B  
Baton Rouge, LA

Boring Started: 05-22-2018

Boring Completed: 05-22-2018

Drill Rig: GP #891

Driller: G. Triplette

Project No.: EH185012

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_EH185012.GPJ TERRACON\_DATATEMPLATE.GDT 6/5/18

# BORING LOG NO. B-12

**PROJECT:** Cypress River Apartments

**CLIENT:** Partners Southeast  
Baton Rouge, LA

**SITE:** Oklahoma Street & Duane Street  
Baton Rouge, LA

GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 30.4353° Longitude: -91.186°  Approximate Surface Elev: 40 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST			WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS
						TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)			LL-PL-PI
0.2	2" TOPSOIL				-						
6.0	LEAN CLAY (CL), brown  - very stiff below 4'	5			4.00 (HP)				14		30-19-11
	- very stiff below 4'								17		
	Boring Terminated at 6 Feet								18		43-21-22

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:  
0'-6" Continuous Flight Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Boring backfilled with auger cuttings upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevation based on Google Earth.

**WATER LEVEL OBSERVATIONS**

*No free water observed*



2822 Oneal Ln, Bldg B  
Baton Rouge, LA

Boring Started: 05-22-2018

Boring Completed: 05-22-2018

Drill Rig: GP #891

Driller: G. Triplette

Project No.: EH185012

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_EH185012.GPJ TERRACON\_DATATEMPLATE.GDT 6/5/18

# BORING LOG NO. B-13

**PROJECT:** Cypress River Apartments

**CLIENT:** Partners Southeast  
Baton Rouge, LA

**SITE:** Oklahoma Street & Duane Street  
Baton Rouge, LA

GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 30.4353° Longitude: -91.1859°  Approximate Surface Elev: 41 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST			WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS  LL-PL-PI
						TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)			
0.4	<b>4.5" TOPSOIL</b>	40.5+/-									
	<b>LEAN CLAY (CL)</b> , brown and tan, stiff -with roots to 4'				2.00 (HP)				21		47-17-30
					3.00 (HP)				24		
		5			1.00 (HP)				26		37-18-19
6.0	<b>Boring Terminated at 6 Feet</b>	35+/-									

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:  
0'-6" Continuous Flight Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Boring backfilled with auger cuttings upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevation based on Google Earth.

**WATER LEVEL OBSERVATIONS**

*No free water observed*



2822 Oneal Ln, Bldg B  
Baton Rouge, LA

Boring Started: 02-01-2018

Boring Completed: 02-01-2018

Drill Rig: GP #891

Driller: G. Triplette

Project No.: EH185012

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_EH185012.GPJ TERRACON\_DATATEMPLATE.GDT 6/5/18

# CPT LOG NO. CPT-01

**PROJECT:** Cypress River Apartments

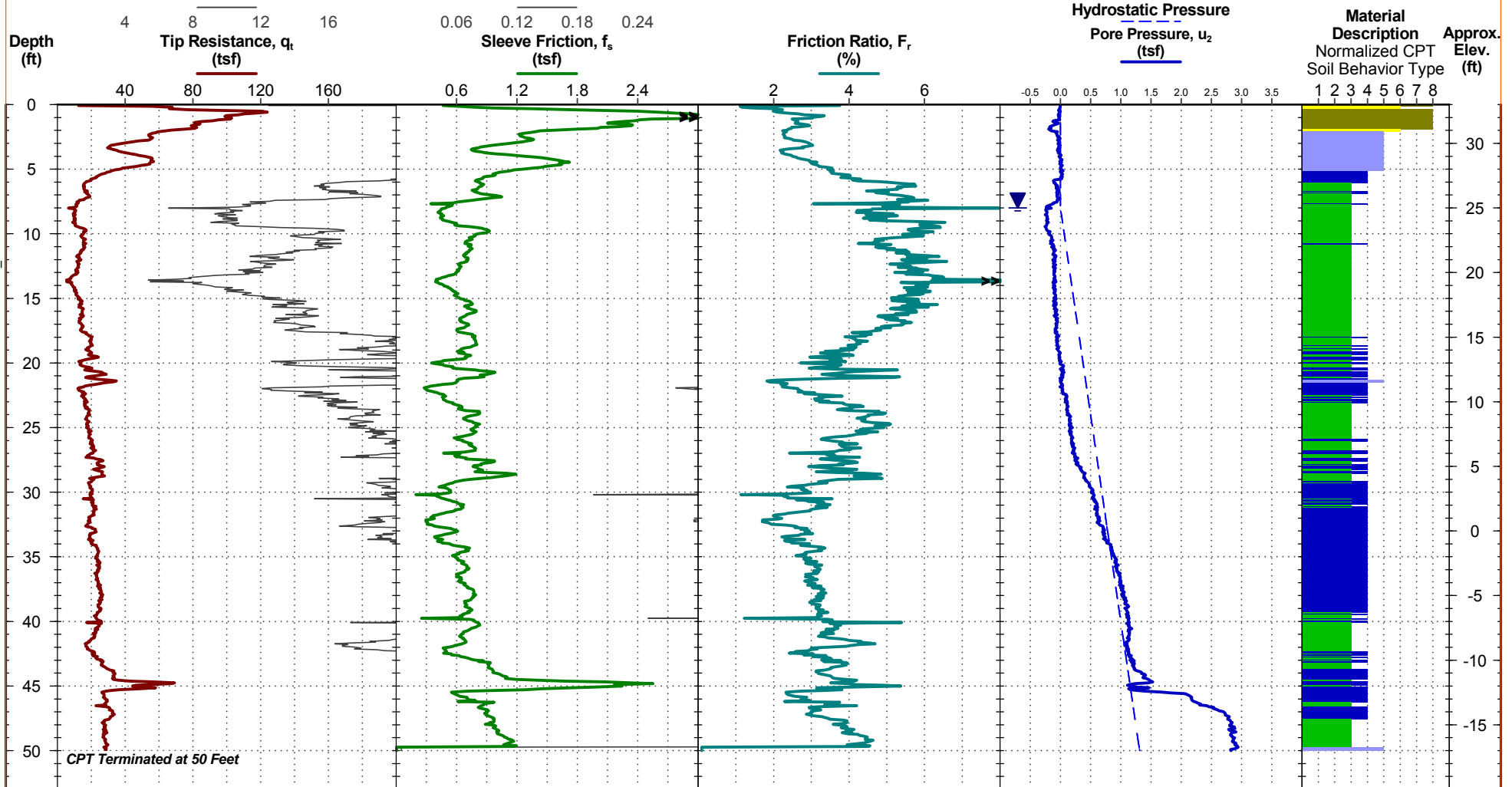
**CLIENT:** Partners Southeast  
Baton Rouge, LA

**TEST LOCATION:** See [Exploration Plan](#)

**SITE:** Oklahoma Street & Duane Street  
Baton Rouge, LA

Approx. Surface Elev: 33 ft +/-  
Latitude: 30.43515°  
Longitude: -91.18664°

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT REPORT\_EH185012.GPJ TERRACON\_DATATEMPLATE.GDT 6/6/18



See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).  
Elevation based on Google Earth.

CPT sensor calibration reports available upon request.

- 1 Sensitive, fine grained
- 2 Organic soils - clay
- 3 Clay - silty clay to clay
- 4 Silt mixtures - clayey silt to silty clay
- 5 Sand mixtures - silty sand to sandy silt
- 6 Sands - clean sand to silty sand
- 7 Gravelly sand to dense sand
- 8 Very stiff sand to clayey sand
- 9 Very stiff fine grained

**WATER LEVEL OBSERVATION**

▼ 8 ft estimated water depth  
(used in normalizations and correlations;  
See [Supporting Information](#))

Probe no. DDG1377 with net area ratio of .8  
U2 pore pressure transducer location  
Manufactured by Vertek; calibrated 1/16/2018  
Tip and sleeve areas of 10 cm<sup>2</sup> and 150 cm<sup>2</sup>  
Ring friction reducer with O.D. of 1.915 in



CPT Started: 5/22/2018

Rig: GP #891

Project No.: EH185012

CPT Completed: 5/22/2018

Operator: G. Triplette

# CPT LOG NO. CPT-02

**PROJECT:** Cypress River Apartments

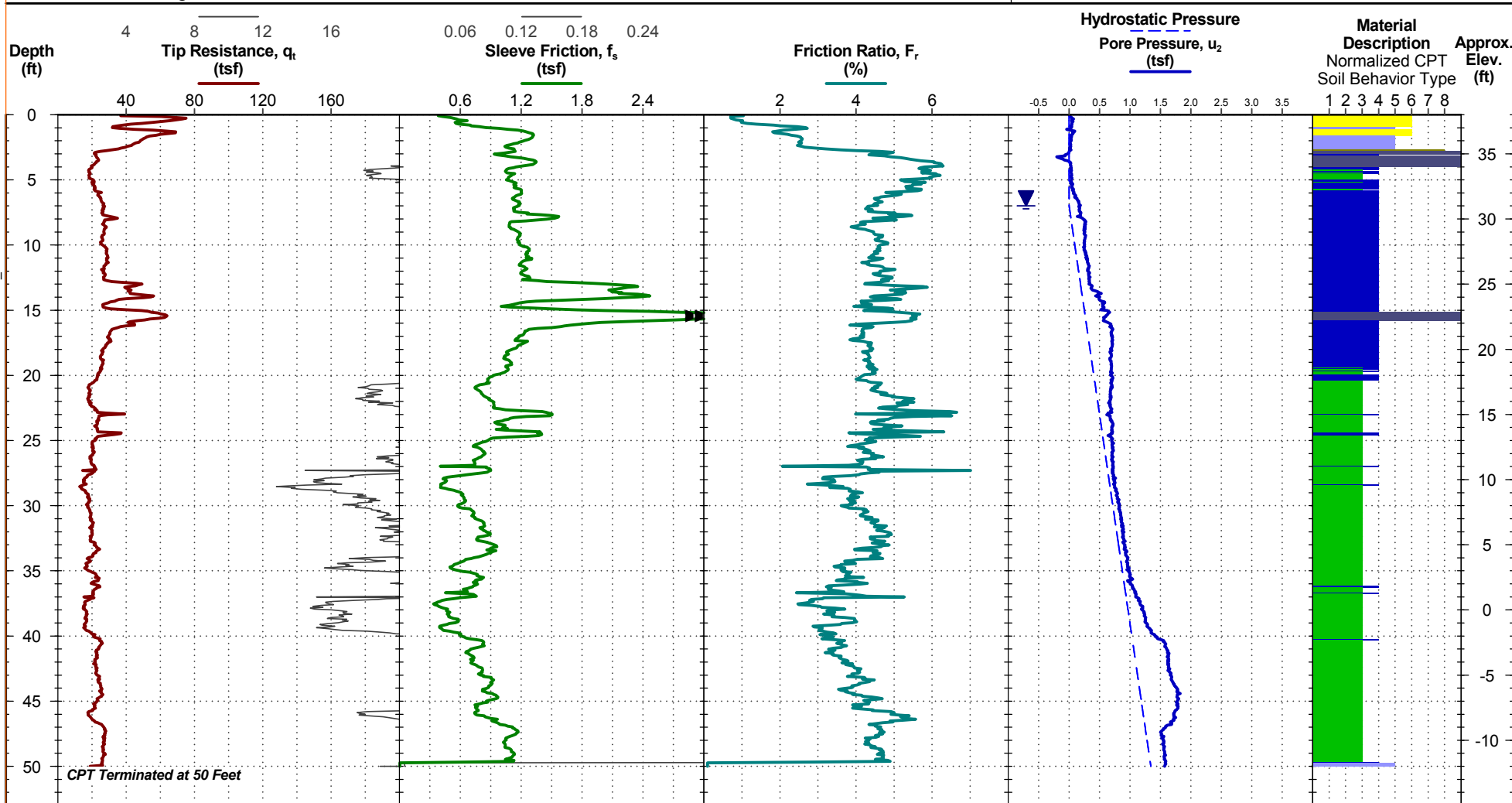
**CLIENT:** Partners Southeast  
Baton Rouge, LA

**TEST LOCATION:** See [Exploration Plan](#)

**SITE:** Oklahoma Street & Duane Street  
Baton Rouge, LA

Approx. Surface Elev: 38 ft +/-  
Latitude: 30.43516°  
Longitude: -91.18629°

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT REPORT\_EH185012.GPJ TERRACON\_DATATEMPLATE.GDT 6/6/18



See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).  
Elevation based on Google Earth.

CPT sensor calibration reports available upon request.

- 1 Sensitive, fine grained
- 2 Organic soils - clay
- 3 Clay - silty clay to clay
- 4 Silt mixtures - clayey silt to silty clay
- 5 Sand mixtures - silty sand to sandy silt
- 6 Sands - clean sand to silty sand
- 7 Gravelly sand to dense sand
- 8 Very stiff sand to clayey sand
- 9 Very stiff fine grained

**WATER LEVEL OBSERVATION**

▼ 7 ft estimated water depth  
(used in normalizations and correlations;  
See [Supporting Information](#))

Probe no. DDG1377 with net area ratio of .8  
U2 pore pressure transducer location  
Manufactured by Vertek; calibrated 1/16/2018  
Tip and sleeve areas of 10 cm<sup>2</sup> and 150 cm<sup>2</sup>  
Ring friction reducer with O.D. of 1.915 in



CPT Started: 5/23/2018

Rig: GP #891

Project No.: EH185012

CPT Completed: 5/23/2018

Operator: G. Triplette



# CPT LOG NO. CPT-03

**PROJECT:** Cypress River Apartments

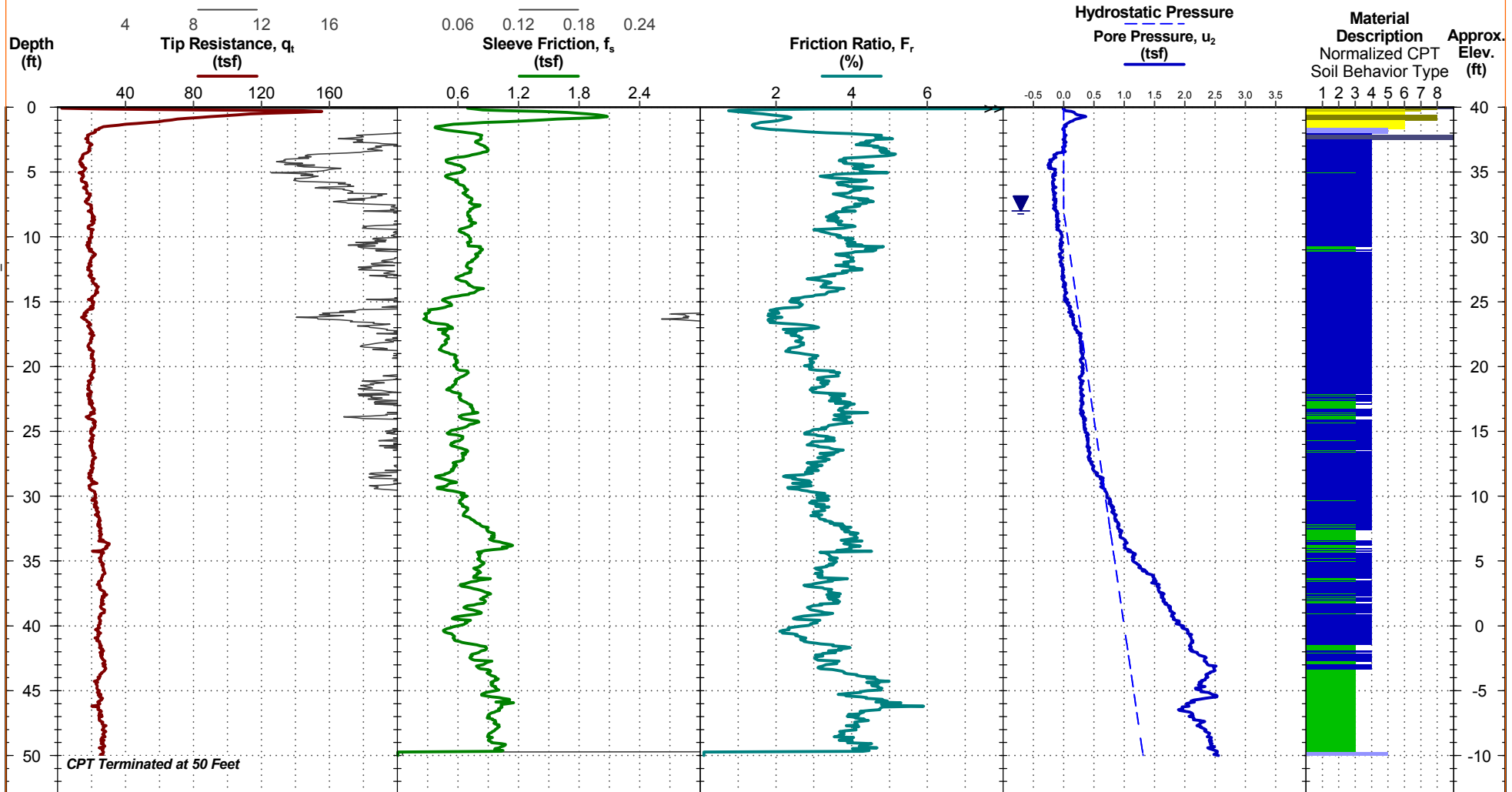
**CLIENT:** Partners Southeast  
Baton Rouge, LA

**TEST LOCATION:** See [Exploration Plan](#)

**SITE:** Oklahoma Street & Duane Street  
Baton Rouge, LA

Approx. Surface Elev: 40 ft +/-  
Latitude: 30.43516°  
Longitude: -91.1861°

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT REPORT\_EH185012.GPJ TERRACON\_DATATEMPLATE.GDT 6/6/18



See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).  
Elevation based on Google Earth.

CPT sensor calibration reports available upon request.

- 1 Sensitive, fine grained
- 2 Organic soils - clay
- 3 Clay - silty clay to clay
- 4 Silt mixtures - clayey silt to silty clay
- 5 Sand mixtures - silty sand to sandy silt
- 6 Sands - clean sand to silty sand
- 7 Gravelly sand to dense sand
- 8 Very stiff sand to clayey sand
- 9 Very stiff fine grained

**WATER LEVEL OBSERVATION**

▼ 8 ft estimated water depth  
(used in normalizations and correlations;  
See [Supporting Information](#))

Probe no. DDG1377 with net area ratio of .8  
U2 pore pressure transducer location  
Manufactured by Vertek; calibrated 1/16/2018  
Tip and sleeve areas of 10 cm<sup>2</sup> and 150 cm<sup>2</sup>  
Ring friction reducer with O.D. of 1.915 in



CPT Started: 5/23/2018

Rig: GP #891

Project No.: EH185012

CPT Completed: 5/23/2018

Operator: G. Triplette

# CPT LOG NO. CPT-04

**PROJECT:** Cypress River Apartments

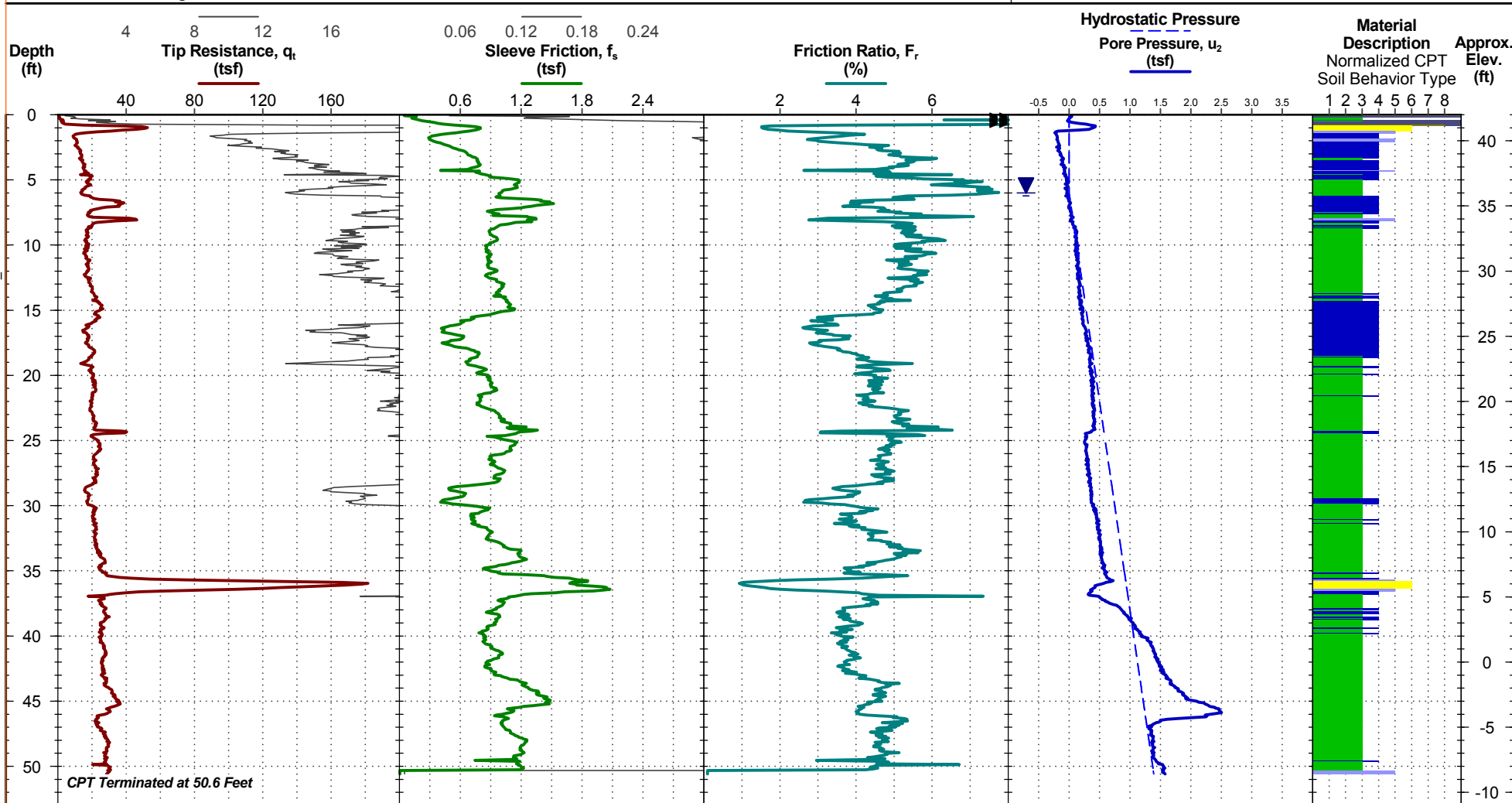
**CLIENT:** Partners Southeast  
Baton Rouge, LA

**TEST LOCATION:** See [Exploration Plan](#)

**SITE:** Oklahoma Street & Duane Street  
Baton Rouge, LA

Approx. Surface Elev: 42 ft +/-  
Latitude: 30.43515°  
Longitude: -91.18585°

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT REPORT\_EH185012.GPJ TERRACON\_DATATEMPLATE.GDT 6/6/18



See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).  
Elevation based on Google Earth.

CPT sensor calibration reports available upon request.

- 1 Sensitive, fine grained
- 2 Organic soils - clay
- 3 Clay - silty clay to clay
- 4 Silt mixtures - clayey silt to silty clay
- 5 Sand mixtures - silty sand to sandy silt
- 6 Sands - clean sand to silty sand
- 7 Gravelly sand to dense sand
- 8 Very stiff sand to clayey sand
- 9 Very stiff fine grained

**WATER LEVEL OBSERVATION**

▼ 6 ft estimated water depth  
(used in normalizations and correlations;  
See [Supporting Information](#))

Probe no. DDG1377 with net area ratio of .8  
U2 pore pressure transducer location  
Manufactured by Vertek; calibrated 1/16/2018  
Tip and sleeve areas of 10 cm<sup>2</sup> and 150 cm<sup>2</sup>  
Ring friction reducer with O.D. of 1.915 in



CPT Started: 2/1/2018

Rig: GP #891

Project No.: EH185012

CPT Completed: 2/1/2018

Operator: G. Triplette






## **SUPPORTING INFORMATION**

# GENERAL NOTES

## DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

Cypress River Apartments ■ Baton Rouge, LA

6/5/2018 ■ Terracon Project No. EH185012

SAMPLING	WATER LEVEL	FIELD TESTS
 Auger Cuttings  Shelby Tube	 Water Initially Encountered  Water Level After a Specified Period of Time  Water Level After a Specified Period of Time	(N) Standard Penetration Test Resistance (Blows/Ft.) (HP) Hand Penetrometer (T) Torvane (DCP) Dynamic Cone Penetrometer (UC) Unconfined Compressive Strength (PID) Photo-ionization Detector (OVA) Organic Vapor Analyzer
	Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	

### DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

### LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

### STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	Standard Penetration or N-Value Blows/Ft.	Descriptive Term (Consistency)	Unconfined Compressive Strength Qu, (tsf)	Standard Penetration or N-Value Blows/Ft.
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	4 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
		Hard	> 4.00	> 30

RELATIVE PROPORTIONS OF SAND AND GRAVEL		RELATIVE PROPORTIONS OF FINES	
Descriptive Term(s) of other constituents	Percent of Dry Weight	Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	<15	Trace	<5
With	15-29	With	5-12
Modifier	>30	Modifier	>12

GRAIN SIZE TERMINOLOGY		PLASTICITY DESCRIPTION	
Major Component of Sample	Particle Size	Term	Plasticity Index
Boulders	Over 12 in. (300 mm)	Non-plastic	0
Cobbles	12 in. to 3 in. (300mm to 75mm)	Low	1 - 10
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)	Medium	11 - 30
Sand	#4 to #200 sieve (4.75mm to 0.075mm)	High	> 30
Silt or Clay	Passing #200 sieve (0.075mm)		

# UNIFIED SOIL CLASSIFICATION SYSTEM

Cypress River Apartments ■ Baton Rouge, Louisiana

January 22, 2018 ■ Terracon Project No. EH185012



Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests <sup>A</sup>				Soil Classification		
				Group Symbol	Group Name <sup>B</sup>	
<b>Coarse-Grained Soils:</b> More than 50% retained on No. 200 sieve	<b>Gravels:</b> More than 50% of coarse fraction retained on No. 4 sieve	<b>Clean Gravels:</b> Less than 5% fines <sup>C</sup>	$Cu \geq 4$ and $1 \leq Cc \leq 3$ <sup>E</sup>	GW	Well-graded gravel <sup>F</sup>	
			$Cu < 4$ and/or $1 > Cc > 3$ <sup>E</sup>	GP	Poorly graded gravel <sup>F</sup>	
		<b>Gravels with Fines:</b> More than 12% fines <sup>C</sup>	Fines classify as ML or MH	GM	Silty gravel <sup>F,G,H</sup>	
			Fines classify as CL or CH	GC	Clayey gravel <sup>F,G,H</sup>	
	<b>Sands:</b> 50% or more of coarse fraction passes No. 4 sieve	<b>Clean Sands:</b> Less than 5% fines <sup>D</sup>	$Cu \geq 6$ and $1 \leq Cc \leq 3$ <sup>E</sup>	SW	Well-graded sand <sup>I</sup>	
			$Cu < 6$ and/or $1 > Cc > 3$ <sup>E</sup>	SP	Poorly graded sand <sup>I</sup>	
		<b>Sands with Fines:</b> More than 12% fines <sup>D</sup>	Fines classify as ML or MH	SM	Silty sand <sup>G,H,I</sup>	
			Fines classify as CL or CH	SC	Clayey sand <sup>G,H,I</sup>	
<b>Fine-Grained Soils:</b> 50% or more passes the No. 200 sieve	<b>Silts and Clays:</b> Liquid limit less than 50	<b>Inorganic:</b>	$PI > 7$ and plots on or above "A" line	CL	Lean clay <sup>K,L,M</sup>	
			$PI < 4$ or plots below "A" line <sup>J</sup>	ML	Silt <sup>K,L,M</sup>	
		<b>Organic:</b>	Liquid limit - oven dried	< 0.75	OL	Organic clay <sup>K,L,M,N</sup>
			Liquid limit - not dried			Organic silt <sup>K,L,M,O</sup>
	<b>Silts and Clays:</b> Liquid limit 50 or more	<b>Inorganic:</b>	$PI$ plots on or above "A" line	CH	Fat clay <sup>K,L,M</sup>	
			$PI$ plots below "A" line	MH	Elastic Silt <sup>K,L,M</sup>	
		<b>Organic:</b>	Liquid limit - oven dried	< 0.75	OH	Organic clay <sup>K,L,M,P</sup>
			Liquid limit - not dried			Organic silt <sup>K,L,M,Q</sup>
	<b>Highly organic soils:</b>	Primarily organic matter, dark in color, and organic odor			PT	Peat

<sup>A</sup> Based on the material passing the 3-inch (75-mm) sieve

<sup>B</sup> If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

<sup>C</sup> Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

<sup>D</sup> Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

<sup>E</sup>  $Cu = D_{60}/D_{10}$      $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

<sup>F</sup> If soil contains  $\geq 15\%$  sand, add "with sand" to group name.

<sup>G</sup> If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

<sup>H</sup> If fines are organic, add "with organic fines" to group name.

<sup>I</sup> If soil contains  $\geq 15\%$  gravel, add "with gravel" to group name.

<sup>J</sup> If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

<sup>K</sup> If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

<sup>L</sup> If soil contains  $\geq 30\%$  plus No. 200 predominantly sand, add "sandy" to group name.

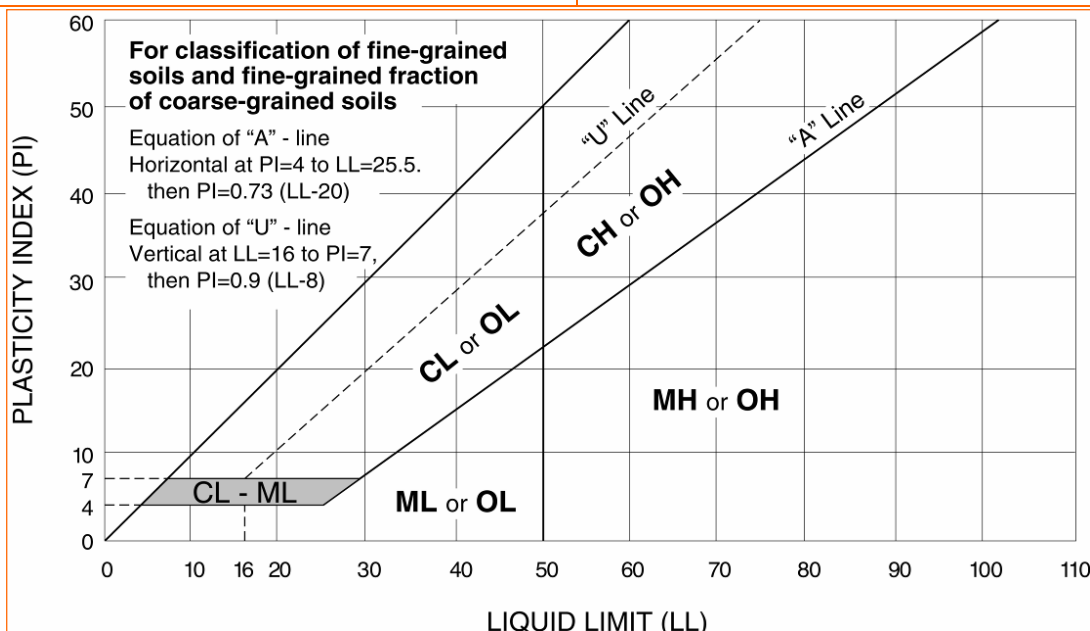
<sup>M</sup> If soil contains  $\geq 30\%$  plus No. 200, predominantly gravel, add "gravelly" to group name.

<sup>N</sup>  $PI \geq 4$  and plots on or above "A" line.

<sup>O</sup>  $PI < 4$  or plots below "A" line.

<sup>P</sup>  $PI$  plots on or above "A" line.

<sup>Q</sup>  $PI$  plots below "A" line.



# CPT GENERAL NOTES

## DESCRIPTION OF MEASUREMENTS AND CALIBRATIONS

To be reported per ASTM D5778:

Uncorrected Tip Resistance,  $q_c$   
Measured force acting on the cone divided by the cone's projected area

Corrected Tip Resistance,  $q_t$   
Cone resistance corrected for porewater and net area ratio effects  
 $q_t = q_c + u_2(1 - a)$

Where  $a$  is the net area ratio, a lab calibration of the cone typically between 0.70 and 0.85

Pore Pressure,  $u$   
Pore pressure measured during penetration  
 $u_1$  - sensor on the face of the cone  
 $u_2$  - sensor on the shoulder (more common)

Sleeve Friction,  $f_s$   
Frictional force acting on the sleeve divided by its surface area

Normalized Friction Ratio,  $F_r$   
The ratio as a percentage of  $f_s$  to  $q_t$ , accounting for overburden pressure

To be reported per ASTM D7400, if collected:

Shear Wave Velocity,  $V_s$   
Measured in a Seismic CPT and provides direct measure of soil stiffness

## DESCRIPTION OF GEOTECHNICAL CORRELATIONS

Normalized Tip Resistance,  $Q_{tn}$   
 $Q_{tn} = ((q_t - \sigma_{vo})/P_a)(P_a/\sigma'_{vo})^n$   
 $n = 0.381(I_c) + 0.05(\sigma'_{vo}/P_a) - 0.15$

Over Consolidation Ratio, OCR  
OCR (1) =  $0.25(Q_{tn})^{1.25}$   
OCR (2) =  $0.33(Q_{tn})$

Undrained Shear Strength,  $S_u$   
 $S_u = Q_{tn} \times \sigma'_{vo}/N_{kt}$   
 $N_{kt}$  is a soil-specific factor (shown on  $S_u$  plot)

Sensitivity,  $S_t$   
 $S_t = (q_t - \sigma_{vo}/N_u) \times (1/f_s)$

Effective Friction Angle,  $\phi'$   
 $\phi' (1) = \tan^{-1}(0.373[\log(q_t/\sigma'_{vo}) + 0.29])$   
 $\phi' (2) = 17.6 + 11[\log(Q_{tn})]$

Unit Weight,  $\gamma$   
 $\gamma = (0.27[\log(F_r)] + 0.36[\log(q_t/\text{atm})] + 1.236) \times \gamma_{\text{water}}$   
 $\sigma_{vo}$  is taken as the incremental sum of the unit weights

Small Strain Shear Modulus,  $G_0$   
 $G_0 (1) = \rho V_s^2$   
 $G_0 (2) = 0.015 \times 10^{(0.55I_c + 1.68)}(q_t - \sigma_{vo})$

Soil Behavior Type Index,  $I_c$   
 $I_c = [(3.47 - \log(Q_{tn}))^2 + (\log(F_r) + 1.22)^2]^{0.5}$

SPT  $N_{60}$   
 $N_{60} = (q_t/\text{atm}) / 10^{(1.1268 - 0.2817I_c)}$

Elastic Modulus,  $E_s$  (assumes  $q/q_{\text{ultimate}} \sim 0.3$ , i.e. FS = 3)

$E_s (1) = 2.6\psi G_0$  where  $\psi = 0.56 - 0.33\log Q_{tn, \text{clean sand}}$

$E_s (2) = G_0$

$E_s (3) = 0.015 \times 10^{(0.55I_c + 1.68)}(q_t - \sigma_{vo})$

$E_s (4) = 2.5q_t$

Constrained Modulus,  $M$

$M = \alpha_M(q_t - \sigma_{vo})$

For  $I_c > 2.2$  (fine-grained soils)

$\alpha_M = Q_{tn}$  with maximum of 14

For  $I_c < 2.2$  (coarse-grained soils)

$\alpha_M = 0.0188 \times 10^{(0.55I_c + 1.68)}$

Hydraulic Conductivity,  $k$

For  $1.0 < I_c < 3.27$   $k = 10^{(0.952 - 3.04I_c)}$

For  $3.27 < I_c < 4.0$   $k = 10^{(-4.52 - 1.37I_c)}$

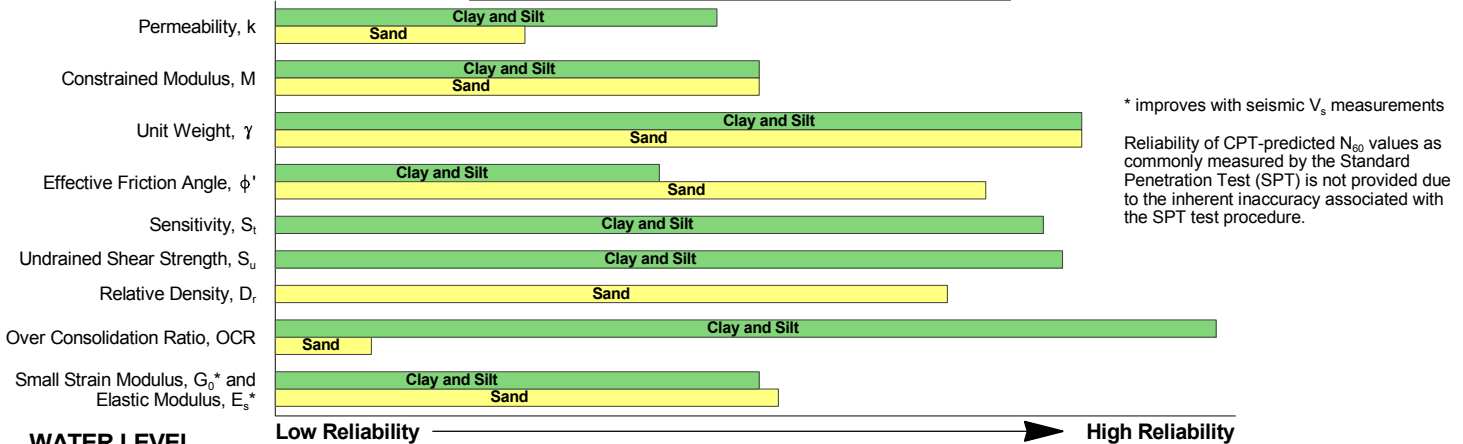
Relative Density,  $D_r$

$D_r = (Q_{tn} / 350)^{0.5} \times 100$

## REPORTED PARAMETERS

CPT logs as provided, at a minimum, report the data as required by ASTM D5778 and ASTM D7400 (if applicable). This minimum data include  $q_t$ ,  $f_s$ , and  $u$ . Other correlated parameters may also be provided. These other correlated parameters are interpretations of the measured data based upon published and reliable references, but they do not necessarily represent the actual values that would be derived from direct testing to determine the various parameters. To this end, more than one correlation to a given parameter may be provided. The following chart illustrates estimates of reliability associated with correlated parameters based upon the literature referenced below.

## RELATIVE RELIABILITY OF CPT CORRELATIONS



## WATER LEVEL

The groundwater level at the CPT location is used to normalize the measurements for vertical overburden pressures and as a result influences the normalized soil behavior type classification and correlated soil parameters. The water level may either be "measured" or "estimated:"

*Measured - Depth to water directly measured in the field*

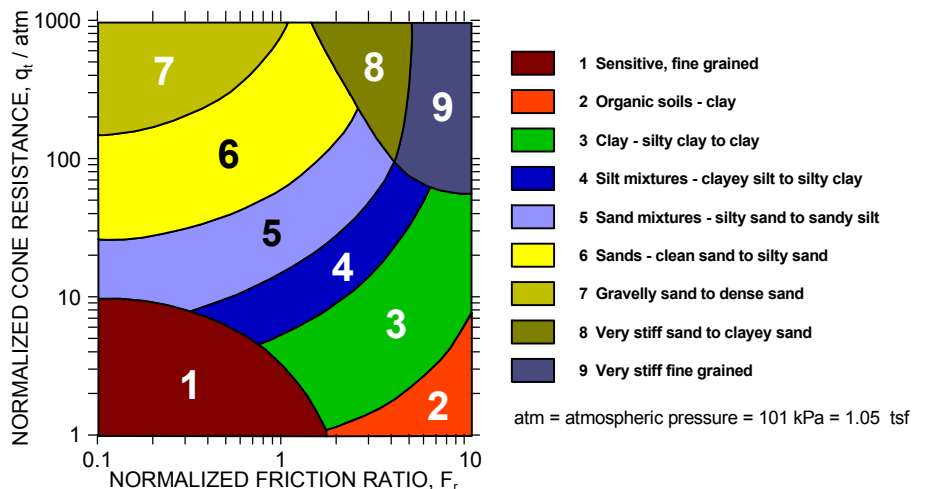
*Estimated - Depth to water interpolated by the practitioner using pore pressure measurements in coarse grained soils and known site conditions*

While groundwater levels displayed as "measured" more accurately represent site conditions at the time of testing than those "estimated," in either case the groundwater should be further defined prior to construction as groundwater level variations will occur over time.

## CONE PENETRATION SOIL BEHAVIOR TYPE

The estimated stratigraphic profiles included in the CPT logs are based on relationships between corrected tip resistance ( $q_t$ ), friction resistance ( $f_s$ ), and porewater pressure ( $u_2$ ). The normalized friction ratio ( $F_r$ ) is used to classify the soil behavior type.

Typically, silts and clays have high  $F_r$  values and generate large excess penetration porewater pressures; sands have lower  $F_r$ 's and do not generate excess penetration porewater pressures. The adjacent graph (Robertson *et al.*) presents the soil behavior type correlation used for the logs. This normalized SBT chart, generally considered the most reliable, does not use pore pressure to determine SBT due to its lack of repeatability in onshore CPTs.



## REFERENCES

- Kulhavy, F.H., Mayne, P.W., (1997). "Manual on Estimating Soil Properties for Foundation Design," Electric Power Research Institute, Palo Alto, CA.
- Mayne, P.W., (2013). "Geotechnical Site Exploration in the Year 2013," Georgia Institute of Technology, Atlanta, GA.
- Robertson, P.K., Cabal, K.L. (2012). "Guide to Cone Penetration Testing for Geotechnical Engineering," Signal Hill, CA.
- Schmertmann, J.H., (1970). "Static Cone to Compute Static Settlement over Sand," *Journal of the Soil Mechanics and Foundations Division*, 96(SM3), 1011-1043.

## Memorandum No. 1

Cypress River Apartments  
Baton Rouge, Louisiana

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To: Mr. Clarke J. Gernon, Jr.  
With: Remson, Haley, Herpin Architects  
Date: July 25, 2018  
Re: Swelling Potential Mitigation Geotechnical Considerations  
Project No. EH185012  
From: Brenda Novoa, P.E.  
Review by: Stephen E. Greaber, P.E.

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This Memorandum presents further considerations/recommendations to aid with the bid phase of the project. This memorandum is considered an Addendum to our Geotechnical Report EH185012, dated June 8, 2018, and is subject to the limitations and considerations outlined therein.

Per our discussions over the phone and emails, we are providing additional recommendations for the recommended buffer to reduce post construction swell potential. Based on the site plans provided by Remson, Haley, Herpin Architects (RHH), Building A is set at 10 feet from the property line along Duane Street. In our Report EH185012, referenced above, we recommended to provide a buffer between the bottom of the slab and underlying fat clays of a minimum of 4 feet and to extend it a minimum of 5 feet beyond the building perimeter. RHH informed us that due to the proximity of the building to the property line, it will be very challenging to extend the buffer zone along Duane Street and this may require raising the sidewalk higher than the existing road elevation. Based on the soil conditions noted at Building A and due to the situation described above, it is permissible to reduce the extension of the buffer zone to 2 feet beyond the building footprint along Duane Street, if the buffer is necessary.

Furthermore, as a clarification to our recommendations about the buffer, we recommended to provide a minimum 4 feet buffer between the bottom of the slab and underlying fat clays. The data obtained from our geotechnical exploration suggests there is a lean clay layer about 2 feet thick around Buildings D and C (Borings B-01 and B-04) and of about 4 feet thick at Buildings A and B (Borings B-02 and B-03). We understand that the designer would prefer to leave the sites near the current prevailing elevations and/or add fill if necessary instead of undercutting. Based on these considerations, the buffer for Buildings C and D will require only 2 feet of low volume change fill to establish the recommended minimum 4 feet; thus, from the site grades, no undercut is necessary. For Buildings A and B, the borings show there is already 4 feet of native lean clay buffer, so they can be constructed at the prevailing site elevation.





Please note the recommendations provided herein are subjected to verification of existing subgrade conditions in the field during construction. Terracon should be retained as the Geotechnical Engineer to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project. If variations appear, we can provide further evaluation and supplemental recommendations.



## Memorandum No. 2

Cypress River Apartments  
Baton Rouge, Louisiana

To: Mr. Clarke J. Geron, Jr.  
With: Remson, Haley, Herpin Architects  
Date: March 25, 2019  
Re: MSE Wall Design Recommendations and  
Global Stability Analysis  
Project No. EH185012  
From: Brenda Novoa, P.E.  
Review by: Stephen E. Greaber, P.E.

This Memorandum presents further considerations/recommendations to aid the contractor with their design and construction of an MSE wall along the Corporate Canal for the proposed Cypress River Lofts project. The contractor's wall provider (Redi-Rock) should validate the internal AND compound stability evaluations provided herein in their preparation of the wall design drawings. Terracon should review the drawings to provide comment on the interpretation of our recommendations prior to beginning construction. Finally, Terracon should provide full time observation and testing during the construction of the wall to validate the construction is in accordance with the wall design prepared by others. This memorandum is considered an Addendum to our Geotechnical Report EH185012, dated June 8, 2018, and is subject to the limitations and considerations outlined therein.

Per the information provided on Drawing C2.01, it is understood that Building D and the parking lot for Building D will be located immediately adjacent to the 5-foot setback from the property line. The project site is located immediately adjacent to the Corporate Canal, therefore a retaining wall is required to allow for the final grades. The topographic information on the drawing shows that the elevation of the site at the proposed wall is about +29 feet, NAVD88. The proposed wall will have a top elevation of +34.75 feet. The building corners will be within approximately 2-1/2 feet of the back of the proposed wall.

It is understood that a Redi-Rock wall system is planned for the project site. Given the proximity of the building to wall and the relative proximity of the wall to the edge of Corporate Canal, the following wall design/construction details are recommended:

- The wall should have a minimum 12-inch embedment below the prevailing grade along the wall toe.
- A minimum 6-inch thick leveling pad consisting of compacted #610 crushed limestone wrapped in non-woven geotextile fabric (Mirafi 160-N or equivalent)

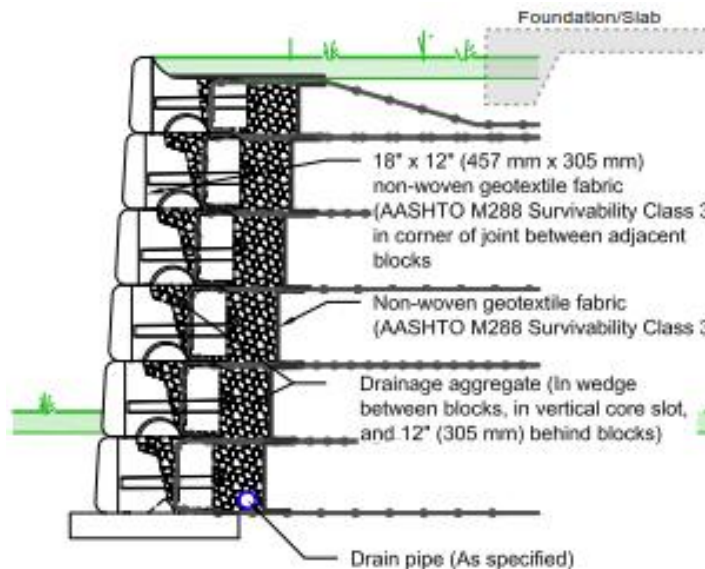


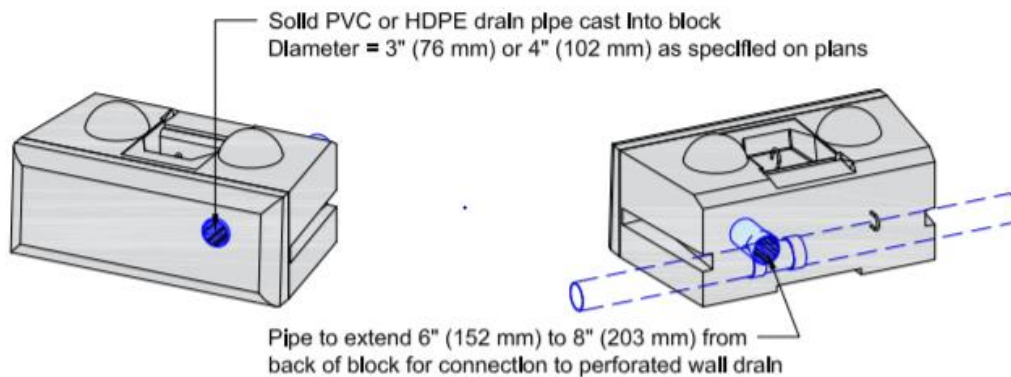
Terracon Consultants, Inc. 2822 O'Neal Lane Building B Baton Rouge, Louisiana 70816  
P [225] 344 6052 F [225] 344 6346 [terracon.com](http://terracon.com)



should be provided. A 2 inch layer of clean sand can be used as a leveling course above the crushed aggregate.

- The wall system should incorporate a geogrid strip reinforced backfill with a minimum grid length of 7 feet from the back face of the wall. Grid should consist of Mirafi 5XT geogrid at a minimum.
- The grid should be placed starting at the elevation of the leveling course, and at minimum 9 inch intervals to the top of the wall from the southern end of the proposed wall to at least 10 feet beyond the north corner of Building D. The top grid should be angled as shown below to avoid conflict with the subsequent building foundation.
- The grid should be placed starting at the elevation of the leveling course, and at minimum 18 inch intervals to the top of the wall from 10-feet north of Building D to the wall end. The top grid should be angled as shown below to avoid conflict with the subsequent pavements etc.
- A clean compacted sand (USCS: SP) with maximum 5% passing the No. 200 sieve, and a Uniformity Coefficient (Cu) greater than 4 should be used for the reinforced zone. Typically, this requires a concrete sand (ASTM C33) to be specified. A compacted lean clay as specified in the geotechnical report can be used in the retained soil behind the reinforced zone.
- A 12-inch layer of washed #57 limestone gravel (chimney drain) should be provided behind the face of the wall with non-woven geotextile placed between the gravel and the reinforced sand layer as shown below. A drain pipe should be provided near the base of the chimney drain that daylights through wall drain weep holes placed at maximum 40-ft intervals at the base of the toe.





- A 12-inch layer of compacted lean clay should be placed at the top of the sand reinforcement zone behind the wall to minimize surface infiltration. A shallow drainage swale should be formed in the lean clay behind the wall to direct surface water laterally to an appropriate outlet at the ends of the wall.
- Roof drains from the building should be routed to piping, with an appropriate number of cleanouts. The pipe should be routed to drain to a reliable outlet such as a drop inlet or other outlet away from the wall.
- Fence posts can be installed in the top of the wall typically by coring the concrete at least 2 blocks deep and grouting the fence post into the wall with a high strength non-shrink grout.

## GLOBAL AND EXTERNAL STABILITY

Terracon performed an evaluation of the global and external stability of the planned wall system.

### Mechanics of Stability

Slope stability analyses take into consideration material strength, presence and orientation of weak layers, water (piezometric) pressures, surcharge loads, and the slope/wall geometry. Mathematical computations are performed using computer-assisted simulations to calculate a Factor of Safety (FS). The FS represents the ratio of the forces tending to resist rotational or sliding failure to the forces tending to cause failure. A FS of 1.0 generally represents conditions of incipient failure. For long term stability, it is common for wall systems to be considered stable if the FS against failure is at least 1.5 for undrained and drained full mobilized peak strength, and at least 1.3 when using the fully softened strength values. The Ru Method, where porewater pressure is set as a ratio of the overburden stress, was used to model porewater pressure. A Ru of 0.3 was used which is typical for projects where limited long term water level information is available.

The FS used in any given project is a function of uncertainty of the strength parameters, design model, and cost/impact of a future failure. Minor changes to slope geometry, surface water flow and/or groundwater levels could result in slope instability. Reasonable FS values are dependent upon the confidence in the parameters utilized in the analyses performed, among other factors related to the project itself. The slope stability analysis was performed based on limited subsurface information and without the benefit of advanced triaxial shear strength testing. Therefore, a factor of safety of at least 1.5 with the overconsolidated lean/fat clay in a drained fully softened condition is recommended. The fully softened strength was modeled using a shear-normal function conservatively reduced from values derived from equations developed by Stark and Hussain (2010).

The global stability analyses were aided using the computer program SLOPE-W to allow for rapid analysis of many potential failure surfaces and scenarios. A search was performed for a “minimum” FS for the given slope profile, failure shape and soil strength condition using Morgenstern-Price methodology. Morgenstern-Price is a rigorous method in a sense that it satisfies all three equations of equilibrium: the force equations of equilibrium in the horizontal and vertical directions and the moment equation of equilibrium. It should be noted that the FS calculated may not be the absolute minimum FS for the slope section. It is possible that a lower FS may exist which was not detected during the search.

## Materials Properties

The materials properties used in the various slope cases analyzed is summarized in the table below.

Soil Parameters Used in Analyses						
Material Type	Moist Unit Weight (pcf)	Undrained Shear Strength (psf)	Effective Fully Mobilized Peak Strength		Effective Fully Softened Strength	
			$c_u$ , psf	$f$ , degrees	$c'$ , psf	$f'$ , degrees
Native Lean and Fat Clay (CL and CH)	125	1,800	Shear Normal Function from Stark-Hussain (2010) <sup>1</sup>		Shear Normal Function from Stark-Hussain (2010) <sup>1</sup>	
Reinforced Zone <sup>2</sup> of MSE Wall – Clean (<5% fines) Well Graded Sand $C_u > 4$	115	--	--	34	--	34
MSE Wall Retained Soil –	125	1,000	250	30	--	--

Soil Parameters Used in Analyses						
Material Type	Moist Unit Weight (pcf)	Undrained Shear Strength (psf)	Effective Fully Mobilized Peak Strength		Effective Fully Softened Strength	
			$C_u$ , psf	$f$ , degrees	$c'$ , psf	$f'$ , degrees
Compacted Lean Clay <sup>3</sup>						
MSE Wall – Foundation Soils <sup>3</sup>	125	1,200	--	--	--	--

1. Shear strength as a function of normal force model used and was derived from correlations from Stark-Hussain (2010) based on liquid limit testing and assumed clay fraction.
2. Reinforced zone modeled in Slope-W using high strength material to force failure plane behind and under reinforced zone.
3. For use in MSE Wall design only.

## Analysis Results – Global Stability

A description of the various cases analyzed and analysis results is presented below:

### Case 1: MSE or Reinforced Wall After End on Construction with Undrained Condition

For this case, the shear strength parameters for the overconsolidated lean and fat clays were modeled using basic laboratory tested values in an undrained condition as shown on Exhibit 1. The analyses indicated the critical failure surface exhibits a FS of 4.68, which exceeds the recommended minimum FS of 1.5. The slope stability analysis model output created under these conditions is presented as Exhibit 1.

### Case 2: MSE Wall Overconsolidated Clay in a Peaked Drained Condition ( $R_u=0.3$ )

For this case, the shear strength parameters for the overconsolidated lean and fat clays and retained fill were modeled using fully mobilized peak strength. The piezometric surface was set using a ratio of overburden stress equal to 0.3. The effective stress analyses indicated the critical failure surface exhibits a FS of 1.91, satisfying the recommended minimum FS of 1.5. The slope stability analysis model output created under these conditions is presented as Exhibit 2.

### Case 3: MSE WALL with Overconsolidated Clay in a Fully Softened Condition ( $R_u=0.3$ )

Although not likely to be present, it is considered prudent to evaluate the possibility that the near surface overconsolidated clays may be in a fully softened strength condition from seasonal desiccation cycling and strain softening from long term creep. The piezometric conditions and critical failure surfaces defined by Case 2 were selected for this check. As previously discussed, a minimum FS of 1.5 is recommended for this condition. The effective stress analyses indicate this slope condition has a FS of 1.70 in this case, which is greater than the recommended

minimum FS. The slope stability analysis model created under these conditions is presented as Exhibit 3.

### **External Stability MSE Wall (Bearing Capacity, Sliding, and Overturning)**

The results of the stability analyses (local external and global) for both end of construction and long-term conditions were compared to evaluate the minimum reinforcement lengths required to satisfy the various minimum required factors of safety considered in our analyses. The wall was considered to have a minimum embedment of 1 foot below finished grade. The results of the analysis indicate a minimum reinforcement length ratio of 6-1/2 feet is required (controlled by the minimum factor of safety for sliding).

Our analysis shows that the minimum reinforcement length of 7 feet provides a FS of 3.8 for bearing capacity, a FS of 1.7 for direct sliding, and an FS of 4.9 for overturning, satisfying the typical AASHTO suggested minimums. An internal stability analysis of the geogrids using Mirafi 5-XT geogrids at 1.5 ft spacing indicated a FS of 7.4 and 2.5 for strength and pullout resistance satisfying the minimum FS of 2 required. The output from the MSEW program is attached as Exhibit 4.

### **Internal Compound Stability MSE Wall**

Since the building foundation will bear on the reinforced zone, Terracon performed a check of compound stability allowing the failure surface to occur through the reinforced zone. The analysis indicates that grid reinforcement with 5XT is required at minimum 9-inch spacing to provide a FS of 1.59, which satisfies a minimum factor of safety of 1.5 for compound stability. The results of the compound stability analysis are included as Exhibit 5.

The contractor's wall provider (Redi-Rock) should validate the above internal stability evaluations in the preparation of the wall design drawings. Terracon should review the drawings to provide comment on the interpretation of our recommendations prior to beginning construction.

### **Construction Monitoring**

The wall construction efforts should be monitored under the direction of the Geotechnical Engineer. Monitoring should include documentation of adequate removal of vegetation and top soil, proof-rolling and mitigation of areas delineated by the proof-roll to require mitigation, observation of the wall foundation subgrade, grid placements, and drainage system installation.

Each lift of compacted fill should be tested, evaluated, and reworked as necessary until approved by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill in the reinforced zone and retained soil. In areas of foundation excavations, the bearing subgrade should be evaluated under the direction of the Geotechnical Engineer. If



unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

## **General Comments**

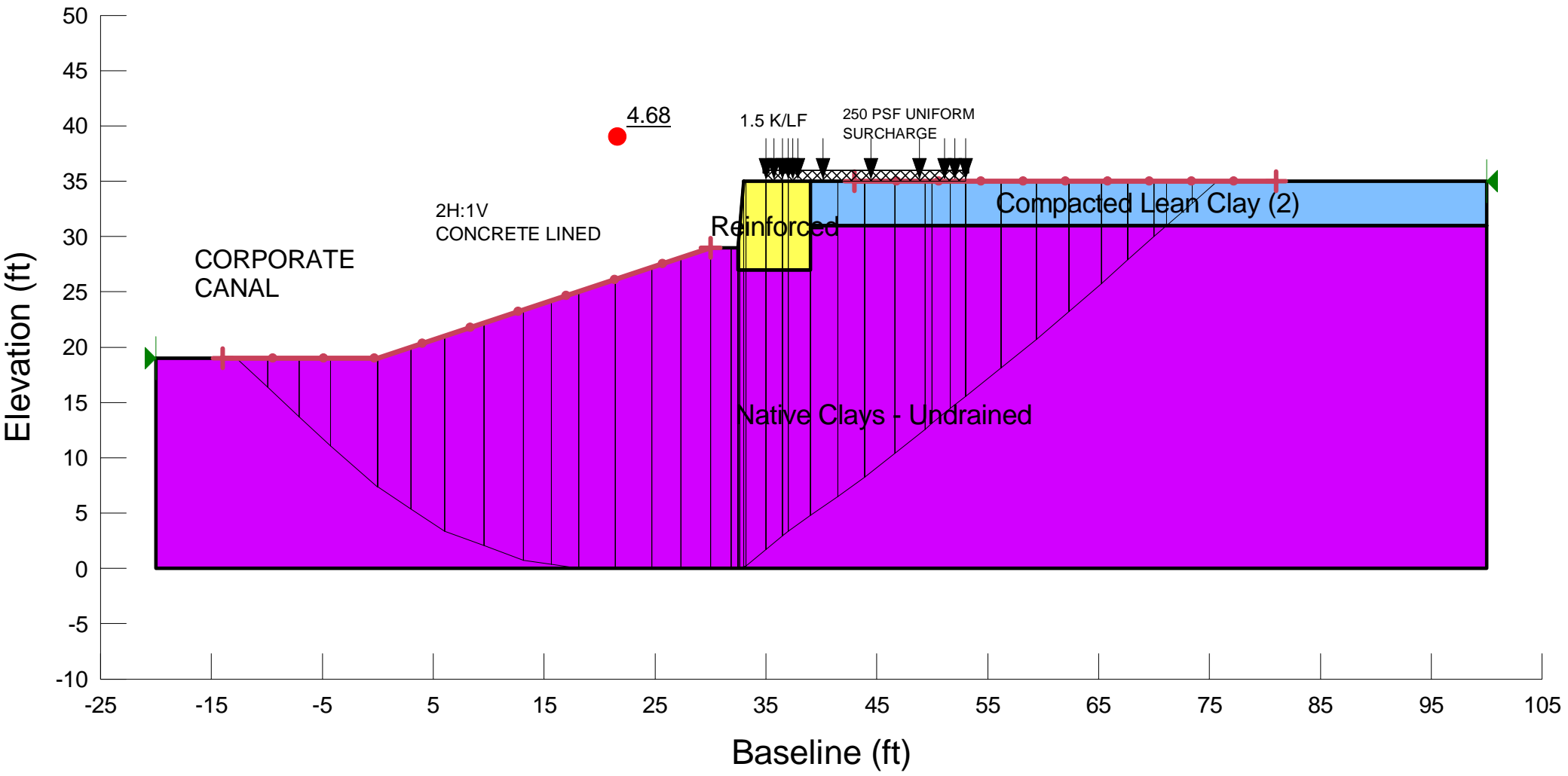
Our analysis and opinions are based upon our understanding of the geotechnical conditions in the area, the data obtained from our site exploration and from our understanding of the project. Variations will occur between exploration point locations, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in the final report, to provide observation and testing services during grading, excavation, wall construction, and other earth-related construction phases of the project. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our scope of services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third party beneficiaries intended. Any third party access to services or correspondence is solely for information purposes only. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

# EXHIBIT 1 UNDRAINED STRENGTH

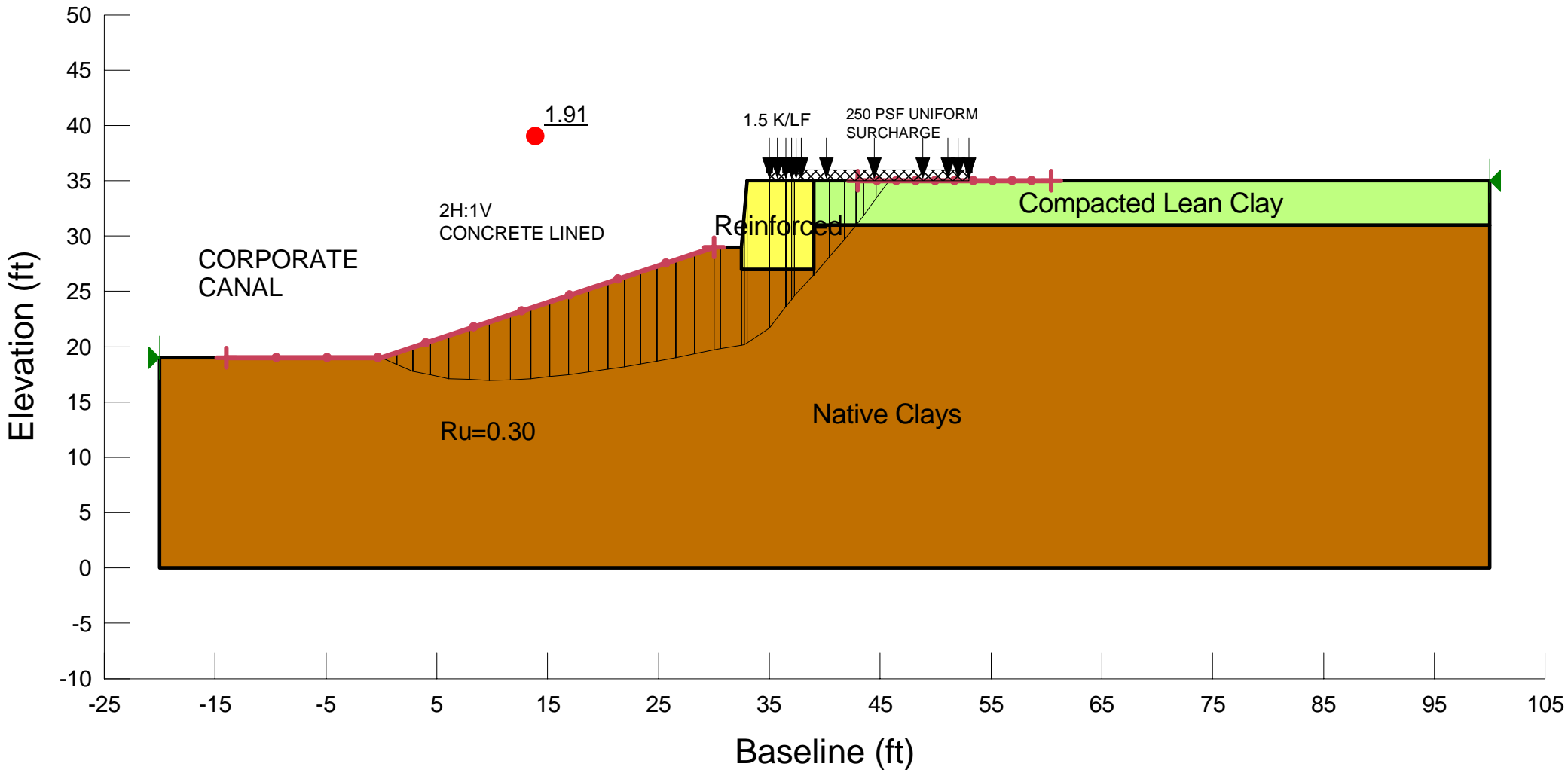


Name: Reinforced	Model: High Strength	Unit Weight: 115 pcf	Ru: 0
Name: Native Clays - Undrained	Model: Undrained (Phi=0)	Unit Weight: 125 pcf	Cohesion': 1,800 psf Ru: 0
Name: Compacted Lean Clay (2)	Model: Undrained (Phi=0)	Unit Weight: 125 pcf	Cohesion': 1,000 psf Ru: 0



# EXHIBIT 2

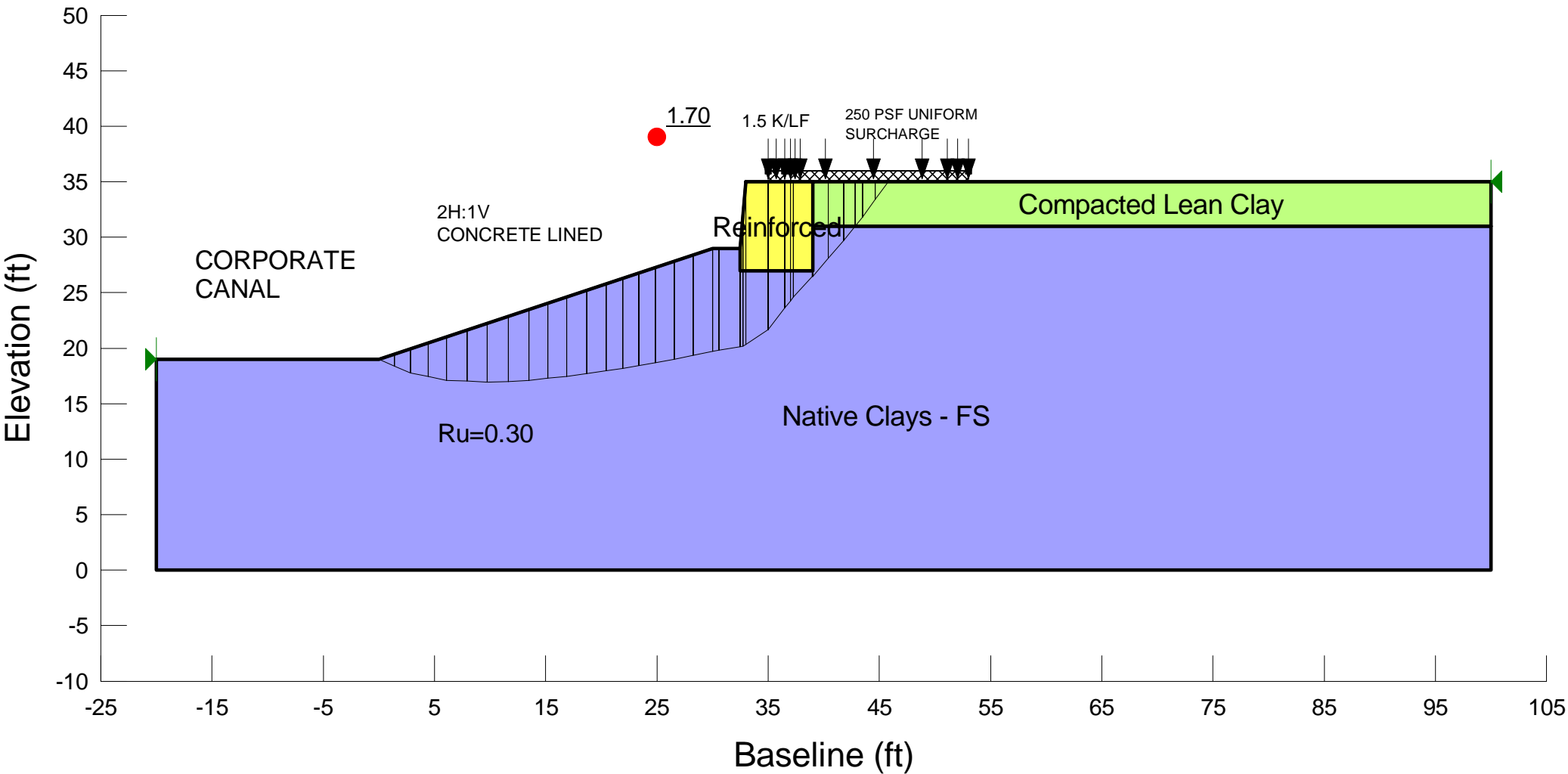
## FULLY MOBILIZED PEAK DRAINED STRENGTH-R<sub>u</sub> METHOD FOR POREWATER PRESSURE



Name: Reinforced    Model: High Strength    Unit Weight: 115 pcf    Ru: 0  
 Name: Compacted Lean Clay    Model: Mohr-Coulomb    Unit Weight: 125 pcf    Cohesion': 250 psf    Phi': 30 °    Ru: 0.3  
 Name: Native Clays    Model: Mohr-Coulomb    Unit Weight: 125 pcf    Cohesion': 250 psf    Phi': 28 °    Ru: 0.3

EXHIBIT 3

FULLY SOFTENED - Ru PORE PRESSURE



Name: Reinforced	Model: High Strength	Unit Weight: 115 pcf	Ru: 0
Name: Compacted Lean Clay	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 250 psf   Phi': 30 °   Ru: 0.3
Name: Native Clays - FS	Model: Shear/Normal Fn.	Unit Weight: 125 pcf	Strength Function: Native Clays   Ru: 0



















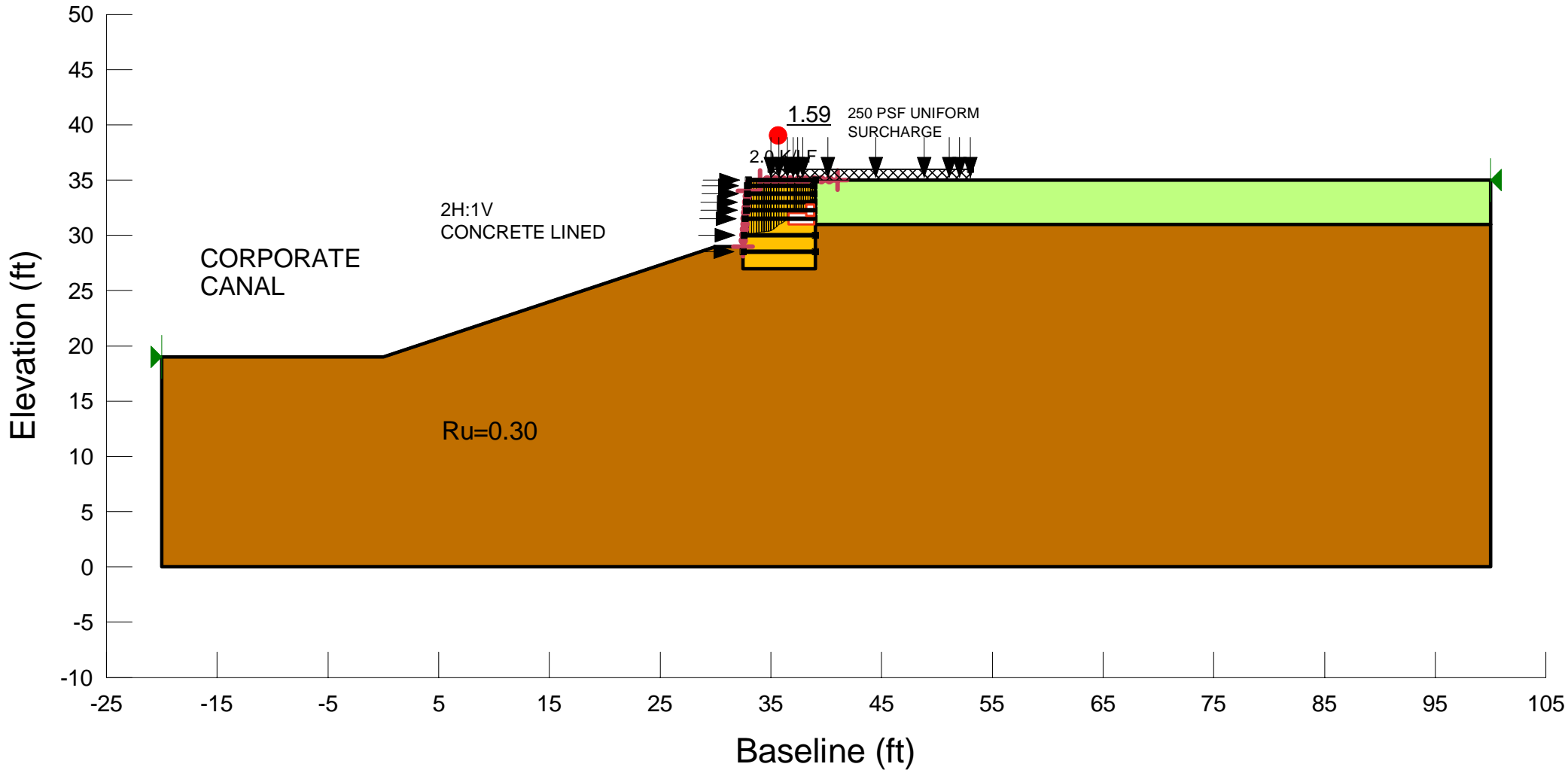




# EXHIBIT 5

## COMPOUND STABILITY ANALYSIS

### FULLY MOBILIZED PEAK DRAINED STRENGTH- $R_u$ METHOD FOR POREWATER PRESSURE



Name: Compacted Lean Clay	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 250 psf	Phi': 30 °	Ru: 0.3
Name: Native Clays	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 250 psf	Phi': 28 °	Ru: 0.3
Name: Sand Material	Model: Mohr-Coulomb	Unit Weight: 118 pcf	Cohesion': 0 psf	Phi': 34 °	Ru: 0