PROJECT MANUAL

VOLUME 2 OF 2

FOR

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GYMNASIUm ADDITION

OWNER

WEST ADA SCHOOL DISTRICT
1303 E CENTRAL DRIVE
MERIDIAN, ID 83642

DESIGN WEST ARCHITECTS, P.A.
216 SW 5th Avenue
Meridian, ID 83642
(208) 888-1768 / 955-6885 (FAX)

Jim Coles, Principal Architect
Chris Vondemkamp, Project Manager
DWA Project No: 17094

Date: 04/18/2018
Bid Set
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Geotechnical Engineering Report

**VOLUME 2**

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SUMMARY OF WORK

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes
   1. Contract Description.
   2. Work by Owner.
   3. Owner furnished products.
   4. Contractor use of site.
   5. Work Sequence.
   6. Owner occupancy.

1.2 CONTRACT DESCRIPTION

A. Provide all Labor and Materials necessary to perform the work indicated in the Contract Documents.

1.3 WORK BY OWNER

A. The Owner may award outside Contracts which will commence during this Project.
   1. Contractors shall allow access to the site for the Owner’s Contractors to perform their Work.

1.4 OWNER FURNISHED PRODUCTS

A. Products furnished to the site and paid for by Owner:
   1. Items noted ‘OFCI’ (Owner Furnished Contractor Installed) will be furnished by the Owner and installed by the Contractor.
   2. Items noted ‘OFOI’ (Owner Furnished Owner Installed) will be furnished and installed by the Owner.

1.5 OWNERS RESPONSIBILITIES – NOT USED

1.6 CONTRACTOR’S RESPONSIBILITIES

A. Review Owner shop drawings, product data, and samples.
B. Receive and unload products at site; inspect for completeness or damage.
C. Handle, store, install and finish products.
D. Repair or replace items damaged after receipt.
E. Provide backing and blocking as required.

1.7 CONTRACTOR USE OF SITE

A. Limit use of site to allow:
   1. Work by Others and Work by Owner.
   2. Use of site and premises by Owner.
B. Construction operations to be limited to areas noted on Drawings.

1.8 FUTURE WORK – NOT USED.
1.9 WORK SEQUENCE

1. Reference Project Schedule in “Instructions to Bidders”.

1.10 OWNER OCCUPANCY – NOT USED

END OF SECTION 01 11 00
PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes
   1. Submission procedures.
   2. Documentation of changes to Contract Sum/Price and Contract Time.

1.2 REQUIREMENTS

A. Coordinate related work and modify surrounding work as required to properly integrate the Work of each Alternate and to provide complete construction required by the Contract Documents.

1.3 SELECTION AND AWARD OF ALTERNATIVES

A. Alternates quoted on Bid Forms will be accepted or rejected under the provisions of Document A701, Instructions to Bidders, Subparagraph 5.3.2.

1.4 SCHEDULE OF ALTERNATES

A. Alternate No. 1: Roofing Membrane
   Add all materials and labor required to provide an 80 mil roofing membrane and 30 year warranty as identified in the Contract Documents.

PART 2 – PRODUCTS – NOT USED.
PART 3 – EXECUTION – NOT USED.

END OF SECTION 01 23 00
PART 1 – GENERAL

1.1 SUMMARY

A. Schedule of values.
B. Applications for payment.
C. Change procedures.
D. Defect assessment.
E. Alternates

1.2 SCHEDULE OF VALUES

A. Submit printed schedule on AIA Form G703 - Continuation Sheet form G702.
B. Submit Schedule of Values in duplicate within 10 days after date established in Notice to Proceed.
C. Format: Utilize Table of Contents of this Project Manual. Identify each line item with number and title of major specification Section. Identify site mobilization, bonds and insurance.
D. Include within each line item, direct proportional amount of Contractor’s overhead and profit.
E. Revise schedule to list approved Change Orders, with each Application For Payment.

1.3 APPLICATIONS FOR PAYMENT

A. Submit three copies of each application on Construction Manager’s billing form.
B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.
C. Payment Period: Submit by the 25th of each month for work completed by the end of the same month.
D. Submit with transmittal letter as specified for Submittals in Section 01 33 00.
E. Substantiating Data: When Architect requires substantiating information, submit data justifying dollar amounts in question. Include the following with Application for Payment:
   1. Partial release of liens from major subcontractors and vendors.
   2. Affidavits attesting to off-site stored products.

1.4 CHANGE PROCEDURES

A. Submittals: Submit name of individual authorized to receive change documents, and be responsible for informing others in Contractor’s employ or Subcontractors of changes to the Work.
B. The Architect/Engineer will advise of minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time by issuing supplemental instructions on AIA Form G710.
C. The Architect may issue a Proposal Request including a detailed description of proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change. Contractor will prepare and submit estimate within five (5) days.
D. Contractor may propose changes by submitting a request for change to Architect describing proposed change and its full effect on the Work. Include a statement describing reason for the change, and effect on Contract Sum/Price and Contract Time with full documentation.
and a statement describing effect on Work by separate or other Contractors. Document requested substitutions in accordance with Section 01 60 00.

E. Stipulated Sum/Price Change Order: Based on Proposal Request and Contractor's fixed price quotation or Contractor's request for Change Order as approved by Architect.

F. Unit Price Change Order: For contract unit prices and quantities, the Change Order will be executed on fixed unit price basis. For unit costs or quantities of units of work which are not pre-determined, execute Work under Construction Change Directive. Changes in Contract Sum/Price or Contract Time will be computed as specified for Time and Material Change Order.


I. Maintain detailed records of work done on Time and Material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.

J. Document each quotation for change in cost or time with sufficient data to allow evaluation of quotation.

K. Change Order Forms: AIA G701/CM Change Order.

L. Execution of Change Orders: Construction Manager will issue Change Orders for signatures of parties as provided in Conditions of the Contract.

M. Correlation Of Contractor Submittals:
   1. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Sum/Price.
   2. Promptly revise progress schedules to reflect change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
   3. Promptly enter changes in Project Record Documents.

1.5 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specified requirements.

B. If, in the opinion of the Architect, it is not practical to remove and replace the Work, the Architect will direct appropriate remedy or adjust payment.

C. The defective Work may remain, but unit sum/price will be adjusted to new sum/price at discretion of Architect/Engineer.

D. Defective Work will be partially repaired to instructions of Architect and unit sum/price will be adjusted to new sum/price at discretion of Architect/Engineer.

E. Individual specification sections may modify these options or may identify specific formula or percentage sum/price reduction.

F. Authority of Architect to assess defects and identify payment adjustments, is final.

G. Non-Payment For Rejected Products: Payment will not be made for rejected products for any of the following:
   1. Products wasted or disposed of in a manner that is not acceptable.
   2. Products determined as unacceptable before or after placement.
   3. Products not completely unloaded from transporting vehicle.
   4. Products placed beyond lines and levels of required Work.
   5. Products remaining on hand after completion of the Work.

1.6 ALTERNATES

A. **Definition:** An Alternate is an amount proposed by Bidders and stated on the Bid Form for certain construction activities defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems or installation methods described in Contract Documents.

B. **Acceptance of Alternates:** Alternates shall be accepted or not accepted at the time of the award of the contract for construction.

1. Alternates may be accepted in any order and in any combination, or no Alternates may be accepted.

2. Alternates in any order and in any combination, together with the Base Bid, shall be used in determining the order of bids for this project.

C. **Coordination:** Coordinate related Work and modify or adjust adjacent Work as necessary to ensure that Work affected by each accepted Alternate is complete and fully integrated into the project.

D. **Notification:** Immediately following the award of the Contract, prepare and distribute to each party involved, notification of the status of each Alternate. Indicate whether Alternates have been accepted, rejected or deferred for consideration at a later date. Include a complete description of negotiated modifications to Alternates.

E. **Schedule:** A "Schedule of Alternates" is listed on the Bid Form Table of Contents and Bid Forms. Specification Sections contain requirements for materials and methods necessary to perform the Work described under each Alternate.

1. Include as a part of each Alternate all labor and materials required to complete the Alternate Work. Include all overhead, profit, supervision, construction aids, and all other costs associated with each Alternate in the alternate price.

2. Include as part of each alternate, all miscellaneous devices, connections, accessory objects, plumbing, HVAC, and/or electrical work and similar items incidental to, or required for, a complete installation whether or not mentioned as part of the Alternate.

3. Accepted Alternates shall not change the Contract Time specified.

1.7 ALLOWANCES

A. **SUMMARY**

1. This Section specifies administrative and procedural requirements governing handling and processing allowances.

   a. Selected materials and equipment, and in some cases, their installation are shown and specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation.

2. Types of allowances required include the following:

   a. Lump sum allowances.

B. **SELECTION AND PURCHASE**

1. At the earliest feasible date after Contract award, advise the Architect of the date when the final selection and purchase of each product or system described by an allowance must be completed in order to avoid delay in performance of the Work.

   a. When requested by the Architect, obtain proposals for each allowance for use in making final selection; include recommendations that are relevant to performance of the Work.
b. Purchase products and systems as selected by the Architect from the designated supplier.
c. Remainder of lump sum allowance not used in the purchase and installation of each allowance item shall be refunded to the Owner.

C. SUBMITTALS
1. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.
2. Submit invoices or delivery slips to indicate actual quantities of materials delivered to the site for use in fulfillment of each allowance.

D. INSPECTION
1. Inspect products covered by an allowance promptly upon delivery for damage or defect.

E. PREPARATION
1. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related construction activities.

F. SCHEDULE OF ALLOWANCES – Are listed on Bid Form Table of Contents and Bid Forms

END OF SECTION 01 29 00
SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 CONTRACT DESCRIPTION

A. This section specifies administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to:
   1. Coordination.
   2. Administrative procedures.
   3. Organization of construction documents.
   4. Preconstruction and site mobilization meeting
   5. Progress meeting.
   6. Preinstallation meeting.
   7. General installation provisions.

B. Related Sections
   1. Section 01 73 00 – Execution Requirements: Field Engineering.
   2. Section 01 73 29 – Cutting and patching.

1.3 COORDINATION

A. Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation.
   1. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.
   2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.
   4. In finished areas except as otherwise indicated, conceal pipes, ducts and wiring within the construction. Coordinate locations of fixtures and outlets with finished elements.

B. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service operating equipment.

C. Coordinate space requirements, supports, and installation of mechanical and electrical work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit as closely as practical; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

D. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
1. Prepare similar memoranda for the Owner and separate contractors where coordination of their work is required.

E. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
   1. Preparation of schedules.
   2. Installation and removal of temporary facilities.
   3. Delivery and processing of submittals.
   4. Progress meetings.
   5. Project close-out activities.

F. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
   1. Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner’s property.

G. Division of Specifications and Drawings: The Contract Specifications and Drawings are divided into Sections, and the keynote reference numbers are related to the Specification Section numbering system, for the convenience of the Contractor. These divisions and keynoting systems are not for the purpose of apportioning work or assigning responsibility among subcontractors, suppliers and manufacturers, and shall not relieve the Contractor of the responsibility for fully coordinating the completion of all Work as shown.

1.4 SUBMITTALS

A. Coordination Drawings: Prepare and submit coordination drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components. Include the following information:
   1. Prepare and submit a composite coordination plan of systems within designed clearances and locations.
   2. Show the interrelationship of components shown on separate Shop Drawings.
   3. Indicate required installation sequences.
   4. Comply with requirements contained in Section 01 33 00.

1.5 PRECONSTRUCTION AND SITE MOBILIZATION MEETING

A. The Construction Manager will schedule meeting after Notice of Award.
B. Approved safety programs must be submitted and on site prior to mobilizing.
C. Attendance Required: Owner, Architect, Construction Manager, special consultants, Contractor, Contractor’s superintendent, and major subcontractors.
D. Agenda:
   1. Introduction of personnel representing the parties in Contract.
   2. Use of premises by Owner and Contractor.
   3. Owner’s requirements and partial occupancy.
   4. Construction facilities and controls provided by Owner.
   5. Temporary utilities provided by Owner.
   7. Security and housekeeping procedures.
   8. Submission of schedule of values and progress schedule.
   9. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   10. Procedures for testing.
11. Procedures for maintaining record documents.
12. Requirements for start-up of equipment. Inspection and acceptance of equipment put into service during construction period.

E. Construction Manager will record minutes and distribute copies within two days after Meeting to participants, with copies to Architect, Owner, and those affected by decisions made.

1.6 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at monthly intervals, or more frequently if deemed necessary.
B. Construction Manager will make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.
C. Attendance Required: Job Superintendent, major contractors and suppliers, Owner, Architect/Engineers, and Construction Manager, as appropriate to agenda topics for each meeting.
D. Agenda:
   1. Review of Work completed and progress "job walk".
   2. Review minutes of previous meetings.
   4. Field observations, problems, and decisions.
   5. Identification of problems impending planned progress.
   7. Review of off-site fabrication and delivery schedules.
   8. Maintenance of progress schedule.
   9. Corrective measures to regain projected schedules.
  10. Planned progress during succeeding work period.
  11. Coordination of projected progress.
  12. Maintenance of quality and work standards.
  13. Effect of proposed changes on progress schedule and coordination.
  14. Other business relating to Work.
  15. Schedule next meeting.
E. Construction Manager will record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, and those affected by decisions made.

1.7 PREINSTALLATION MEETINGS

A. Building Façade Meeting: Convene a preinstallation meeting at work site 2 weeks prior to commencing work related to the exterior “envelope” of the building. These elements include the exterior wall finish materials, roofing, flashings, control joints, expansion joints, decking details, all roof and wall penetrations. The Contractor shall prepare the appropriate details and shop drawings illustrating compliance with the Construction Documents. The Contractor shall submit these drawings/submittals to the Architect at least 2 weeks prior to this meeting.
B. When required in individual Specification Sections, convene preinstallation meeting at Project site prior to commencing work of specific Section.
C. Require attendance of parties directly affecting, or affected by, work of specific Sections.
D. Notify Architect 14 days in advance of meeting date.
E. Prepare agenda and preside at meeting.
   1. Review conditions of installation, preparation, and installation procedures.
   2. Review coordination with related work.
3. Record minutes and distributes copies within two days after meeting to participants, with copies to Architect, Owner, and those affected by decisions made.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS.

A. Inspection of Conditions: Require the installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Manufacturer’s Instructions: Comply with manufacturer’s installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.


E. Recheck measurements and dimensions before starting each installation.

F. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

G. Close openings in exterior surfaces to protect installed work from weather and extremes of temperature and humidity.

H. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

END OF SECTION 01 31 00
PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes
   1. Construction progress schedules.
   2. Submittal Procedures for Shop Drawings, Product Data & Samples.
   3. Shop Drawings, Product Data & Samples.
   5. Manufacturers’ certificates.

1.2 CONSTRUCTION PROGRESS SCHEDULES

A. Progress Schedules shall be a computer generated Critical Path Method schedule. This CPM schedule will consist of and provide the following:
   1. Gantt (Bar Chart) Report and PERT (Program Evaluation and Review Technique chart) (Flow Diagram) containing the following information:
      a. Diagrams which show elements of project in detail and in summary.
      b. Diagrams which show order and interdependence of construction activities and sequence in which work is to be accomplished as planned by Contractor.
   2. Detailed network activities which include, in addition to the construction activities, the following items:
      a. Submittal and review of submittals required under Section 01 33 00.
      b. Procurement of critical materials and equipment.
      c. Fabrication of special material and equipment, their installation, and testing.
      d. Activities of the owner and Architect which affect progress.
   3. Selection and number of activities are subject to Architect’s review and approval.
      CPM network activities should coordinate with Payment Request form and Construction Progress Chart.
   4. Detailed network diagrams which are time scaled by month or week.
   5. Sheet size of diagrams which are of sufficient size to be easily read and understood.
      Each monthly updated copy shall show date of latest revision.
   6. Network diagram which includes tabulation of each activity and furnishes following information for each activity on analysis and diagram forms:
      a. Predecessor and successor tasks
      b. Activity description
      c. Estimated duration of activities
      d. Earliest start date by calendar date
      e. Earliest finish date by calendar date
      f. Actual start date by calendar date
      g. Actual finish date by calendar date
      h. Latest start date by calendar date
      i. Latest finish date by calendar date
      j. Slack or float time in calendar days
      k. Percentage of activity completed
   7. Program or means used in making mathematical computation shall be capable of compiling total value of completed and partially completed activities. Program shall
also be capable of accepting revised completion dates as modified by approved time
adjustments and re-computations and float days accordingly.

8. Mathematical analysis shall show activities as follows:
   a. Contract amount
   b. Previous payments
   c. Current request
   d. Percent complete

B. Submit completed network program consisting of detailed network mathematical analysis,
schedule of anticipated earnings as of last day of each month, and network diagrams. These
shall be submitted within thirty (30) days after receipt of Notice to Proceed.

C. Contractor shall participate in review and evaluation of proposed network PERT diagrams
and mathematical analysis of GANTT diagrams by Architect. Resubmit for Architect
approval revisions necessary due to this review within ten calendar days after this review.
Contractor shall use approved schedule for planning, organizing, and directing the work, for
reporting progress, and for requesting payment for work accomplished.

D. Joint Ownership of Float: Float or slack time within the construction schedule is not
for the exclusive use or benefit of either the Owner or the Contractor, but is jointly owned,
expiring project resource available to both parties as needed to meet contract milestones
and completion date.

E. Submit initial submittal, complete revisions, and periodic monthly reports in three copies,
one reproducible and two prints.

F. Monthly updated CPM Schedule submittal shall be prerequisite to payment for work for
which payment is requested. Monthly updated CPM schedule shall be submitted with
contractors payment request form and construction progress chart.

G. Submit monthly revisions to CPM schedule charts to illustrate the impact on the Critical Path
of change orders upon which Contractor is requiring time extensions.

H. Distribute copies of reviewed submittals to concerned parties and maintain a complete set
of reviewed and accepted submittals at the job site. Instruct parties to promptly report any
inability to comply with provisions.

I. If the Contractor fails to submit a schedule within the time prescribed, the Owner may
withhold progress payments until the Contractor submits the required schedule.

J. If the Contractor falls behind the progress schedule, the Contractor shall submit for approval
revised schedules which demonstrate steps and manner in which the rate of progress will
be regained and which also indicates the steps necessary to improve the progress of the
project. This revised scheduling shall be at no additional cost to the Owner.

K. Failure of the Contractor to comply with the requirements for Construction Progress
Schedules may be grounds for a determination by the owner that the Contractor is not
prosecuting the work with sufficient diligence to insure completion within the time specified
in the Contract. Upon making this determination, the Owner may terminate the
Contractor’s right to proceed with the work, or any separable part of it, in accordance with
the default provisions of this Contract.

L. The Contractor should expect to schedule no less than ten (10) days starting up and testing
the facility.

1.3 SUBMITTAL PROCEDURES FOR SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

A. Submit a complete list of Required Submittals. Individual submittals are to be numbered as
outlined in Paragraph C, below.

B. Transmit each submittal with a SUBMITTAL FORM, provided at the end of this Section, to
the office of the Architect.

C. Each submittal form shall be cross referenced with the submittal number. Submittal
numbers shall be in the following format:
   1. All number shall be eight digits.
a. The first six numbers shall reflect the specification section number (i.e. Section 07 25 00 submittals number shall begin with "07 25 00").

b. The next two numbers shall make the particular submittal unique (i.e. the eighth submittal in Section 072500 shall be "07 25 00-08").

c. Resubmittals shall to have original number with a numeric/alphabetic suffix. (i.e. first resubmittal would be "07 25 00-08-R1" the second resubmittal would be "07 25 00-08-R2").

D. Identify Project, Contractor, Subcontractor or supplier; pertinent Drawing sheet and detail number(s), and specification Section number, as appropriate.

E. Apply Contractor's stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents. Any submittal, shop drawing, product data, or sample that does not bear the Contractor's approval stamp shall be returned without review.

F. Schedule submittals to expedite the Project, and deliver to Architect at business address.

G. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.

H. Provide space for Contractor and Architect review stamps.

I. Shop drawings, product data, etc. shall be submitted in sufficient time to allow not less than 28 calendar days for the examination of shop drawings by the Architect:

   1. Where two or more submittals are interdependent in nature such that the Architect cannot fully review one (or more) without the other, no review shall take place nor shall the 28 day time limit take affect, until all required interdependent submittals have been submitted.

J. The submittal notes and review does not authorize any increase in cost for the item, installation or related coordination.

K. Revise and resubmit submittals as required, identify all changes made since previous submittal.

   1. Resubmittals of Contractor’s submittals shall have the same review time as the initial submittal.

L. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

1.4 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

A. Shop Drawings and Product Data:

   1. Submit the number of copies which Contractor requires to be returned to him, plus two copies which will be retained by Architect and professional consultants.

   2. Collect required data into one submittal for each unit of work or system. Mark each copy to identify applicable products, models, options, and other data applicable to the Project. Supplement manufacturers' standard data to provide information unique to this Project.

   3. Include those requirements as outlined in individual specifications sections as well as any special coordination requirements.

B. Samples:

   1. Submit the number of copies which Contractor requires to be returned to him, plus two copies which will be retained by Architect and professional consultants.

   2. Submit samples of finishes from the full range of manufacturer's standard colors; custom colors; and/or texture and patterns as specified in individual specification sections for Architect's selection.

   3. Include full project identification on each sample

C. After review, reproduce and distribute in accordance with Submittal Procedures above and per Record Documents described in Section 01 70 00 -Contract Closeout.
1.5 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, [start-up,] adjusting, and finishing, in quantities specified for Product Data.

B. Identify conflicts between manufacturers' instructions and Contract Documents.

1.6 MANUFACTURER'S CERTIFICATE

A. When specified in individual specification Sections, submit manufacturers' certificate to Architect for review, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect.

PART 2 – PRODUCTS – NOT USED.
PART 3 – EXECUTION – NOT USED.

END OF SECTION 01 33 00
**SUBMITTAL FORM**

**PROJECT NAME:** PIONEER SCHOOL OF THE ARTS GYM ADDITION  
**PROJECT NO:** 17094

**DATE:**

**SUB-CONTRACTOR (NAME & ADDRESS):**

**SUPPLIER (NAME & ADDRESS):**

**MANUFACTURER (NAME & ADDRESS):**

**PREPARED BY (NAME & COMPANY):**

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<thead>
<tr>
<th>SUBMITTAL COMPONENTS</th>
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<tr>
<td>SHOP DRAWINGS</td>
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<td>INSTALLATION DATA</td>
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<tr>
<td>CALCS./TEST DATA</td>
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<td>MANUFACTURER’S WARRANTY</td>
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<td>DRAWING No. &amp; DETAIL REFERENCE AS APPROPRIATE</td>
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<th>COMMENTS</th>
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<tr>
<td>ITEM MANUFACTURER SUBMITTED IS ONE SPECIFIED</td>
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<td>YES</td>
</tr>
<tr>
<td>ITEM MODEL/TYP SUBMITTED IS THAT SPECIFIED</td>
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<td>YES</td>
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<tr>
<td>ITEM SUBMITTED IS CORRECT SIZE, WEIGHT/GAUGE</td>
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<tr>
<td>ITEM SUBMITTED HAS CORRECT CONFIGURATION, SLOPE, ETC.</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>COMPONENTS OF SYSTEM SUBMITTED ARE ONES SPECIFIED</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>VERIFY SPACING AND LOCATION OF SUPPORTS/STRUCTURE</td>
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<td>N/A</td>
</tr>
<tr>
<td>VERIFY CONNECTIONS, BEARING HEIGHTS, REINFORCING, BENDS, LAPS, ETC.</td>
<td>OK</td>
<td>N/A</td>
</tr>
<tr>
<td>CHECK OPENINGS, SLEEVES OFFSETS, ETC.</td>
<td>OK</td>
<td>N/A</td>
</tr>
<tr>
<td>CHECK BLOCKING BACKING, REINFORCING, ETC.</td>
<td>OK</td>
<td>N/A</td>
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CHECKED BY:
SECTION 01 42 00

REFERENCE STANDARDS AND DEFINITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.
B. Approved: The term “approved”, where used in conjunction with the Architect’s action on the Contractor’s submittals, applications, and requests, is limited to the Architect’s duties and responsibilities as stated in the Conditions of the Contract.
C. Construction Manager (CM): An entity employed by the Owner as a liaison. All information, approvals, etc. between the Contractor and Owner are to be forwarded through the Construction Manager. Also referred to as the Project Manager.
D. Directed: Terms such as “directed”, “requested”, “authorized”, “selected”, “approved”, “required”, and “permitted” mean “directed by the Architect”, “requested by the Architect”, and similar phrases.
E. Furnish: The term “furnish” is used to mean “supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.”
F. Indicated: The term “indicated” refers to graphic representations, notes or schedules on the Drawings, or other paragraphs or schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as “shown”, “noted”, “scheduled”, and “specified” are used, it is to help the reader locate the reference; no limitation on location is intended.
G. Install: The term “install” is used to describe operations at Project site including the “unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.”
H. Installer: An “Installer” is the Contractor or any entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
1. The term “experienced”, when used with the term “installer”, means having a minimum of five previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with the requirements of the authority having jurisdiction.
2. Trades: Use of titles such as “carpentry” is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as “carpenter”. It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.
3. Assignment of Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in the operations to be performed. The specialists must be engaged for those activities, and assignments are requirements over which the Contractor has no choice or option. Nevertheless, the ultimate responsibility for fulfilling Contract requirements remains with the Contractor.
4. This requirement shall not be interpreted to conflict with enforcement of building codes and similar regulations governing the Work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.

I. Project Site: The space available to the Contractor for performance of construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

J. Provide: The term “provide” means “to furnish and install, complete and ready for the intended use.”

K. Regulation: The term “Regulation” includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

L. Testing Laboratories: A “testing laboratory” is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute’s 2004 33-digit format and MASTERFORMAT numbering system.

B. Specification Content: This Specification uses certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used.

1. Abbreviated Language: Language used in Specifications and other Contract Documents is the abbreviated type. Words and meanings shall be interpreted as appropriate. Words that are implied, but not stated shall be interpolated as the sense required. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and the context of the Contract Documents so indicates.

2. Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the text, for clarity, subjective language is used to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.
   a. The words “shall be” shall be included by inference wherever a colon (:) is used within a sentence or phrase.

1.4 DRAWING SYMBOLS AND KEYNOTE FORMAT EXPLANATION

A. General: Except as otherwise indicated in legends on the Drawings, graphic symbols used on Drawings are symbols recognized in construction industry for purposes indicated. Where not otherwise noted, symbols are defined by Architectural Graphic Standards, published by John Wiley & Sons, Inc., latest edition.

B. Mechanical and Electrical: Graphic symbols used on mechanical and electrical drawings are generally aligned with symbols recommended by ASHRAE, supplemented by symbols recommended by ASME, ASPE, IEEE, and similar organizations. Refer instances of uncertainty to the Project Manager for clarification before proceeding.

C. Vignetting: Where graphic symbols that denote specific materials are employed for only portions of a defined area on the Drawings, it is intended that the entire area within which the symbols is used by comprised of the same material denoted by the graphic symbol and no other meaning is implied or may be inferred by such use of vignetting.

D. Condoc Keynote Format: The Drawings contain material keynotes which relate to the Specification Section numbers for identification and organization. These numbers shall not
be used for dividing the work among subcontractors and are not intended to establish the extent of work to be performed by any trade.

1.5 INDUSTRY STANDARDS

A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with the standard in effect as of the date of the Contract Documents.

C. Conflicting Requirements: Where compliance with two or more standards is specified, and the standards may establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties to the Architect for a decision before proceeding.

D. Optional Requirements: When a standard presents options that have not specifically been selected in the Contract Documents, refer the requirement to the Architect for selection before proceeding.

E. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity.

1. Where copies of standards are needed for performance of a required construction activity, the Contractor shall obtain copies directly from the publication source.

F. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision. Refer to the “Encyclopedia of Associations” published by Gale Research Co., available in most libraries.

1.6 GOVERNING REGULATIONS/AUTHORITIES

A. The Architect has contacted authorities having jurisdiction where necessary to obtain information necessary for preparation of Contract Documents. Contact authorities having jurisdiction directly for information and decisions having a bearing on the Work.

B. Comply with all Codes in effect as of the date of the Contract Documents including all local ordinances.

1.7 SUBMITTALS

A. Permits, Licenses, and Certificates: For the Owner’s records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgements, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

PART 2 - PRODUCTS - NOT USED.
PART 3 - EXECUTION - NOT USED.

END OF SECTION 01 42 00
SECTION 01 45 00
QUALITY CONTROL

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes
1. Quality Assurance and Control of Installation.
2. References.
3. Field samples.
4. Mock-up.
5. Inspection and testing laboratory services.
6. Manufacturers' field services and reports.

1.2 QUALITY ASSURANCE

A. Qualifications
1. Perform work by persons qualified to produce workmanship of specified quality.

B. Regulatory Requirements
1. For products or workmanship specified by association, trade, or federal standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

C. General
1. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.
2. Comply fully with manufacturers' instructions, including each step in sequence.
4. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
5. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.
6. Asbestos:
   a. The Contract Documents for this project have been prepared in accordance with generally accepted professional architectural and engineering practices. Accordingly, no asbestos or products containing asbestos have been knowingly specified for this project. Notify the Architect immediately for instruction if –
      1) Materials containing asbestos are brought to the site for inclusion in the Work.
      2) Asbestos materials are encountered in any existing structures upon which work is being performed.
   b. At Architect's direction and with owner's approval, an independent testing laboratory will perform testing procedures on suspect materials.
   c. Contractor shall certify that based upon his best knowledge, information, inspection and belief no building materials containing asbestos were used in the construction of the project. Submit certification on form provided by Owner. Sample form follows this section.

1.3 REFERENCES
A. Conform to reference standard by date of issue current on building permit.
B. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
C. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.4 FIELD SAMPLES

A. Acceptable samples represent a quality level for the Work.
B. Where field sample is specified in individual Sections to be removed, clear area after field sample has been accepted by Architect.

1.5 MOCK-UP

A. Tests will be performed under provisions identified in this section.
B. Assemble and erect specified items, with specified attachment and anchorage devices, flashings, seals, and finishes.
C. Where mock-up is specified in individual Sections to be removed, clear area after mock-up has been accepted by Architect.

1.6 INSPECTION AND TESTING LABORATORY SERVICES

A. Owner will appoint, employ, and pay for services of an independent firm to perform inspection and testing.
B. The independent firm will perform inspections, tests, and other services specified in individual specification Sections and as required by the Architect.
C. Reports will be submitted by the independent firm to the Architect, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
D. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage and assistance as requested.
   1. Notify Architect and independent firm two (2) working days prior to expected time for operations requiring services.
   2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.
E. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Architect. Payment for retesting will be charged to and paid for by the Contractor.

1.7 MANUFACTURER’S FIELD SERVICES AND REPORTS

A. Submit qualifications of observer to Architect thirty (30) days in advance of required observations. Observer subject to approval of Architect.
B. When specified in individual specification Sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance of equipment as applicable, and to initiate instructions when necessary.
C. Individuals to report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers’ written instructions.
D. Submit report in duplicate within thirty 30 days of observation to Architect for review.

PART 2 — PRODUCTS — NOT USED.
PART 3 — EXECUTION — NOT USED.
CONSTRUCTION MATERIAL ASBESTOS STATEMENT

Building Name: ____________________________________________________________
Building Address: __________________________________________________________
Building Owner: ____________________________________________________________
Completion Date: ____________________________________________________________

As GENERAL CONTRACTOR in charge of construction; based on my best knowledge, information, inspection and belief; I certify that on the above-referenced building no asbestos containing building materials were used in the construction.

________________ ________________________________
Date General Contractor in Charge

________________________________________________________
Company Name

END OF SECTION 01 45 00
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Related Sections include the following:
   1. Divisions 02 through 33 for specific requirements for products in those Sections.

1.2 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weather-tight; exterior walls are insulated and weather-tight; and all openings are closed with permanent construction or substantial temporary closures.

1.3 USE CHARGES

A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:
   1. Owner’s construction forces.
   2. Occupants of Project.
   3. Architect.
   4. Testing agencies.
   5. Personnel of authorities having jurisdiction.

1.4 QUALITY ASSURANCE

A. Standards: Comply with ANSI A10.6, NECA’s “Temporary Electrical Facilities,” and NFPA 241.
   1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.
   2. Electrical Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

A. Temporary Utilities: At earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of permanent service.
   1. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner’s acceptance, regardless of previously assigned responsibilities.

B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:
   1. Keep temporary services and facilities clean and neat.
   2. Relocate temporary services and facilities as required by progress of the Work.

PART 2 - PRODUCTS
2.1 MATERIALS

A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect. Provide materials suitable for use intended.

2.2 EQUIPMENT

A. General: Provide equipment suitable for use intended.
B. Field Offices and Sheds: Will not be allowed on site without approval of the Construction Manager. Locate as per the direction of the Construction Manager.
C. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.
   1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.
D. Drinking Water Fixtures: Bottled water drinking water units including paper cup supply.
   1. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 degrees F.
E. Heating Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic controls.
   1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
   2. Heating Units: Listed and labeled, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use for type of fuel being consumed.
F. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110-to 120-V plugs into higher voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.
G. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of Work. Relocate and modify facilities as required.
B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are not longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITIES

A. General: Engage appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.
   1. Provide adequate capacity at each stage of construction.
B. Water Service:
   1. Owner will pay cost of temporary water. Exercise measures to conserve water. Utilize Owner’s existing water system, extend and supplement with temporary devices as needed to maintain specified conditions for construction operations.
   2. Contractors will pay to extend branch piping with outlets located so water is available by hoses with threaded connections for individual use. Provide temporary pipe insulation to prevent freezing.
3. Provide rubber hoses as necessary to serve Project site.

C. Sanitary Facilities: The Owner, through the Construction Manager, will provide and maintain temporary toilets and wash facilities.

D. Heating and Ventilation: The Owner, through the Construction Manager, will provide temporary heating and ventilating fans as required for curing or drying of completed installation or for protecting installed construction from adverse effects of low temperatures or high humidity, or to prevent the accumulation of dust, fumes, vapors or gases. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed.

1. Maintain a minimum temperature of 50 degrees F in permanently enclosed portions of building for normal construction activities, and 65 degrees F for finishing activities and areas where finished Work has been installed.

E. Electrical Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnecting means, automatic ground-fault interrupters, and main distribution switchgear.

1. The Electrical Contractor will provide a temporary power source at the project site and a distribution system to the new building area and the staging area from the temporary power source.

2. The voltage provided at point of distribution will be 120/208, single phase, except as noted in electrical drawings for provision of temporary power when modifying electrical.

3. All Contractors shall provide their own UL approved extension cords and any adapters required.

4. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.

5. All Contractors shall provide supplementary electrical power to handle welding machines or furnish gasoline operated welders, at their option.

6. Contractor shall provide labor to relocate, as required, distribution boxes to each desired location. Each re-location is subject to the Construction Manager’s approval.

F. Lighting:

1. The Owner, through the Construction Manager, will provide temporary light strings for general lighting purposes. Lamps will be furnished, installed and maintained by the Electrical Contractor. The Electrical Contractor shall provide labor for installing and moving light strings to desired locations. Each new location is subject to the Construction Manager’s approval. The above Owner-provided lighting is for minimal general illumination only. Each contractor shall provide all required work lighting in sufficient quantity and quality to adequately execute the work.

2. Specifically, the Contractors responsible for the execution of the work which will affect the final appearance of surfaces (i.e., CMU, gypsum, drywall, lath and plaster, painting, etc.) shall provide rolling lighting assemblies sufficient to deliver 50 foot candles of illumination on these surfaces while work is actually in progress.

3. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

4. Maintain lighting in corridors and hallways during normal construction time frames to ensure safe routes of passage.

G. Telephone Service: The Owner, through the Construction Manager, will provide Contractor’s telephone service at the Construction Manager’s field office for local telephone calls. Long distance calls will be permitted provided the charges are reversed or are previously approved and paid for by the party originating the call. Other telephone services are the responsibility of the Contractor.

H. Facsimile: Provide for facsimile service and a dedicated telephone line to field office at time of project mobilization.
3.3 SUPPORT FACILITIES

A. General: Comply with the following:
   1. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access.
   2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Dewatering Facilities and Drains: Comply with requirements in applicable Division 2 Sections for temporary drainage and dewatering facilities and operations not directly associated with construction activities included in individual Sections. Where feasible, use same facilities. Maintain project site, excavations, and construction free of water.
   1. Grade site to drain. Provide, operate, and maintain pumping equipment.
   2. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

C. Erosion and Sediment Control:
   1. Contractor shall plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   2. Minimize surface area of bare soil exposed at one time.
   3. Provide temporary measures including berms, dikes, drains, and other devices to prevent water flow.
   4. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
   5. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

D. Storm Water Control: Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of storm water from heavy rains.

E. Project Identification and Temporary Signs: Prepare Project identification and other signs in sizes indicated. Install signs to inform public and persons seeking entrance to Project. Do not permit installation of unauthorized signs.
   1. Engage an experienced sign painter to apply graphics for Project identification signs. Comply with details indicated at the end of this Section.
   2. Prepare temporary signs to provide directional information to construction personnel and visitors.
   3. Construct signs of exterior type Grade B-B high density concrete form overlay plywood in sizes and thickness indicated. Support on posts or framing of preservative-treated wood or steel.
   4. Paint sign panel and applied graphics with exterior grade alkyd gloss enamel over exterior primer.
   5. All signage requires approval of Construction Manager prior to installation.

F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations.

G. Field Surveying and Layout: The Owner, through the Construction Manager will provide overall initial layout of building structures and overall control information including building corner points, floor elevation, parking lot edges, asphalt grade breaks, and location of major utility locations as shown on the drawings. Detailed surveying required by each Contractor for his own work will be the responsibility of that Contractor. Any staking destroyed by Contractor’s activities must be promptly re-staked and shall be the responsibility of that Contractor to replace.

3.4 SECURITY AND PROTECTION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct
construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination, pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near Project site.

B. Security Enclosure and Lockup: Contractor shall be responsible for and provide security program during the construction period.
1. Protect Work and existing premises from theft, vandalism, and unauthorized entry.
2. Initiate program at project mobilization.
3. Maintain program throughout construction period until Owner occupancy.

C. Security Restrictions:
1. Do not work on Saturdays, Sundays, or Holidays without Construction Manager approval.

D. Barricades, Warning Signs, and Lights: Contractor shall provide barriers to prevent unauthorized entry to construction areas and protect existing facilities and adjacent properties from damage from construction operations. Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing warning lights.
1. Contractor shall provide 6’ high fence around their individual construction staging site, equip with vehicular and pedestrian gates with locks.
2. Contractor shall be responsible for protection of their stored materials on site.
3. Contractor shall provide protection for non-owned vehicular traffic, stored materials, site, and structures from damage.
4. Contractors are responsible for fall protection for their portions of work, including but not limited to safety lines, railings and warning signs.

E. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weather tight enclosure for building exterior.
1. The Owner through the Construction Manager will provide and direct the installation of temporary enclosures where needed for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
2. Vertical openings: Close openings of 25 sq. ft. or less with plywood or similar materials.
3. Horizontal openings: Close openings in floor or roof decks and horizontal surfaces with load-bearing, wood framed construction.
4. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.

F. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.
   a. Field Offices: Class-A stored-pressure water-type extinguishers.
   b. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.
   c. Locate fire extinguishers where conventional and effective for their intended purpose.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities and other access routes for firefighting. Prohibit smoking on school property.
4. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
5. Permanent Fire Protection: At earliest feasible date in each area of Project, complete
installation of permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.

6. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

G. Provide protection for plant life designated to remain. Replace damaged plant life.

3.5 DUST CONTROL

A. Contractor shall execute Work by methods to minimize raising dust from construction operations.

B. Provide positive means to prevent air-borne dust from dispersing into atmosphere

3.6 PARKING

A. Construction personnel parking is to be provided by Owner and shall be located as per the Construction Manager.

B. Do not allow heavy vehicles or construction equipment in finished parking areas.

C. Permanent Pavements And Parking Facilities:
   1. Prior to Substantial Completion, bases for permanent roads and parking areas may be used for construction traffic.
   2. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.

D. Maintenance: Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, and ice.

E. Mud From Site Vehicles: Contractor to provide means of removing mud from vehicle wheels before entering streets.

3.7 TRAFFIC REGULATIONS, SIGNS AND SIGNALS

A. Contractor shall be responsible for traffic regulation; and when required, provide a written traffic plan.
   1. Post Mounted and Wall Mounted Traffic Control and Informational Signs: As approved by authority having jurisdiction.
   2. Automatic Traffic Control Signals: As approved by local jurisdictions.
   3. Traffic Cones and Drums, Flares and Lights: As approved by authority having jurisdiction.
   4. Flag Persons: Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.
   5. Flares and Lights: Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.
   6. Haul Routes: Consult with authority having jurisdiction, establish public thoroughfares to be used for haul routes and site access.
   7. Provide signs at approaches to site and on site, at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
   8. Provide, operate, and maintain [automatic] traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor’s control, and areas affected by Contractor’s operations.
   9. Relocate as Work progresses, to maintain effective traffic control.
   10. Remove equipment and devices when no longer required at Substantial Completion.
   11. Repair damage caused by installation.
   12. Remove post settings.

3.8 ACCESS AND CONSTRUCTION AIDES
A. Roof Top Access: Access to all areas will be the responsibility of the Contractor requiring access. All vertical and horizontal access shall be maintained in a safe state, meeting OSHA standards for by Contractors requiring access.

B. Temporary Vertical Transportation: Contractor shall provide temporary ladders, ramps, material hoists, scaffolding, cranes and other devices required for the Work, including guys, bracing and other required devices.

3.9 PROGRESS CLEANING AND WASTE REMOVAL

A. Contractors shall be responsible for own waste removal/disposal and maintaining areas free of waste materials, debris and rubbish. Demolition materials are to be removed and disposed of in a legal manner by any contractor performing demolition work.
   1. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

B. Contractors shall broom clean work areas daily.

C. If Contractor fails to clean up his work area in a timely and satisfactory manner after 24-hours notice, the Construction Manager will cause the clean up to be done by others at the expense of the Contractor.

3.10 PROTECTION OF INSTALLED WORK BY CONTRACTOR

A. Contractors to protect their installed Work and provide special protection where specified in individual Specification Sections. This includes covering work with visqueen or heat blankets to protect from freezing or adverse weather conditions. Owner will pay costs for tenting and heating of those elements.

B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to prevent damage.

C. Protect finished floors, stairs, walls, ceilings and soffits, finished openings and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

D. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

E. Prohibit traffic across landscaped areas.

3.11 OPERATION, TERMINATION, AND REMOVAL

A. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.
   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
   2. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

B. Temporary Facility Changeover: Except for using permanent fire protection as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

C. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
   1. Materials and facilities that constitute temporary facilities are the property of Contractor.
   2. Remove underground installations to minimum depth of 2 feet. Grade site as indicated.
3. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.

4. Clean and repair damage caused by installation or use of temporary work.

5. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

6. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Division 1 Section “Closeout Procedures.”

3.12 MISCELLANEOUS

A. Pets are not allowed on job-site.
B. Firearms are not allowed on job-site.
C. Loud or distractive music is not allowed on job-site. Contractors to comply with local noise ordinances to protect workers and public.
D. Smoking is unlawful on School Property.
E. Per Idaho Code 18-8329, the contractor will prohibit any persons in their employ who are registered or are required to register under the sex offender registration act from participation on this project if such participation would require them to enter upon school property.

END OF SECTION 01 50 00
PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes
   1. Products.
   2. Transportation and handling.
   3. Storage and protection.
   4. Product options.
   5. Substitutions.

1.2 PRODUCTS

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.

B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

C. Provide interchangeable components of the same manufacturer, for similar components.

D. Install all products in accordance with manufacturer's instructions.

1.3 TRANSPORTATION AND HANDLING

A. Transport and handle products in accordance with manufacturer's instructions.

B. Arrange deliveries of products in accordance with construction progress schedules. Allow time for inspection prior to installation and coordination of deliveries to avoid conflict with Work and conditions at site; limitations on storage space; availability of personnel and handling of equipment.

C. Clearly mark partial deliveries of component parts of equipment to identify equipment and contents to permit each accumulation of parts and to facilitate assembly.

D. Immediately on delivery, inspect shipment to assure:
   1. Product complies with requirements of Contract Documents and reviewed submittals.
   2. Quantities are correct.
   3. Accessories and installation hardware are correct.
   4. Containers and packages are intact and labels legible.
   5. Products are protected and undamaged.

E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

F. Provide additional protection during handling to prevent marring and otherwise damaging products, packaging, and surrounding surfaces. Handle product by methods to avoid bending or overstressing. Lift large and heavy components only at designated lift points.

1.4 STORAGE AND PROTECTION

A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate controlled enclosures.
B. For exterior storage of fabricated products, place on sloped supports, above ground.
C. Provide off-site storage and protection when site does not permit on-site storage or protection.
D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
E. Store loose granular materials on solid flat surfaces in a well-drained area. Avoid mixing with foreign matter.
F. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
G. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.
H. Maintain temperature, humidity control and ventilation within ranges stated in manufacturer’s instruction continually. Store unpacked and loose products on shelves, in bins or in neat groups of like items.
I. Products exposed to the elements shall be stored so the exposed surfaces are not adversely affected and that any weathering of finishes is acceptable under the requirements of the Contract Documents.

1.5 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description
B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.
C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

1.6 SUBSTITUTIONS

A. Architect will consider request for substitutions as outlined in the following:
   1. AIA Document A701 - Instructions to Bidders
   2. Document 00 01 00 - Supplementary Instructions to Bidders
   3. AIA Document A201 - General Conditions
B. Submit each substitution request with the SUBSTITUTION REQUEST form found at the end of this section.

PART 2 – PRODUCTS – NOT USED.
PART 3 – EXECUTION – NOT USED.

END OF SECTION 01 60 00
Substitution Request

TO ____________________________________________________________

PROJECT PIONEER SCHOOL OF THE ARTS GYMNASIUM ADDITION

SPECIFIED ITEM

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The undersigned, a representative of the Manufacturer, requests consideration of the following:

PROPOSED SUBSTITUTION _______________________________________________________________

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes description of changes to Contract Documents which proposed substitution will require for its proper installation.

The undersigned, a representative of the Manufacturer, states that the following items listed below, are correct.

1. The Proposed Substitution does not affect dimensions shown on Drawings.
2. The undersigned will pay for changes to the building design, including engineering design, detailing and construction costs caused by the requested substitution.
3. The Proposed Substitution will have no adverse affect on other trades or the construction schedule.
4. Maintenance and service parts will be locally available for the Proposed Substitution.
5. The warranty of the proposed substitution shall meet or exceed the warranty of the specified product.

The undersigned further states that the function, appearance and quality of the Proposed Substitution are equivalent or superior to the Specified Item. By signing this substitution request, the undersigned is stating that they represent the Manufacturer of the product proposed and have the authority to commit the Manufacturer to the conditions set forth in this substitution request regardless of the local supplier or contractor.

Submitted By__________________________________________

Signature______________________________________________

Firm__________________________________________________

Address________________________________________________

Date___________________________________________________

Telephone_______________________________

Fax ____________________________________

For use by Design Consultant:

Is the Manufacturer requesting this substitution? ☐ Yes ☐ No

_____Accepted              _____Accepted as noted

_____Not Accepted       _____Received too late

By___________________________________________________

Date_________________________________________________

Remarks__________________________________________

Attachments:
PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section specifies administrative and procedural requirements for cutting and patching.
B. Execute cutting, fitting, and patching including excavation and fill, to complete Work, and to:
   1. Fit the several parts together, to integrate with other work.
   2. Uncover work to install or correct ill-timed work.
   3. Remove and replace defective and non-conforming work.
   4. Remove samples of installed work for testing.
   5. Provide openings in elements of Work for penetrations of mechanical and electrical work.
C. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
   1. Requirements of this Section apply to mechanical and electrical installations. Refer to Division 21 through Division 26 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.3 SUBMITTALS

A. Submit written request in advance of cutting or altering elements which affects:
   1. Structural integrity of element.
   2. Integrity of weather-exposed or moisture-resistant elements.
   3. Efficiency, maintenance, or safety of element.
   5. Work of Owner or separate contractor.
B. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:
   1. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.
   2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building’s appearance and other significant visual elements.
   3. List products to be used and firms or entities that will perform work.
   4. Indicate dates when cutting and patching is to be performed.
   5. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
   6. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.
7. Approval by the Architect to proceed with cutting and patching does not waive the Architect’s right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.

C. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:
   a. Foundation construction.
   b. Bearing and retaining walls.
   c. Structural concrete.
   d. Structural steel.
   e. Lintels.
   f. Timber and primary wood framing.
   g. Structural decking.
   h. Stair systems.
   i. Miscellaneous structural metals.
   j. Exterior curtain wall construction.
   k. Equipment supports.
   l. Piping, ductwork, vessels and equipment.
   m. Structural systems of special construction in Division 13.

D. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

E. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Architect’s opinion, reduce the building’s aesthetic qualities, or result in visual evidence of cutting or patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 – EXECUTION

3.1 INSPECTION

A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. If unsafe or unsatisfactory conditions are encountered take corrective action before proceeding.

3.2 PERFORMANCE

A. General: Employ skilled and experienced workmen to perform cutting and patching. Where possible, employ original installer to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

B. Execute work by methods to avoid damage to other work, and which will provide proper surfaces to receive patching and finishing.

C. Cut masonry and concrete materials using masonry saw or core drill.
D. Restore Work with new products in accordance with requirements of Contract Documents.
E. Fit work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
F. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.
G. At penetrations of fire-rated walls, partitions, ceilings or floor construction, completely seal voids with fire-rated material in accordance with Section 078413, to full thickness of penetrated element.
H. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.
I. Where new work abuts or aligns with existing, provide smooth and even transition. Patch work to match existing adjacent work in texture and appearance.
J. Where change of plane of ¼” or more occurs, submit recommendation for providing smooth transition to Architect for review.
K. Patch or replace portions of existing surfaces that are damaged, lifted, discolored, or showing other imperfections.
L. Identify any hazardous substance or condition exposed during the Work to the Architect for decision or remedy.

3.3 CLEANING

A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION 01 73 29
PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes

1. Project Record Drawings and Documents.
2. Final Project Record Drawings and Documents. (As-Builts)
3. Operation and Maintenance Manuals.
4. Final Cleaning.
5. Adjusting.
7. Spare Parts and Maintenance Materials.
8. Closeout Procedures for Substantial Completion.
10. Building “Bake-Out” Procedure Prior to Occupancy

1.2 PROJECT RECORD DRAWINGS AND DOCUMENTS:

A. The Contractor shall continually record factual information regarding all aspects of the Work, both concealed and visible; to enable future modification of design to proceed without lengthy and expensive site measurement, investigation and examination.

B. Maintain on site, one set of the following documents; record actual revisions to the Work (AS-BUILT REVISIONS) concurrent with construction:

1. Project Record Drawings (Bound Set): Record information on a set of Construction Documents using felt tip marking pens, maintaining a separate color for each major system. Do not conceal any work until required information is recorded. Legibly mark each item to record actual construction including, but not limited to:
   b. Measured horizontal and vertical locations of underground utilities and appurtenances referenced to permanent surface improvements.
   c. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   d. Field changes of dimension and detail.
   e. Details not on original Contract Drawings.

2. Project Record Documents (Project Manual; Bound in 3-Ring Binder): Legibly mark and record at each Product section description of actual Products installed, including the following:
   a. Manufacturer's name and product model and number.
   b. Product substitutions or alternates utilized.
   c. Changes made by Addenda and Modifications.
   d. Addenda.

3. Project Record Documents (Shop Drawings and Submittals; Bound in 3-Ring Binder) shop drawings, product data, and samples: Shop drawings, product data and samples are to be bound in a usable fashion in 3-Ring Binders arranged according to the Table of Contents of this Project Manual.

4. Additional Project Information (Bound in 3-Ring Binder)
   a. Change Orders and other Modifications to the Contract.
   b. Field test records.
   c. Inspection Certificates.
   d. Manufacturers' Certificates.

C. Store Record Drawings and Documents separate from documents used for construction. Do not use Record Documents for construction purposes. Label document "PROJECT RECORD DOCUMENTS ON SITE"
D. Submit Project Record Drawings and Documents to Architect for review 10 days prior to Substantial Completion.

1. The Architect will review Project Record Drawings and Documents prior to Contractor generating final reproducible record drawings. Upon request, Contractor shall participate in review meetings of Project Record Documents, make required changes, and then submit for final review by the Architect.

2. Upon final review by the Architect, the Contractor shall generate a set of reproducible Final Project Record Drawings (As-Builts) and Documents as described below.

### 1.3 FINAL PROJECT RECORD DRAWINGS AND DOCUMENTS

A. The Contractor is to provide the Owner with one (01) complete set of reproducible Final Project Record Drawings (As-Builts) and Documents.

1. Final Project Record Drawings (As-Builts).
   a. The Architect shall provide the Contractor a set of original reproducible drawings.
   b. The Contractor shall have this set reproduced with the Architect’s title block and seals deleted from all documents.
   c. The Contractor shall transfer all information from the reviewed Project Record Drawings to this set.

2. Final Project Record Documents: (Reviewed Project Record Documents).
   a. Contractor is to provide the Owner with one (01) complete set of Final Project Record Documents Bound in 8-1/2 x 11 inch text page and Labeled according to Content as follows:
      1) Project Manual (1 rigid 3-ring binder).
      2) Shop Drawing, Product Data and Samples (1 rigid 3-ring binder).
      3) Additional Project Information (1 rigid 3-ring binder).
         i) Change Orders and other Modifications to the Contract.
         ii) Field test records.
         iii) Inspection Certificates.
         iv) Warranties and Manufacturers’ Certificates.

3. Final Project Record Drawings and Documents shall be submitted with the Contractors’ Final Application for Payment.

### 1.4 OPERATION AND MAINTENANCE DATA

A. Contractor is to provide three (3) Sets of Operation and Maintenance Manuals 10 days prior to Substantial Completion, for review by the Architect.

1. Manuals shall be bound in rigid 3-ring binders with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project printed on the cover. Internally subdivide the binder contents with permanent tabbed page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs. Prepare a Table of Contents for each volume, with each Product or system description identified, type on 24 pound white paper.

2. Manuals are to include:
   a. Directory - List names addresses and telephone numbers of:
      1) Architect
      2) Contractor
      3) Subcontractors
      4) Major equipment suppliers.
   b. General Information - Provide copies of each of the following:
      1) Certificate of Occupancy
      2) Lien Releases
      3) Consent of Surety
      4) Certificates of Insurance
5) Contractors and Subcontractors One-Year Warranty.
6) Extended Warranties required in Individual Specification Sections.
7) Air and water balance reports.
8) Certificates.
9) Photocopies of warranties and bonds.
10) Signed Receipt of Extra Stock Items (Form at end of this Section 01 70 00).
11) Copy of Keying Schedule.
12) Signed Form that Operation and Maintenance Instruction has been completed with Owner’s Representative (Form at end of this Section 01 70 00).
13) Certified Completed Punch List.

c. Operation and Maintenance Instructions Divisions 2-14 - Arranged by specification section and for each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Including, but not limited to, the following:
   1) Significant design criteria.
   2) List of equipment.
   3) Parts list for each component.
   4) Operating instructions.
   5) Maintenance instructions for equipment and systems.
   6) Maintenance instructions for special finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.

d. Operation and Maintenance Instructions Division 22 & 23 - Arranged by specification section and for each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Including, but not limited to, the following:
   1) Significant design criteria.
   2) List of equipment.
   3) Parts list for each component.
   4) Operating instructions.
   5) Maintenance instructions for equipment and systems.
   6) Maintenance instructions for special finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.

e. Operation and Maintenance Instructions Division 26-28 - Arranged by specification section and for each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Including, but not limited to, the following:
   1) Significant design criteria.
   2) List of equipment.
   3) Parts list for each component.
   4) Operating instructions.
   5) Maintenance instructions for equipment and systems.
   6) Maintenance instructions for special finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.

f. Operation and Maintenance Instructions Division 31-33 - Arranged by specification section and for each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Including, but not limited to, the following:
   1) Significant design criteria.
   2) List of equipment.
   3) Parts list for each component.
   4) Operating instructions.
5) Maintenance instructions for equipment and systems.
6) Maintenance instructions for special finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.

3. Submit one copy of completed volumes in final form 10 days prior to Substantial Completion. This copy will be returned with Architect comments. Revise content of documents as required prior to Final Completion.

4. Final O&M Manuals shall be presented to Architect at Final Completion.

1.5 INSTRUCTIONAL DVDS

A. Contractor shall provide Owner with three (3) copies of professionally produced Instructional DVDs with the Operations and Maintenance Manuals.
B. Submit 10 days prior to Substantial Completion for Review by the Architect.
C. Reviewed Instructional DVDs shall be presented to the Architect at Final Completion.

1.6 FINAL CLEANING

A. Execute final cleaning prior to Substantial Completion and, if necessary, provide additional cleaning in areas of Work prior to Final Completion.
B. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
C. Clean equipment and fixtures to a sanitary condition.
D. Replace filters of operating equipment.
E. Clean debris from roofs, gutters, downspouts, and drainage systems.
F. Clean site; sweep paved areas, rake clean landscaped surfaces.
G. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.7 BUILDING “BAKE-OUT” PRIOR TO OWNER OCCUPANCY - NOT USED.

1.8 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

1.9 EXTENDED WARRANTY

A. Contractor shall secure guarantees and/or warranties required for each section of the work, properly addressed and signed and in favor of Owner. Execute and assemble documents from Subcontractors, suppliers, and manufacturers as identified under Final Project Record Documents above.
B. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

1.10 SPARE PARTS, MAINTENANCE MATERIALS, & EXTRA STOCK ITEMS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification Sections.
B. Handling and storage requirements outlined in Section 01 60 00 - Product Requirements shall be met.
C. Maintain spare products in original containers with labels intact and legible until delivery to Owner.
D. Coordinate delivery with Owner. Deliver and unload spare products to the designated location prior to Substantial Completion.
E. Obtain written verification of quantities and acceptance of spare parts and maintenance materials from authorized Owner's representative. (Form provided following this Section).
1.11 CLOSEOUT PROCEDURES FOR SUBSTANTIAL COMPLETION

A. Provide the following items:
   1. Submit Project Record Drawings and Documents ten (10) days prior to Contractor's Request for Substantial Completion.
   2. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect's review.
   3. Submit a list of Project Deficiencies to the Architect 48 hours minimum prior to Substantial Completion Review.
   4. Provide submittals to Architect that are required by governing or other authorities.
   5. Owner will occupy all of the building as specified in Section 01 11 00 upon Substantial Completion.

B. Should status of completion of work require additional review by Architect due to failure of work to comply with Contractor's claim of Substantial Completion, Owner will deduct the amount of compensation for additional review services from final payment to Contractor.

1.12 CLOSEOUT PROCEDURES FOR FINAL COMPLETION

A. Submit Final Record Drawings and Documents.
B. Submit Final Operations and Maintenance Manuals and Instructional DVDs.
C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.
D. Should status of final completion of work require additional review by Architect due to failure of work to comply with Contractor's claim of Final Completion, Owner will deduct the amount of compensation for additional review services from final payment to Contractor.

PART 2 - PRODUCTS – NOT USED.
PART 3 - EXECUTION – NOT USED.

END OF SECTION 01 77 00
The Operation and Maintenance Procedures for the following list of systems has been demonstrated to the Owner's representatives on the dates indicated below. This form is to be included in the Operation and Maintenance Manuals - Part 2.

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Contractor's Representative

Owner's Representative
The following list of items taken from individual specification sections has been delivered to the Owner. Receipt is indicated by signatures of Owner and Contractor. This form is to be included in the Operations and Maintenance Manuals - Part 2.

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SECTION 01 80 00

KEYNOTE SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Drawings and details in these documents have been annotated using a "Keynoting" system to improve drawing clarity and document coordination. The first six digits of the keynote indicate the specification section covering the referenced item. Following a decimal point is a two digit number which serves to make each keynote unique.

B. As in other annotation systems, this system is not intended to remove the contractor's responsibility for submitting a complete and comprehensive bid that covers all work associated with the Work being bid. While every effort has been made to ensure that all work covered by keynotes is properly cross-referenced to a specification section and division, it is not represented to be a comprehensive list of all the work. All provisions of the Specifications are no less applicable than they would be in the absence of an integrated keynoting system.

C. Be aware that not all sections of work or portions of work occurring within the graphic portions of the contract documents may have been annotated using the keynoting system.

PART 2 - PRODUCTS – NOT USED.
PART 3 - EXECUTION – NOT USED.

END OF SECTION 01 80 00
# TABLE OF CONTENTS

## DIVISION 03 - CONCRETE

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<tr>
<td>03 35 00</td>
<td>Concrete Finishing</td>
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PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Formwork, shoring, bracing, and anchorage.
   2. Concrete reinforcement and accessories.
   5. Concrete coating.
   6. Concrete Inspection and Testing Requirements.

B. Related Sections include the following:
   1. Division 01: Administrative, procedural, and temporary work requirements.
   2. Section 03 35 00 - Concrete Finishing
   3. Section 07 11 13 - Bituminous Dampproofing
   4. Section 07 21 13 - Board Insulation
   5. Section 07 26 00 - Vapor Retarders.
   6. Section 07 92 00 - Joint Sealants

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.

B. American Concrete Institute (ACI) (www.concrete.org):
   1. 301 - Specifications for Structural Concrete.
   4. 308 - Guide to Curing Concrete.
   5. 318 - Building Code Requirements for Structural Concrete.
   7. SP66 - ACI Detailing Manual

C. American Welding Society (AWS) (www.aws.org):
   1. D1.4 - Structural Welding Code - Reinforcing Steel.

D. ASTM International (ASTM) (www.astm.org):
   1. A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
   3. A767 - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
   5. C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
15. C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

E. Concrete Reinforcing Steel Institute (CRSI) (www.crsi.org):
   2. Publication 63 - Recommended Practice for Placing Reinforcing Bars.
   3. Publication 65 - Recommended Practice for Placing Bar Supports, Specifications and Nomenclature.

F. American Association of State and Highway Transportation Officials (AASHTO) (www.transportation.org):
   1. M182 - Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats.

G. American Society of Concrete Contractors. (ASCC).
H. Concrete Polishing Council. (CPC).
I. 2010 Americans with Disabilities Act (ADAAG).

1.3 SUBMITTALS

A. Submit shop drawings of reinforcing steel under provisions of Division 01.
B. Indicate reinforcement sizes, spacings, locations and quantities of reinforcing steel, bending and cutting schedules, splicing, and supporting and spacing devices.
C. Installation Procedure:
   1. Handling and installation of vapor barrier.
   2. Installation of items above vapor barrier to prevent penetration of vapor barrier material.
D. Submit proposed mix design of each class of concrete to appointed testing firm for review 14 days prior to commencement of work:
   1. Designate each mix design with a specific number to be verified during construction.
E. Testing firm will take cylinders and perform slump and air entrainment tests in accordance with ACI 301.
F. Submit Concrete Coating Color and texture samples.
1.4 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301 and 347.
B. Maintain copies of ACI 301 and 347 on site.
C. Conform to ACI 305 when concreting during hot weather.
D. Conform to ACI 306 when concreting during cold weather.
E. Perform work in accordance with CRSI - Manual of Standard Practice.
F. Regulatory Requirements:
   1. Conform to local code for transport.
   2. Conform to ACI 347 for design, fabrication, erection and removal of formwork.

1.5 DELIVERY, STORAGE AND HANDLING – NOT USED.
1.6 PROJECT/SITE CONDITIONS – NOT USED.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate work under provisions of Instructions to Bidders.
B. Coordinate placement of reinforcing with placement of formwork, formed opening and other work.
C. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.

1.8 EXTENDED WARRANTY – NOT USED.
1.9 MAINTENANCE – NOT USED.

PART 2 - PRODUCTS

2.1 MANUFACTURERS – NOT USED.

2.2 MATERIALS

A. Concrete Materials:
   1. Cement: ASTM C150, Type I - Normal and Type IA - Air Entraining, Portland Type.
      a. Use one type of cement throughout project.
   2. Fly Ash: ASTM C618, Type F.
   4. Water: Clean and not detrimental to concrete.

B. Concrete Admixtures:
   1. Air entrainment admixture may not be used.
   2. Water-Reducing Admixture: ASTM C494; Type A or Type D; containing no chloride ions.
   3. High-Range water Reducing Admixture: ASTM C494, Type F or G.
   4. Water-Reducing Accelerating Admixture: ASTM C494, Type F.
   5. Calcium chloride may not be used.

C. Reinforcement:
   1. Reinforcing Steel: ASTM A615, Grade 60; deformed billet steel bars, unfinished.
   2. Weldable Reinforcing Steel: ASTM A706, grade 60, deformed billet steel bars.
   4. Tie Wire: Minimum 16 gauge annealed type.
   6. Chairs, Bolsters, Bar Supports, and Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load...
bearing pad on bottom to prevent vapor barrier puncture.

7. Polypropylene Fibers: 3/4 inch length @ 1.5 lbs/cubic yard.

D. Vapor barrier: Install over 4 inch aggregate beneath all concrete slabs on grade:
1. As specified in Section 07 26 00 – Vapor Retarders.

E. Bituminous Dampproofing:
1. Type II and Type III
2. As specified in Section 07 11 13 - Bituminous Dampproofing.

F. Sealants:
1. As specified in Section 07 92 00 - Joint Sealants.

2.3 MANUFACTURED UNITS – NOT USED.
2.4 EQUIPMENT – NOT USED.
2.5 COMPONENTS – NOT USED.

2.6 ACCESSORIES

A. Concrete Accessories:
1. Bonding Agent: Polymer resin emulsion.
2. Absorbable Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per square yard, complying with AASHTO M182.
3. Moisture Retaining Cover: One of the following, complying with ASTM C171:
   a. Waterproof paper.
   b. Polyethylene film.
   c. Polyethylene-coated burlap.
4. Liquid Membrane-Forming Curing Compound: comply with ASTM C309, Type 1, Class A, moisture not more than 0.55 kg/square meter when applied at 200 sq. ft./gal.
5. Water-Based Acrylic Membrane Curing Compound: ASTM C309, Type 1, Class B.
6. Construction Joints: Metal “Keylock” or equivalent.
7. Corners: Chamfered rigid plastic or wood strip type, 3/4 by 3/4 inch, maximum possible lengths.
8. Chemical Hardener: Magnesium fluosilicate and zinc fluosilicate blend, liquid type.
9. Concrete Coatings:
   a. Thorocoat by Thorosystems or approved equal.
      i. Coarse Texture

B. Joint Devices and Filler Materials:
2. Construction Joint Devices: Integral galvanized steel, formed to tongue and groove profile, with removable top strip exposing sealant trough, knockout holes spaced at 6 inches, ribbed steel spikes with tongue to fit top screed edge.
3. Sealant: As Specified in Section 07 92 00 - Joint Sealants.

C. Form Materials:
1. Forms for Exposed Finish Concrete: Unless otherwise indicated construct formwork for exposed concrete surfaces with plywood, metal, metal-framed-plywood-faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints.
2. Formwork Accessories
   a. Form Ties: Snap-off type, metal, fixed length, cone type, 3/4 inch (19 mm) back break dimension, free of defects that could leave holes larger than 1 inch (25 mm) diameter in concrete surface.
   b. Form Release Agent: Colorless mineral oil which will not stain concrete, absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.
2.7 MIXES

A. Ready-Mix Concrete; in accordance with ASTM C94:
   1. When air temperature is between 85 degrees F and 90 degrees F reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 degrees F, reduce mixing and delivery time to 60 minutes.

B. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. Designate each type of mix with a specific label to be verified during construction. For trial batch method use an independent testing agency acceptable to Architect for preparing and reporting proposed mix designs:
   1. Do not use same testing agency for field quality control.
   2. Limit use of fly ash to 15 percent of cement content by weight.

C. Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until proposed mix designs have been reviewed by Architect.

D. Concrete Exposed to Freezing and Thawing:
   1. Maximum Size Aggregate: See Structural Notes
   2. Portland Cement: Type I or II
   3. Compressive Strength (7 days): 2400 psi
   4. Compressive Strength (28 days): See Structural Notes
   5. Slump (per 2015 IBC): 4 inches (before additives)
   6. Entrained Air: See Structural Notes
   7. Minimum Cement Content: 500 lbs./cubic yard
   8. Maximum Water/Cement Ratio: See Structural Notes

E. Concrete not Exposed to Freezing and Thawing:
   1. Maximum Size Aggregate: See Structural Notes
   2. Portland Cement: Type I
   3. Compressive Strength (7 days): 2400 psi
   4. Compressive Strength (28 days): See Structural Notes
   5. Slump (per 2015 IBC): 4 ½ to 5 inches
   6. Entrained Air: See Structural Notes
   7. Minimum Cement Content: 500 lbs./cubic yard
   8. Maximum Water/Cement Ratio: See Structural Notes

F. Non-Shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 5,000 psi in 28 days.

G. Add super plasticizers per Manufacturer’s recommendation for additional workability, if required. Specified concrete slump shall be verified on site prior to addition of super plasticizer.

H. Use accelerating admixture in concrete placed at ambient temperatures below 30 degrees Fahrenheit.

2.8 FABRICATION

A. Reinforcement
   2. Weld reinforcement in accordance with AWS D1.4.
   3. Locate reinforcing splices not indicated on Drawings, at point of minimum stress.
Indicate location of splices on Shop Drawings.

2.9 SOURCE QUALITY CONTROL

A. Acquire cement and aggregate from same source for all work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Instructions to Bidders.
B. Verify requirements for concrete cover over reinforcement.
C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3.2 PREPARATION

A. Formwork:
   1. Verify lines, levels, and measurement before proceeding with formwork. Ensure that dimensions agree with drawings.
   2. Hand trim sides and bottom of earth forms; remove loose dirt prior to placing concrete.
   3. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
   4. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to over stressing by construction loads.
   5. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
   6. Align joints and make watertight. Keep form joint to a minimum.
   7. Obtain approval before framing openings in structural members which are not indicated on Drawings.
   8. Provide chamfer strips on external corners of beams, joists, columns and slabs as detailed.
   9. Do not apply form release agent where concrete surfaces receive applied coatings which may be affected by agent.
   10. Provide formed openings where required for items to be embedded in passing through concrete work.
   11. Locate and set in place items which will be cast directly into concrete.
   12. Coordinate with work of other Section in forming and placing openings, slots, reglets, recesses, chases, sleeves, bolts, anchors, other inserts, and components of other Work.

3.3 EXECUTION

A. Reinforcement:
   1. Place, support, and secure reinforcement against displacement. Clean reinforcement of loose rust and mill scale, earth, ice and other materials that reduce bond with concrete.
   2. Locate reinforcing splices at non-critical stress locations. Comply with CRSI’s recommend practice for “Placing Reinforcing Bars”.
   3. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Not required in slabs on grade.
   4. Do not displace or damage vapor barrier.
B. Concrete:
1. Place concrete in accordance with ACI 301 and ACI 318.
2. Notify Construction Manager a minimum of 24 hours prior to commencement of operations.
3. Notify testing organization a minimum of 24 hours prior to commencement of operations.
4. Ensure reinforcement, inserts, embedded parts, and formed expansion and contraction joints are not disturbed during concrete placement.
5. Repair vapor barrier damaged during placement of concrete reinforcing. Repair with vapor barrier material; lap over damaged areas minimum 6 inches and seal watertight.
6. Separate slabs on grade from vertical surfaces with joint filler.
7. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface. Conform to Section 07 92 00 for finish joint sealer requirements.
8. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
9. Apply sealants in joint devices in accordance with Section 07 92 00.
10. Place concrete continuously between predetermined expansion, control, and construction joints.
11. Place floor slabs in pattern indicated.
12. Screed floors and slabs on grade level, maintaining surface flatness of maximum 1/4 inch in 10 ft.

C. Horizontal Surface Finishes:
1. Finish concrete floor surfaces in accordance with ACI 301 and CPC recommendations.
2. Trowel finish monolithic slab surfaces to be exposed to view or covered with resilient flooring, carpet, paint, elastomeric or other thin film finish coating system.
3. Steel Trowel and Fine Broom Finish: Apply to exterior sidewalks, steps, platforms. Steel trowel finish as specified, then immediately follow by brooming surface with fine bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
4. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1/8 inch per foot nominal as indicated on drawings unless noted otherwise.
5. Flatness Requirements: Overall FF 50, Local FF 35.

D. Floor Slab Control Joints:
1. Saw cut floor slabs per Contract Documents, in a square checkerboard pattern, and not greater than 20 feet in any direction.
2. Saw cut control joints at an optimum time after finishing. Cut slabs with 3/16 inch thick blade, cutting 1/3 of depth of slab thickness.
3. Submit sawcutting location plan for Architect approval 30 days prior to slab placement. Do not place slabs prior to receipt of Architect approval of sawcut locations.

E. Curing and Protection:
1. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to Manufacturer’s instructions after screeding and bull floating, but before power floating and troweling.
2. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting; keep continuously moist for not less
3. Curing Methods: Cure concrete by curing compound, moist curing, by moisture-retaining cover curing, or by combining these methods, as specified.
4. Provide moisture curing by the following methods (Contractor's Option):
   a. Keep concrete surface continuously wet by covering with water.
   b. Use continuous water-fog spray.
   c. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with a 4-inch lap over adjacent absorptive covers.
5. Provide moisture-retaining cover curing as follows:
   a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
6. Apply curing compound on exposed interior slabs and on exterior slabs, walks, and curbs as follows:
   a. Apply curing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller according to Manufacturer's directions. Recoat areas subject to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
   b. Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.
7. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for the full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
8. Curing Unformed Surfaces: Cure unformed surfaces, including slabs, floor topping, and other flat surfaces, by applying the appropriate curing method.
   a. Final cure concrete surfaces to receive finish flooring with a moisture retaining cover, unless otherwise directed.

F. Shores and Supports:
1. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed in less than 14 days or until concrete has attained at least 75 percent of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens’ representative of concrete location or members.
2. Form-facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.

3.4 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed in accordance with ACI 301 and under provisions of Division 01. Owner will appoint, employ and pay for services and any independent firm to perform inspection and testing.
B. Provide free access to Work and cooperate with appointed testing firm.
C. Appointed Testing Firm will take cylinders and perform slump and air entrainment tests in accordance with ACI 301.
D. Sampling and testing for quality control during concrete placement may include the
following, as directed by Architect:

1. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.
2. Slump: ASTM C143, Concrete slump shall be verified prior to addition of super plasticizer. Additional tests will be required when concrete consistency seems to have changed.
3. Air Content: ASTM C173, volumetric method for lightweight or normal weight concrete; ASTM C231, pressure method for normal weight concrete; one with each compression test.
4. Concrete Temperature: ASTM C1064, one test hourly when air temperature is 40 degrees F and below, or when 80 degrees F and above, and one test for each set of compressive-strength specimens.
5. Compression Test Specimen: ASTM C31, one set of four standard cylinders at point of Concrete Placement at point of concrete placement, for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
6. Compressive-Strength Tests: ASTM C39, one set for each day’s pour exceeding 5 cu.yd. Plus additional sets for each 50 cu.yd. More than the first 50 cu.yd. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days and one specimen retained in reserve for later testing if required.

E. Test results will be reported in writing to Architect, Construction Manager, Structural Engineer, ready-mix producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type, and class, mix design number, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

F. Non destructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by but shall not be used as the sole basis for acceptance or rejection.

G. Additional Tests: The testing agency will make additional tests of in-lace concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing agency may conduct test to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed.

H. One additional test cylinder will be taken during cold weather concreting, cured on job site under same conditions as concrete it represents.

I. Any concrete that does not comply with slump or air entrainment limits will be rejected immediately.

J. No water may be added to mix after slump test.

K. The contractor is to record slump on each batch ticket and provide copies to the Architect.

L. The contractor is to be present during all placement of concrete.

M. Definition of Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

N. Repair or replacement of defective concrete will be determined by the Architect.

O. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.5 ADJUSTING – NOT USED.
3.6 CLEANING – NOT USED.
3.7 DEMONSTRATION – NOT USED.
3.8 PROTECTION – NOT USED.

3.9 SCHEDULES
A. Formed Surfaces (vertical):
   1. Smooth surface finish where finish is exposed to view.
   2. Rough form finish at concealed locations.
   3. Concrete Coating finish at exterior foundations and vertical walls.
   4. Remove all projections and fill all voids at areas to receive waterproofing or dampproofing.
   5. Concrete columns, column bases, piers and exposed foundation and vertical walls shall be finished with Concrete Coating applied in two coats at Manufacturer’s recommended rate; course texture, spray-applied, brush in first coat, gray color and final texture as selected by Architect.

B. Floor Slab Finishes:
   1. Scratch finish at ceramic tile setting beds.
   2. Hard-Steel Troweled (3 passes) Concrete: No burn marks. Finish to ACI 302.1R, Class 5 floor.

END OF SECTION 03 30 00
SECTION 03 35 00

CONCRETE FINISHING

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Products and procedures for special aggregate, integral colors, and bonded abrasive polishing concrete floors using multi-step wet/dry mechanical process, and accessories indicated, specified, or required to complete polishing.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.
   2. Section 03 30 00 – Cast in Place Concrete.
   3. Section 07 92 00 – Joint Sealants.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.

B. American Concrete Institute. (ACI):
   1. 117 – Tolerances for Concrete Construction and Materials.
   2. 301 – Structural Concrete.
   3. 302.1R – Guide for Concrete Floor and Slab Construction.
   4. 303.1 – Cast-in-Place Architectural Concrete.
   5. 305.1 – Hot Weather Concreting.
   6. 306.1 – Cold Weather Concreting.
   7. 308R – Curing Concrete.
   8. 318 – Building Code Requirements for Structural Concrete.
   9. 347 – Formwork for Concrete

C. American Society of Concrete Contractors. (ASCC):
   1. ASCC – Guide for Surface Finish of Concrete Slabs on Ground.
   2. ASCC – Decorative Concrete Council Problems and Practice Papers.

D. American National Standards Institute (ANSI) (www.ansi.org):

E. Concrete Polishing Council. (CPC). Concrete Polishing Certification Program.

F. Portland Cement Association. (PCA):
   1. PCA PA124 – Finishing Concrete with Color and Texture.

   2. C979 - Pigments for Integrally Colored Concrete.
   3. F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
   4. F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride


1.3 DEFINITIONS
A. Terminology: As defined by CPAA.
B. Polished Concrete: The act of changing a concrete floor surface, with or without aggregate exposure, to achieve a specified level of gloss.
C. Bonded Abrasive Polished Concrete: The multi-step operation of mechanically grinding, honing, polishing of a concrete floor surface with bonded abrasives to cut a concrete floor surface and to refine each cut to the maximum potential to achieve a specified level of finished gloss as defined by the CPAA. This yields the most durable finish and requires the least amount of maintenance.

1.4 SUBMITTALS
A. Product Data: Manufacturer’s technical literature for each product indicated, specified, or required. Include Manufacturer’s technical data, application instructions, and recommendations.
B. Installer Qualifications: Data for company, principal personnel, experience, and training specified in Quality Assurance.
C. Field Quality Control – Dynamic Coefficient of Friction Test Reports: Reports of testing specified in Field Quality Control.
D. Field Quality Control – Static Coefficient of friction test reports: Report of testing specified in Field Quality Control.
E. Maintenance Data: For inclusion in maintenance manual required by Division 01.
F. Include instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated use.
G. Include precautions against cleaning products and methods which may be detrimental to finishes and performance.
H. Field Samples:
   1. Coordinate with Architect and Schedule for aggregate exposure and gloss level.

1.5 QUALITY ASSURANCE
A. Polisher Qualifications:
   1. Experience: Company experienced in performing specified work similar in design, products, and extent to scope of this Project; with a record of successful in-service performance; and with sufficient production capability, facilities, and personnel to produce specified work.
   2. Supervision: Maintain competent supervisor who is at Project during times specified work is in progress, and is currently certified as Craftsman - Level I or higher by CPAA.
B. Manufacturer Qualification: Approved by Manufacturer to apply liquid applied products.
C. Walkway Auditor: Certified by CPAA or NFSI to test bonded abrasive polished concrete floors for dynamic and static coefficient of friction according to ANSI B101.1 and B101.3.
D. Coefficient of Friction: Achieve following coefficient of friction by field quality control testing in accordance to the following standards:
   1. ANSI B101.1 Static Coefficient of Friction - Achieve a minimum of 0.42 for level floor surfaces.
   2. ANSI B101.3 Dynamic Coefficient of Friction - Achieve a minimum of 0.35 for level floor surfaces.
E. Field Mock-Up: Before performing work of this section, provide a minimum of four (4) 48 by 48 inch finished mock-ups to verify the appearance of the local concrete and aggregates, the selected Aggregate Exposure, and the selected Gloss Level.
   1. The mock-ups will be prepared and inspected in a sequential order of steps to obtain the final appearance.
   2. Concrete shall be same mix design as scheduled for project.
3. Placement and finishing of mock-ups shall be by the same personnel that will place and finish the final product.
4. Form, reinforce, cast, and finish a 48 by 48 inch concrete slab, 4 inches thick for each required mock-up demonstrating the required level of aggregate, grinding and finish.
5. The final approved mock-up shall be maintained as the standard for the work installed as the final product.

1.6 FIELD CONDITIONS

A. Damage and Stain Prevention: Take precautions to prevent damage and staining of concrete surfaces to be polished.
B. Prohibit use of markers, spray paint, and soapstone.
C. Prohibit improper application of liquid membrane film forming curing compounds.
D. Prohibit vehicle parking over concrete surfaces.
E. Prohibit pipe-cutting operations over concrete surfaces.
F. Prohibit storage of any items over concrete surfaces for not less than 28 days after concrete placement.
G. Prohibit ferrous metals storage over concrete surfaces.
H. Protect from lifts or other wheeled equipment.
I. Protect from petroleum, oil, hydraulic fluid, or other liquid dripping from equipment working over concrete surfaces.
J. Protect from acids and acidic detergents contacting concrete surfaces.
K. Protect from painting activities over concrete surfaces.
L. Environmental Limitations: Comply with Manufacturer’s written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting liquid applied product application.

PART 2 – PRODUCTS

2.1 SPECIAL AGGREGATES – NOT USED

2.2 INTEGRAL COLOR ADDITIVES – NOT USED

2.3 LIQUID APPLIED PRODUCTS

A. Liquid Densifier: An Aqueous solution of Silicon Dioxide dissolved in one of the following Hydroxides that penetrates into the concrete surface and reacts with the Calcium Hydroxide to provide a permanent chemical reaction that hardens and densifies the wear surface of the cementitious portion of the concrete. All of the following have the same chemistry varying only by the alkali used for solubility of the Silicon Dioxide.
   1. Sodium Silicate
   2. Potassium Silicate
   3. Lithium Silicate
   4. Alkalis solution of Colloidal Silicates or Silica

2.4 ACCESSORIES

A. Repair Material: A product that is designed to repair cracks and surface imperfections. The specified material must have sufficient bonding capabilities to adhere after the polishing to the concrete surface and provide abrasion resistance equal to or greater than the surrounding concrete substrate.
B. Grout Material: A thin mortar used for filling spaces. Acceptable products shall be:
1. Epoxy, urethane, polyurea, or polyaspartic resins.
2. Latex or acrylic binders mixed with cement dust from previous grinding steps.
3. Silicate binders mixed with cement dust from previous grinding steps.

C. Protective Cover: Non-woven, puncture and tear resistant, polypropylene fibers laminated with a multi-ply, textured membrane, not less than 18 mils in thickness.

2.5 POLISHING EQUIPMENT

A. Field Grinding and Polishing Equipment:
   1. A multiple head, counter rotating, walk behind or ride on machine, of various size and weights, with diamond tooling affixed to the head for the purpose of grinding concrete. Excludes janitorial maintenance equipment.
   2. If dry grinding, honing, or polishing, use dust extraction equipment with flow rate suitable for dust generated, with squeegee attachments.
   3. If wet grinding, honing, or polishing, use slurry extraction equipment suitable for slurry removal and containment prior to proper disposal.

B. Edge Grinding and Polishing Equipment: Hand-held or walk-behind machines which produces same results, without noticeable differences, as field grinding and polishing equipment.

C. Burnishing Equipment: High speed walk-behind or ride-on machines capable of generating 1000 to 2000 revolutions per minute and with sufficient head pressure of not less than 20 pounds to raise floor temperature by 20 degrees F.

D. Diamond Tooling: Abrasive tools that contain industrial grade diamonds within a bonded matrix (such as metallic, resinous, ceramic, etc) that are attached to rotating heads to refine the concrete substrate.

E. Bonded Abrasive: Abrasive medium that is held within a bonding that erodes away to expose new abrasive medium as it is used.

F. Metal Bond Tooling: Diamond tooling that contains industrial grade diamonds with a metallic bonded matrix that is attached to rotating heads to refine the concrete substrate. These tools are available in levels of soft, medium, and hard metallic matrices that are matched with contrasting concrete substrates (i.e. hard matrix/soft concrete, medium matrix/medium concrete, soft matrix/hard concrete) and are typically used in the grinding and early honing stages of the polishing process.

G. Resin Bond Tooling: Diamond tooling that contains industrial grade diamonds within a resinous bonded matrix (poly-phenolic, ester-phenolic, and thermoplastic-phenolic) that is attached to rotating heads to refine the concrete substrate. Resin bond tooling does not have the soft/medium/hard characteristics of metal bond tooling and are typically used for the later honing and polishing stages of the polishing process.

H. Hybrid Tooling: Diamond tooling that combines metal bond and resin bond that has the characteristics of both types of tooling. These types of tools are typically used as either transitional tooling from metal bond tools to resin bond tools or as a first cut tool on smooth concrete surfaces.

I. Transitional Tooling: Diamond tooling that is used to refine the scratch pattern of metal bond tooling prior to the application of resin bond tooling in an effort to extend the life of resin bond tooling and to create a better foundation for the polishing process.

J. Abrasive Pad: An abrasive pad, resembling a typical floor maintenance burnishing pad that has the capability of refining the concrete surface on a microscopic level that may or may not contain industrial grade diamonds. These pads are typically used for the maintenance and/or restoration of previously installed polished concrete flooring.

PART 3 – EXECUTION

3.1 EXAMINATION
A. Acceptance of Surfaces and Conditions:
   1. Examine substrates to be polished for compliance with requirements and other conditions affecting performance.
   2. Concrete Finished Floor Flatness according to applicable Division 03 Section on cast-in-place concrete.
   3. Concrete curing methods according to applicable Division 03 Section on cast-in-place concrete.
   4. Concrete Compression strength per according to applicable Division 03 Section on cast-in-place concrete.
   5. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
   6. Starting work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION – NOT USED

3.3 MIXES

A. Slump: 4 1/2 to 5 inches. If greater slump is required, use water-reducing or super-plasticizing admixture; do not add water.

B. Do not retemper mix or add water in field.

3.4 PREPARATION

A. Cleaning New Concrete Surfaces:
   1. Prepare and clean concrete surfaces.
   2. Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, paint splatter, and other contaminants incompatible with liquid applied products and polishing.

3.5 VAPOR TESTING CONCRETE FLOORS

A. Alkalinity:
   1. Test Method: Measure pH according to method indicated in ASTM F710.

B. Moisture Vapor Transmission Rate:
   1. Test Method: Perform anhydrous calcium chloride test according to ASTM F1869.
   2. Acceptable Results: Not more than 5 pounds per 1000 square feet in 24 hours.

C. Relative Humidity:
   2. Acceptable Results: Not more than 75 percent.

3.6 POLISHING CONCRETE FLOORS

A. Perform all polishing procedures to ensure a consistent appearance from wall to wall.

B. Initial Grinding:
   1. Use grinding equipment with metal or semi-metal bonded tooling.
   2. Begin grinding in one direction using sufficient size equipment and diamond tooling to meet specified aggregate exposure class.
   3. Make sequential passes with each pass perpendicular to previous pass using finer grit tool with each pass, up to 100 grit metal bonded tooling.
4. Achieve maximum refinement with each pass before proceeding to finer grit tools.
5. Clean floor thoroughly after each pass using dust extraction equipment properly fitted with squeegee attachment or walk behind auto scrubber suitable to remove all visible loose debris and dust.
6. Continue grinding until aggregate exposure matches approved field mock-ups.
7. Treating Surface Imperfections:
   a. Mix patching compound or grout material with dust created by grinding operations, Manufacturer’s tint, or sand to match color of adjacent concrete surfaces.
   b. Fill surface imperfections including, but not limited to, holes, surface damage, small and micro cracks, air holes, pop-outs, and voids with grout to eliminate micro pitting in finished work.
   c. Work compound and treatment until color differences between concrete surface and filled surface imperfections are not reasonably noticeable when viewed from 10 feet away under lighting conditions that will be present after construction.
C. Liquid Densifier Application: Apply undiluted to point of rejection, remove excess liquid, and allow curing according to Manufacturer's instructions.
D. Grout Grinding:
   1. Use grinding equipment and appropriate grit and bond diamond tooling.
   2. Apply grout, forced into the pore structure of the concrete substrate, to fill surface imperfections.
E. Clean floor thoroughly after each pass using dust extraction equipment properly fitted with squeegee attachment or walk behind auto scrubber suitable to remove all visible loose debris and dust.
F. Honing:
   1. Use grinding equipment with hybrid or resin bonded tooling.
   2. Hone concrete in one direction starting with a 100 grit tooling and make as many sequential passes as required to remove scratches, each pass perpendicular to previous pass, up to 400 grit tooling reaching maximum refinement with each pass before proceeding to finer grit tooling.
G. Clean floor thoroughly after each pass using dust extraction equipment properly fitted with squeegee attachment or walk behind auto scrubber suitable to remove all visible loose debris and dust.
H. Polishing:
   1. Use polishing equipment with resin-bonded tooling.
   2. Begin polishing in one direction starting with 800 grit tooling.
   3. Make sequential passes with each pass perpendicular to previous pass using finer grit tooling with each pass until the specified level of gloss has been achieved.
   4. Achieve maximum refinement with each pass before proceeding to finer grit pads.
   5. Clean floor thoroughly after each pass using dust extraction equipment properly fitted with squeegee attachment or walk behind auto scrubber suitable to remove all visible loose debris and dust.
   6. Stain Protection: Uniformly apply and remove excessive liquid according to Manufacturer's instructions. Final film thickness should be less than .05 mils after cure.
   7. Final Polish: Using burnishing equipment and finest grit abrasive pads, burnish to uniform reflective sheen matching approved field mock-up.
I. Final Polished Concrete Floor Finish:
   1. Aggregate Exposure Class A – Cream Finish: Polish Portland cement paste resulting in little or no aggregate exposure.
   2. Aggregate Exposure Class B – Fine / Sand Aggregate Finish: Remove not more than 1/16 inch of concrete surface by grinding and polishing resulting in majority
of exposure displaying fine aggregate with no, or small amount of, medium aggregate at random locations.

3. Aggregate Exposure Class C – Medium Aggregate Finish: Remove not more than 1/8 inch of concrete surface by grinding and polishing resulting in majority of exposure displaying medium aggregate with no, or small amount of, large aggregate at random locations.

4. Aggregate Exposure Class D – Large Aggregate Finish: Remove not more than 1/4 inch of concrete surface by grinding and polishing resulting in majority of exposure displaying large aggregate with no, or small amount of, fine aggregate at random locations.

J. Finished Gloss Level 1 – Low Gloss Appearance:
1. Procedure: Recommended not less than 4 step process with full refinement of each diamond tool with one application of densifier.
2. Gloss Measurement: Determine the specular gloss by incorporating the following:
   a. Reflective Clarity Reading: Not less than 20 according to ASTM D5767 prior to the application of sealers.
   b. Reflective Sheen Reading: Not less than 15 according to ASTM D523 prior to the application of sealers.

K. Finished Gloss Level 2 – Medium Gloss Appearance:
1. Procedure: Recommended not less than 4 step process with full refinement of each diamond tool with one application of densifier.
2. Gloss Measurement: Determine the specular gloss by incorporating the following:
   a. Reflective Clarity Reading: Not less than 55 according to ASTM D5767 prior to the application of sealers.
   b. Reflective Sheen Reading: Not less than 25 according to ASTM D523 prior to the application of sealers.

L. Finished Gloss Level 3 – High Gloss Appearance:
1. Procedure: Recommended not less than 4 steps with full refinement of each diamond tool with one application of densifier.
2. Gloss Measurement: Determine the specular gloss by incorporating the following:
   a. Reflective Clarity Reading: Not less than 65 according to ASTM D5767 prior to the application of sealers.
   b. Reflective Sheen Reading: Not less than 35 according to ASTM D523 prior to the application of sealers.

M. Finished Gloss Level 4 – Very High Gloss Appearance:
1. Procedure: Recommended not less than 4 steps with full refinement of each diamond tool with one application of densifier.
2. Gloss Measurement: Determine the specular gloss by incorporating the following:
   a. Reflective Clarity Reading: Not less than 85 according to ASTM D5767 prior to the application of sealers.
   b. Reflective Sheen Reading: Not less than 50 according to ASTM D523 prior to the application of sealers.

3.7 FIELD QUALITY CONTROL

A. Field Testing: Engage a qualified walkway auditor to perform field testing to determine if polished concrete floor finish complies with specified coefficient of friction.
   1. ANSI B101.1 for static coefficient of friction
   2. ANSI B101.3 for dynamic coefficient of friction

3.8 CLOSEOUT ACTIVITIES

A. Maintenance Training: CPAA Craftsman shall train Owner's designated personnel in
proper procedures for maintaining polished concrete floor.

3.9 PROTECTION

A. Covering: After completion of polishing, protect polished floors from subsequent construction activities with protective covering.

3.10 SCHEDULE

A. Polished Concrete All Locations:
1. Provide Aggregate Exposure Class B.
2. Provide Finished Gloss Level 2.

END OF SECTION 03 35 00
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**PIONEER SCHOOL OF THE ARTS GYMNASIUM ADDITION**

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04/18/2018
PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Brick unit masonry.
   2. Masonry Mortaring.
   4. Integral flashings.
B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.
   2. Section 07 62 00 - Sheet Metal Flashing and Trim.
   3. Section 07 92 00 - Joint Sealers.

1.2 REFERENCES
A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.
B. ASTM International (ASTM):
   2. A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   3. A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
   4. A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
   8. C90 - Standard Specification for Hollow Loadbearing Concrete Masonry Units.
   9. C129 - Standard Specification for Hollow Nonloadbearing Concrete Masonry Units.
  12. C744 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units.
C. The Masonry Society (TMS):
1.3 SUBMITTALS

A. Submittals for Review:
   1. Product Data: Provide information on reinforcing and anchors including sizes, profiles, materials, and finishes.
   2. Samples: Brick samples in quantities showing full color and texture range.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Minimum five (5) years documented experience in work of this Section.
B. Mockup:
   1. Size: 2 feet high x 2 feet wide.
   2. Show:
      a. Masonry color and texture range.
      b. Mortar joint size, color, and profile.
      c. Each bond pattern.
      d. Anchors.
      e. Flashings and weeps.
   3. Locate where directed by Architect.
   4. Approved mockup may remain as part of the Work.
C. Perform Work in accordance with TMS 402 and 602.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store masonry off ground; prevent contact with materials that could cause staining or damage.
B. Protect reinforcement and anchors from corrosion.

1.6 PROJECT CONDITIONS

A. Wall Protection:
   1. During erection, cover tops of partially completed walls with strong waterproof membrane at end of each day or work stoppage.
   2. Extend cover minimum of 24 inches down both sides; hold securely in place.
B. Load Application:
   1. Do not apply uniform loads for at least 12 hours after building masonry columns or walls.
   2. Do not apply concentrated loads for at least 3 days after building masonry columns or walls.
C. Environmental Requirements:
   1. Hot weather requirements: If ambient temperature is over 95 degrees F or relative humidity is less than 50 percent, protect from direct sun and wind exposure for minimum 48 hours after installation.
   2. Cold weather requirements: Do not use frozen materials or build on frozen work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers - Brick Masonry Units:
   1. Interstate Brick. (www.interstatebrick.com)
B. Acceptable Manufacturers - Masonry Accessories:
   1. Blok-Lok Ltd. (www.blok-lok.com)
   2. Heckmann Building Products. (www.heckmannbuildingprods.com)
   3. Hohmann and Barnard, Inc. (www.h-b.com)

C. Substitutions: Under provisions of Division 01. Proposed substitutions must provide color match for existing masonry veneer and blending.

2.2 MATERIALS

A. Brick:
   1. ASTM C652, ASTM C216, FBX, Grade SW, Type HBX.
   2. Size: As indicated on Contract Documents. (match existing).
   3. Color: Match existing.
   5. Provide solid units where holes would otherwise occur on exposed faces.

2.3 ACCESSORIES

A. Mortar:
   1. Portland cement: ASTM C150, Type I.
   2. 2000 psi minimum.
   4. Hydrated Lime: ASTM C 207, Type S.
   5. Water: Clean and potable.

B. Mortar Color:
   1. Mineral oxide pigment; color to match existing.
   2. Color is to be compatible with mortar type.

C. Grout:
   1. Portland cement: ASTM C150, Type I.
   2. 2000 psi minimum.
   5. Quickline: ASTM C5, non-hydraulic type.

D. Veneer Ties:
   2. Product: 2-Seal Tie, washer, and 2-seal Byna-Loc wire tie.

E. Fasteners: Hot-dip galvanized, minimum 3/4 inch penetration into framing.

F. Flashings:
   1. Rubberized asphalt laminated to plastic film, release paper facing, self adhering.
   2. Termination mastic: Type recommended by flashing Manufacturer.

G. Flashings: Galvanized steel, ASTM A653,

H. Weeps: Preformed plastic tubes filled with cotton wicks

I. Air Barrier: As specified in Section 07 27 00 – Air Barrier.

J. Mortar Dropping Control: Provide trapezoidal shaped mortar net to suspend mortar droppings at unequal heights allowing moisture to drain from the cavity and maintain airflow within the cavity wall.

K. Joint Sealer: Specified in Section 07 92 00.

L. Cleaner: Type recommended by masonry Manufacturer.

PART 3 - EXECUTION
3.1 PREPARATION

A. Wet brick having an absorption rate in excess of 20g per 30 square inches per minute as determined by ASTM C67 so that absorption rate when laid does not exceed this amount.

B. Remove dirt, loose rust, and other foreign matter from reinforcement and anchors.

3.2 INSTALLATION

A. Establish lines, levels and courses indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimensions. Form horizontal and vertical joints of uniform thickness.

B.C. Select and arrange units for exposed masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

C.D. Lay brick masonry in bond type to match existing. Course three brick units and three mortar joints to equal existing height.

D.E. Lay masonry plumb and level. Do not adjust masonry units after mortar has set.

E.F. Lay solid masonry units in full mortar bed, with full head joints. Lay hollow masonry units with face shell bedding on head and bed joints.

F.G. Do not butter corners or excessively furrow joints.

G.H. Machine cut masonry with straight cuts and clean edges; prevent oversized or undersized joints. Discard damaged units. Do not expose cut cells.

H.I. Isolate masonry from structural members with compressible filler.

I.J. When joining fresh masonry to partially set masonry, remove loose masonry and mortar; clean and lightly wet exposed surface of set masonry.

J.K. Stop horizontal runs by racking back normal bond unit in each course. Tooothing not permitted.

K.L. Veneer Ties:

1. Space ties to provide one tie 24 inches maximum spacing both ways.

2. Locate ties within 12 inches of ends of masonry walls and openings.

L.M. Control Joints:

1. Do not continue horizontal joint reinforcement through joints.

2. Keep joints free from mortar and grout.

3. Install joint backing and joint sealer at control joints in accordance with Section 07 92 00 – Joint Sealants.

4. Form expansion joint as indicated on Drawings.

M.N. Finishing Mortar Joints:

1. Exposed locations: Tool joints to profile to match existing.

2. Concealed locations: Cut joints flush.

N.O. Flashings:

1. Install flashing with outer edge flush with outside face of masonry; extend up backup 8 inches minimum.

2. Lap end joints 4 inches minimum and seal.

3. Form end dams where flashing is stopped or interrupted.

4. Apply trowel coat of mastic along flashing at top edge, seams, cuts, and penetrations.

5. Apply Air Barrier in strict accordance to Manufacturer’s published instructions.

O.P. Weeps:

1. Locate in head joints in first course above flashings at maximum 32 inches on center.

2. Set weeps flush with exterior face of masonry.

P.Q. Install mortar dropping control continuously in cavities above flashings.

Q.R. Installation Tolerances; Maximum variation from:

1. Alignment of columns and pilasters: Plus or minus 1/4 inch.
2. Alignment face to face of adjacent units: Plus or minus 1/8 inch.
3. Vertical alignment of head joints: Plus or minus 1/2 inch in 10 feet.
4. True plane of wall: Plus or minus 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.
5. Plumb: Plus or minus 1/4 inch in 10 feet noncumulative; 1/2 inch in 20 feet or more.
6. Level coursing: Plus or minus 1/8 inch in 3 feet; 1/4 inch in 10 feet; 1/2 inch in 30 feet.
7. Joint thickness: Plus or minus 1/8 inch.
8. Cross sectional thickness of walls: Plus or minus 1/4 inch.

3.3 FIELD QUALITY CONTROL

A. Testing and Inspection Services:
   1. Masonry units: Inspect masonry units prior to and during installation for compliance with specified requirements.
   2. Masonry assemblies:
      a. Determine compressive strength of masonry by the prism method, ASTM C1314.
      b. Verify dimensions and condition of grout spaces and type, quantity, and placement of reinforcement during installation and just prior to closing of cleanouts.
      c. Verify type, quantity, and installation of reinforcement, anchors, and ties.
      d. Inspect placement of grout.
   3. Grout: Mold and test one set of compressive strength cubes in accordance with ASTM C1019 for each 1000 square feet of masonry wall area or fraction thereof.

3.4 CLEANING

A. Protect adjacent and underlying surfaces.
B. Apply masonry cleaner in accordance with Manufacturer’s instructions.
C. Thoroughly rinse surfaces with clean water after completion of cleaning.
D. Remove all traces of cleaning solution.

3.5 SCHEDULE

A. Building Veneer – 4” ‘Emperor’ profile (4x4x16 Nom). Field verify color and match existing color blending percentages. Final color approval by Architect.
C. Mortar – Field verify color and match existing. Final color approval by Architect.

END OF SECTION 04 21 00
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SECTION 05 12 00

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Structural steel framing members.
   2. Base plates.

B. Products Furnished but not Installed Under this Section:
   1. Division 01: Administrative, procedural, and temporary work requirements.
   2. Section 03 30 00 - Cast-In-Place Concrete: Anchors for casting into concrete.
   3. Section 04 21 00 - Clay Unit Masonry.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.

B. American Institute of Steel Construction (AISC) (www.aisc.org) - Specifications for Structural Steel Buildings.


   6. A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

E. SSPC - Steel Structures Painting Council.

F. 2010 Americans with Disabilities Act (ADAAG).


1.3 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings
   1. Indicate profiles, sizes, spacing, and locations of structural members, openings,
2. Connections.
3. Cambers.

C. Manufacturer's Mill Certificate: Submit under provisions of Division 01 certifying that products meet or exceed specified requirements.

D. Welders' Certificates: Submit under provisions of Division 01 Manufacturer's Certificates, certifying welders employed on the Work, verifying AWS qualifications within the previous 12 months.

1.4 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

B. Perform work in accordance with AISC-Specification for Exposed Structural Steel.

C. Qualifications:
   1. Fabricator: Company specializing in performing the work of this Section with minimum five (5) years documented experience.
   2. Erector: Company specializing in performing the work of this Section with minimum five (5) years documented experience.

1.5 DELIVERY, STORAGE AND HANDLING – NOT USED.

1.6 PROJECT/SITE CONDITIONS

A. Verify that field measurements are as shown on Drawings.

1.7 SEQUENCING AND SCHEDULING – NOT USED.

1.8 EXTENDED WARRANTY – NOT USED.

1.9 MAINTENANCE – NOT USED.

PART 2 - PRODUCTS

2.1 MANUFACTURERS – NOT USED.

2.2 MATERIALS

A. Structural Steel Members: ASTM A36 - plates, angles and channels, ASTM A992-W shapes.

B. Structural Tubing: ASTM A500, Grade B or ASTM A501.

C. Bolts, Nuts, and Washers: ASTM A325.


E. Welding Materials: AWS D1.1; type required for materials being welded.

F. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 7,000 psi.

G. All stainless steel tube to be 304 or 316 welded stainless steel, ornamental tubing - (1.9 inches O.D. for guardrail and 1.5 inches O.D. for handrail) finished with a #6 polish.

H. All stainless steel rail fittings to be 304 or 316 stainless steel.

I. Shop and Touch-Up Primer: SSPC Paint 15, Type 1, red oxide.

2.3 MANUFACTURED UNITS – NOT USED.

2.4 EQUIPMENT – NOT USED.

2.5 COMPONENTS – NOT USED.

2.6 ACCESSORIES
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A. Anchor bolts, shims, connectors and plates.

2.7 Mixes – Not Used.

2.8 Fabrication

A. Prepare structural component surfaces in accordance with SSPC SP-2.
B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or where high strength bolts are to be installed.

2.9 Source Quality Control and Tests

A. Testing and analysis of components will be performed under provisions of Division 01.

Part 3 - Execution

3.1 Examination

A. Verify that field conditions are acceptable and are ready to receive work.
B. Beginning of installation means erector accepts existing conditions.

3.2 Preparation – Not Used.

3.3 Erection

A. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
B. Field weld components indicated on Drawings.
C. Do not field cut or alter structural members without approval of Architect/Engineer.
D. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.
E. Grout under baseplates in accordance with Manufacturers recommendations.
F. Tolerances
   1. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

3.4 Field Quality Control

A. Field inspection will be performed under provisions of Division 01.

3.5 Adjusting – Not Used.
3.6 Cleaning – Not Used.
3.7 Demonstration – Not Used.
3.8 Protection – Not Used.
3.9 Schedules – Not Used.

End of Section 05 12 00
SECTION 05 21 00
STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Open web steel joists, with bridging, attached seats, and anchors.
   2. Framed roof openings greater than 18 inches.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.
   2. Section 04 21 00 - Clay Unit Masonry.
   3. Section 05 50 00 - Metal Fabrications.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.
B. American Welding Society (AWS) (www.aws.org):
   1. D1.1 - Structural Welding Code - Steel.
C. ASTM International (ASTM) (www.astm.org):
D. Society for Protective Coatings (SSPC) (www.sspc.org) - Painting Manual.
E. Steel Joist Institute (SJI) (www.steeljoist.org) - Standard Specifications and Load Tables for Steel Joists.
G. Steel Joist Institute (SJI) Specifications, load table, and weight tables for steel joists and joist girdles.
H. 2010 Americans with Disabilities Act (ADAAG).

1.3 SUBMITTALS

A. Submit Under Provisions of Division 01.
B. Shop Drawings:
   1. Indicate Standard designations, configuration, sizes, spacing, locations of joists, and joist leg extensions.
   2. Joist coding, bridging, connections and attachments. Coordinate bridging with ductwork. Provide parallel type in lieu of cross bridging as necessary to allow installation of ducts and other systems.
   3. Designer shall verify all loads imposed on trusses by HVAC mechanical units, and ceiling mounted athletic equipment whether indicated on the roof framing plan or not.
   4. Shop Drawings shall bear signed seal of an Engineer licensed in the State of Idaho.
C. Welder’s Certificates: Submit Manufacturer’s certificates under provisions of Division 01 that welders employed on the Work have met AWS verification within the previous 12 months.
1.4 QUALITY ASSURANCE

A. Perform Work in accordance with SJI Standard Specifications, Load Tables, and Weight Tables.
B. Maintain one copy of each document on site.
C. Qualifications:
   1. Fabricator: Company specializing in performing the work of this Section with minimum ten (10) years documented experience.
   2. Erector: Company specializing in performing the work of this Section with minimum three (3) years documented experience.
   3. Design connections not detailed on the Drawings under direct supervision of a Professional Engineering experienced in design of this work and licensed in the State of Idaho.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Division 01 and to SJI requirements.
B. Store and protect products under provisions of Division 01 and SJI requirements.
C. Protect joists from distortion or damage.

1.6 PROJECT/SITE CONDITIONS

A. Verify that field measurements are shown on shop drawings.

1.7 SEQUENCING AND SCHEDULING – NOT USED.

1.8 EXTENDED WARRANTY – NOT USED.

1.9 MAINTENANCE – NOT USED.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Equivalent products by following Manufacturers are acceptable:
B. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Open Web Joists Members: SJI Type LH & K open web joist with special loading.
B. Open Web Truss Members: SJI Type Gable.
C. Joist Girder Members: SJI joist girder.
E. Primer: FS TT-P-636.
F. Structural Steel for Supplementary Framing and Joist Leg Extensions: ASTM A36.
G. Welding Materials: AWS D1.1; type required for materials being welded.

2.3 MANUFACTURED UNITS – NOT USED.
2.4 EQUIPMENT – NOT USED.
2.5 COMPONENTS – NOT USED.
2.6 ACCESSORIES – NOT USED.
2.7 MIXES – NOT USED.

2.8 FABRICATION

A. Provide bottom and top chord extensions as indicated.
B. Frame special sized openings in joist girder chord framing as detailed.
C. Shop prime joists. Do not prime surfaces that will be field welded.

2.9 SOURCE QUALITY CONTROL

A. Testing and analysis of components will be performed under provisions of Division 01.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.
B. Beginning of installation means erector accepts existing conditions.

3.2 PREPARATION – NOT USED.

3.3 ERECTION

A. Erect and bear joists on supports.
B. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment until completion of erection and installation of permanent bridging and bracing.
C. Coordinate placement of anchors in masonry and construction for securing bearing plate and angles.
D. After joist alignment and installation of framing, field weld joist seat to bearing plates or angles.
E. Position and field weld joist chord extensions and wall attachments as detailed.
F. Frame roof openings greater than 12 inches with supplementary framing.
G. Do not permit erection of decking until joists are braced, bridged, and secured.
H. Do not field cut or alter structural members without approval of joist fabricator.
I. After erection, prime welds, abrasions, and surfaces not shop primed.
J. Tolerances:
   1. Maximum Variation from plumb: 1/4 inch.
   2. Maximum Offset from true alignment: 1/4 inch.

3.4 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Division 01.

3.5 ADJUSTING – NOT USED.
3.6 CLEANING – NOT USED.
3.7 DEMONSTRATION – NOT USED.
3.8 PROTECTION – NOT USED.

END OF SECTION 05 21 00
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PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Steel roof deck and accessories
   2. Acoustic deck and accessories in the Gymnasium.
   3. Formed steel cant strips and deck bearing channels.
   4. Framing for openings up to and including 24 inches.
   5. Bearing plates and angles.
   6. Roof and floor sump pans.
   7. Formed steel deck end forms to contain wet concrete.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.
   2. Section 04 21 00 - Clay Unit Masonry.

C. Performance Requirements:
   1. Design metal decking in accordance with SDI Design Manual.
   2. Calculate to structural working stress design and maximum vertical deck deflection of 1/240.
   3. Lateral deflection of diaphragm shall not exceed L/500 of the height of the wall.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.

B. American Iron and Steel Institute (AISI) (www.steel.org):
   1. Specifications for Design of Light Gage Structural Members.

C. American Welding Society (AWS) (www.aws.org):
   2. D1.3 - Structural Welding Code Sheet Steel.

D. ASTM International (ASTM) (www.astm.org):
   2. A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) 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, Solution Hardened, and Bake Hardenable.

E. Society for Protective Coatings (SSPC) (www.sspc.org).

F. Steel Deck Institute (SDI) (www.sdi.org).
   1. Design Manual for Composite Decks, Form Decks, and Roof Decks.

G. Underwriters Laboratory (UL)- Fire Resistance Directory

H. 2010 Americans with Disabilities Act (ADAAG).


1.3 SUBMITTALS

A. Submit under provisions of Division 01.
B. Shop Drawings: Indicate decking plan, support locations, projections, openings and
reinforcement, pertinent details, and accessories. Indicate temporary shoring of decking where required.

C. Product Data: Provide deck profile characteristics and dimensions, structural properties, finishes.

D. Manufacturer's Installation Instructions: Indicate specific installation sequence, special instructions.

E. Welder's Certificate: Certify that welders employed on the work have met AWS verification within the previous twelve months.

F. Certificates: Certify that Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Installer: Company specializing in performing the work of this Section with minimum three (3) years documented experience.
   2. Design deck layout, spans, fastening, joints, and under direct supervision of a Professional Engineer experienced in design of this work and licensed in the State of Idaho.

B. Regulatory Requirements:
   1. Conform to UL Assembly as indicated on drawings

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 01.
B. Store and protect products under provisions of Division 01.
C. Cut plastic wrap to encourage ventilation.
D. Separate sheets and store deck on dry sleepers; slope for positive drainage.

1.6 PROJECT/SITE CONDITIONS - NOT USED

1.7 SEQUENCING AND SCHEDULING – NOT USED.

1.8 EXTENDED WARRANTY – NOT USED.

1.9 MAINTENANCE – NOT USED.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Equivalent products by following Manufacturers are acceptable:

B. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Sheet Steel: ASTM A653, Grade B Structural Quality, primed white where painted, G60 galvanized coating conforming to ASTM A653 in all other locations.
D. Touch-Up Primer: SSPC 15, Type 1 Red oxide type (verify primer is compatible with spray on fireproofing).

2.3 MANUFACTURED UNITS – NOT USED.
2.4 EQUIPMENT – NOT USED.

2.5 COMPONENTS – NOT USED.

2.6 ACCESSORIES

A. Flute Closures: Closed cell foam rubber, one inch thick; profiled to fit tight to the decking.
B. Acoustical Flute Insulation: By acoustical decking Manufacturer and installed using Manufacturer’s approved installation methods.
C. Metal Closure Strips, Cover Plates, Cant Strips, and Related Accessories: 20 gauge galvanized sheet steel; of profile and size required or unless otherwise noted.
D. Fabricate roof/ floor sump pan of 14 gauge sheet steel, flat bottom, sloped sides, recessed 1-1/2 inches below roof/ floor deck surface, bearing flange 3 inches (75 mm) wide, sealed watertight.
E. Weld Washers: Mild steel, uncoated, 3/4 inch outside diameter, 1/8 thick.
F. Fasteners: Galvanized hardened steel, self tapping.
G. Glass fiber type, minimum 1.1 lb./cu.ft. density; profiled to suit decking. Type to conform to Manufacturer’s requirements to achieve specified NRC- 0.80 ratings.

2.7 MIXES – NOT USED.

2.8 FABRICATION

A. Roof and Deck: Sheet steel, configured as follows:
   1. Span Design: Multiple
   3. Nominal Height: See Contract Documents
   4. Formed Sheet Width: 24 to 36 inch
   5. Side Joints: lock or lapped seam, see Contract Documents.

2.9 SOURCE QUALITY CONTROL – NOT USED.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.
B. Beginning of installation means installer accepts existing conditions.

3.2 PREPARATION – NOT USED.

3.3 INSTALLATION

A. Erect metal decking in accordance with SDI Design Manual and Manufacturer’s instructions.
B. Bear decking on steel supports with 1-1/2 inch minimum bearing. Align and level.
C. Fasten deck to steel support members at ends and intermediate supports with fusion welds through weld washers, or mechanical fasteners as shown on roof framing plans.
D. Weld in accordance with AWS D1.1.
E. Mechanically clinch or fasten male/female side laps at spacings shown on plans.
F. Reinforce steel deck openings from 6 to 30 inches in size. See Contract Documents. Place angles perpendicular to flutes; extend minimum three flutes beyond each side of opening and fusion weld or mechanically attach to deck at each flute unless otherwise noted on drawings.
G. Install 6 inch minimum wide sheet steel cover plates, of same thickness as decking, where
deck changes direction. Fusion weld or Mechanically attach 6 inches O.C. maximum.

H. Install sheet steel closures and angle flashings to close openings between deck and walls, columns, and openings.

I. Install single row of foam flute closures above walls and partitions perpendicular to deck flutes.

J. Install insulation in deck flutes with light spray adhesive.

K. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up prime paint.

L. Place metal cant strips in position and fusion weld.

M. Install wet concrete stops at floor edge upturned to top surface of slab to contain wet concrete. Provide stops of sufficient strength to remain stationary under wet concrete without distortion.

3.4 FIELD QUALITY CONTROL – NOT USED.
3.5 ADJUSTING – NOT USED.
3.6 CLEANING – NOT USED.
3.7 PROTECTION – NOT USED.

3.8 SCHEDULES

A. Acoustical Deck at Gymnasium – See Structural Drawings.
B. Steel Roof Deck at all other locations – See Structural Drawings.

END OF SECTION 05 30 00
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Load bearing formed steel stud exterior wall and interior wall, framing.
   2. Steel soffit framing.
   3. Steel floor and ceiling joist framing.
   4. Steel stud truss framing.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.

   1. Specification for the Design of Cold-Formed Steel Structural Members.

C. American Society of Civil Engineers (ASCE) (www.asce.org).


E. ASTM International (ASTM) (www.astm.org):
   2. A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   3. A1003 - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
   4. C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
   6. C1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.

F. Society for Protective Coatings (SSPC) (www.sspc.org)

G. Steel Framing Alliance (SFA) (www.steelframing.org)

H. Metal Framing Manufacturers Association (MFMA) (www.metalframingmfg.org)
   1. Guidelines for the Use of Metal Frame.

I. 2010 Americans with Disabilities Act (ADAAG).


1.3 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading,
welds, type and location of fasteners, and accessories or items required of related work.
C. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations and fasteners.
D. Manufacturer's Installation Instructions: Indicate special procedures.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.
   2. Installer: Company specializing in performing the work of this section with minimum three (3) years documented experience.
B. Calculate structural properties of framing members in accordance with AWCI, MFMA and AWS D1.3 requirements.

1.5 DELIVERY, STORAGE AND HANDLING – NOT USED.

1.6 PROJECT/SITE CONDITIONS

A. Verify that field measurements are as indicated.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate work under provisions of Division 01.
B. Coordinate with the placement of components within the stud framing system, as specified in Division 01.

1.8 EXTENDED WARRANTY – NOT USED.
1.9 MAINTENANCE – NOT USED.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Marino Ware. (www.marinoware.com).
B. Clark Dietrich Industries. (www.clarkdietrich.com).
C. SCAFCO. (www.scafco.com).
D. Superior Metal Framing Systems. (www.superiormetalframing.com).
E. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Studs: ASTM C955, formed to channel shape, solid or punched web; 1-5/8 inch face, 1/2 inch return and 6 inch or 3.5 inch depth, per drawings.
B. Joists, Purlins: ASTM A653 Grade sheet steel, formed to channel shape, solid web; 1-5/8 inch face; gauge, thickness and depth per drawings.
C. Track: Formed steel; channel shaped; same width and gage as studs, tight fit; solid web.

2.3 MANUFACTURED UNITS – NOT USED.
2.4 EQUIPMENT – NOT USED.
2.5 COMPONENTS – NOT USED.
2.6 ACCESSORIES
A. Bracing, Furring, Bridging: Sheet steel formed to channel shape. Same thickness as studs or joists unless indicated otherwise on drawings.

B. Plates, Gussets, Clips: Formed sheet steel, thickness 20 gauge minimum, unless indicated otherwise on drawings.

C. Touch-Up Primer for Galvanized surfaces: SSPC Paint 20, Type II organic, zinc rich.

D. Fasteners:
   2. Anchorage Devices: Drilled expansion bolts, and drilled epoxy anchors.
   3. Welding: In conformance with AWS D1.1 and AWS D1.3.

2.7 MIXES – NOT USED

2.8 FABRICATION

A. Factory Finishing:
   1. Studs, Tracks, Headers, Joists, Bracing, Furring, and Bridging: Galvanize to G90 coating class.
   2. Plates, Gussets, Clips: ASTM A123, hot dip galvanized to 1.25 oz/sq ft.

2.9 SOURCE QUALITY CONTROL – NOT USED.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Division 01.
B. Verify that substrate surfaces and building framing components are ready to receive work.
C. Verify that rough-in utilities are in proper location.

3.2 PREPARATION – NOT USED.

3.3 ERECTION

A. The erector of the steel framing is to insulate all concealed spaces as the work progresses. This includes headers and concealed stud spaces. Insulation materials as specified in Section 07 21 16 – Blanket Insulation.

B. Studs and Tracks:
   1. Install components in accordance with Manufacturer's instructions.
   2. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches O.C. Coordinate installation of sealant with floor and ceiling tracks.
   3. Place studs at 24 inches O.C. unless indicated otherwise on drawings; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using fastener method.
   4. Construct corners using minimum three studs. Double stud all wall openings including, door and window jambs.
   5. Erect load bearing studs in one piece full length. Splicing of studs is not permitted. Punched webs not allowed within 12 inches of ends.
   6. Erect load bearing studs, brace, and reinforce to develop full strength, to achieve design requirements. Install 1-1/2 inch cold rolled steel channels at 48 inches O.C. horizontally through punchouts in studs. Attach with self drilling screws and clips.
7. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection. All inaccessible spaces shall be insulated.
8. Install intermediate studs above and below openings to align with wall stud spacing.
9. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.
10. Attach cross studs to studs for attachment of fixtures anchored to walls including but not limited to door stops and wall mounted brackets.
11. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.
12. Touch-up field welds and damaged primed surfaces with primer.
13. Complete framing ready to receive gypsum or plywood sheathing.

C. Joists:
1. Install framing components in accordance with Manufacturer’s instructions.
3. Place joists per drawings. Connect joists to supports using fastener method.
4. Set joists parallel and level, with lateral bracing and bridging.
5. Locate joist end bearing directly over load bearing studs or provide load distributing member to top of stud track.
6. Provide web stiffeners at reaction points.
7. Touch-up field welds and damaged primed surfaces with primer.
8. Complete framing ready to receive gypsum or plywood sheathing.

D. Tolerances:
1. Maximum Variation from True Position: 1/8 inch.
2. Maximum Variation of any Member from Plane: 1/8 inch.

3.4 FIELD QUALITY CONTROL – NOT USED.
3.5 ADJUSTING – NOT USED.
3.6 CLEANING – NOT USED.
3.7 DEMONSTRATION – NOT USED.
3.8 PROTECTION – NOT USED.
3.9 SCHEDULE – NOT USED.

END OF SECTION 05 40 00
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Shop fabricated ferrous metal items, prime painted.
   2. Shop fabricated aluminum items.
   3. Miscellaneous fasteners, including, but not limited to bolts, nuts and washers.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.
   2. Section 03 30 00 - Cast In Place Concrete.
   3. Section 04 21 00 - Clay Unit Masonry.
   4. Section 06 40 23 - Architectural Woodwork.
   5. Section 08 71 00 - Door Hardware.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.

B. American Architectural Manufacturers Association (AAMA) (www.aamanet.org):
   1. 611 - Voluntary Specification for Anodized Architectural Aluminum.

C. American Welding Society (AWS):
   4. D1.6 - Structural Welding Code - Stainless Steel.

D. ASTM International (ASTM):
12. A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
15. A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
18. A1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardened.

E. National Association of Architectural Metal Manufacturers (NAAMM):
   1. AMP 503 - Finishes for Stainless Steel.
   2. MBG 531 - Metal Bar Grating Manual.

F. Society for Protective Coatings (SSPC) - Painting Manual.

G. 2010 Americans with Disabilities Act (ADAAG).


1.3 SUBMITTALS

A. Submit under provisions of Division 01.
B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
C. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.

1.4 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
B. Perform work in accordance with AISC-Specification for Exposed Structural Steel.
C. Qualifications:
   1. Manufacturer's Mill Certificate: Submit under provisions of Division 01 certifying that products meet or exceed specified requirements.
   2. Welders' Certificates: Submit under provisions of Division 01, certifying welders employed on the Work, and verifying AWS qualification within the previous 12 months.

1.5 DELIVERY, STORAGE, AND HANDLING – NOT USED.
1.6 PROJECT/SITE CONDITIONS

A. Field Measurements:
   1. Verify that field measurements are as indicated on shop drawings.

1.7 SEQUENCING AND SCHEDULING – NOT USED.
1.8 EXTENDED WARRANTY – NOT USED.
1.9 MAINTENANCE – NOT USED.

PART 2 - PRODUCTS

2.1 MANUFACTURERS – NOT USED.

2.2 MATERIALS

A. Steel Sections: ASTM A36 – plates, angles and channels; ASTM A992 – W-Shapes.
B. Steel Tubing: ASTM A500, Grade B or ASTM A501.
C. Plates: ASTM A283.
D. Anchor Bolts: ASTM A325.
F. Welding Materials: AWS D1.1; type required for materials being welded.
G. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide.
H. Pipe: ASTM A53, Grade ‘B’ or schedule 40.
I. Pipe Rail and Posts: 1/2 inch diameter pipe – welded and ground smooth joints.
J. Fittings: Elbows, T-shapes, brackets, escutcheons in cast or machined steel.
K. Mounting: Brackets and flanges for mounting to floor or wall construction or to steel spanning members.
L. Exposed Fasteners: Screws or bolts; consistent with design of railing.
M. Grating: Castor machined open steel grating in type, size and opening profiles indicated.
N. Extruded Aluminum Bars, Shapes and Aluminum Structural Angles: sizes and configurations as indicated on drawings.
   1. Bars and shapes from aluminum alloy 6063-T52.
O. Plate Aluminum: 3/16 inch aluminum checker plate.

2.3 MANUFACTURED UNITS – NOT USED.
2.4 EQUIPMENT – NOT USED.

PART 2 - PRODUCTS

2.5 COMPONENTS

A. Welded Steel wire mesh as manufactured by McNicols Co. (www.mcnicols.com) or equal.
B. Mesh Panels: Factory cut to sizes indicated in wire gauge and mesh pattern spacing as indicated. Square welded – Weldmesh balanced and trimmed, plain steel, 2 by 2 inch wire spacing in 6 gauge wire.

2.6 ACCESSORIES – NOT USED.
2.7 MIXES – NOT USED.

2.8 FABRICATION

A. Fit and shop assemble in largest practical sections, for delivery to site.
B. Fabricate items with joints tightly fitted and secured.
C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints
butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

F. Shop Finishing:
   1. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
   2. Do not prime surfaces in direct contact with concrete or where field welding is required.
   3. Prime paint items with one coat. Apply two coats to surfaces which are inaccessible after assembly or erection.

G. Fabrication Tolerances:
   1. Squareness: 1/8 inch maximum difference in diagonal measurements.
   5. Maximum Deviation From Plane: 1/16 inch in 48 inches.

2.9 SOURCE QUALITY CONTROL – NOT USED.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.
B. Beginning of installation means erector accepts existing conditions.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.
B. Supply items required to be cast into concrete or embedded in masonry with setting templates, to appropriate sections.

3.3 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.
B. Allow 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. Obtain Architect approval prior to site cutting or making adjustments not scheduled.
F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

G. Erection Tolerances:
   1. Maximum Variation From Plumb: 1/4 inch per story.

3.4 FIELD QUALITY CONTROL – NOT USED.

3.5 ADJUSTING – NOT USED.

3.6 LEANING – NOT USED.

3.7 DEMONSTRATION – NOT USED.
3.8 PROTECTION – NOT USED.

3.9 SCHEDULES

A. The Schedule is a partial list of principal items only. Refer to Drawings for items not specifically scheduled.
   1. Countertop Knee Braces (placed at 4 feet o.c. maximum).
   2. Joist Hangers: As detailed.
   3. Columns, plates and beam saddles: As detailed.
   5. Steel Bollards, eye bolts and traffic control chains where occurs.
   7. Miscellaneous steel plate and steel angle support brackets.
   8. Fabricated steel tube frames.
   9. Tube Steel Downspouts, straps, and fasteners.

END OF SECTION 05 50 00
PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Shop fabricated metal components.
   2. Ladders.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.

B. American Architectural Manufacturers Association (AAMA):
   1. 611 - Voluntary Specification for Anodized Architectural Aluminum.

C. American Welding Society (AWS):
   1. D1.1/D1.1M - Structural Welding Code - Steel.

D. ASTM International (ASTM):
   9. A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  10. A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
  12. A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.


E. National Association of Architectural Metal Manufacturers (NAAMM):
   1. MBG 531 - Metal Bar Grating Manual.

F. Society for Protective Coatings (SSPC) - Painting Manual.

G. 2010 Americans with Disabilities Act (ADAAG).


1.3 SYSTEM DESCRIPTION

A. Minimum Design Loads:
   1. Pedestrian loading:
      a. Uniform load of 100 PSF.
      b. Concentrated load of 300 pounds.
      c. Maximum deflection under loading: L/240.
      d. Additional concentrated load of 300 pounds every 10 feet for lengths exceeding 10 feet.
   2. Concentrated and uniform loads do not need to be applied simultaneously.
   3. Perform design under direct supervision of Professional Structural Engineer licensed in Idaho, with minimum two (2) years documented experience in work of this Section.

B. The ladder shall meet the requirements of OSHA and ANSI A14.3.

1.4 SUBMITTALS

A. Submittals for Review:
   1. Shop Drawings: Show dimensions, metal thicknesses, finishes, joints, attachments, and relationship of work to adjacent construction.

B. Quality Control Submittals:
   1. Certificate of Compliance from Professional Structural Engineer, licensed in Idaho, performing system design.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Minimum five (5) years documented experience in work of this Section.

B. Mockup:
   1. Provide mockup.
   2. Locate as indicated on Contract Documents.
   3. Approved mockup may remain as part of the Work.

1.6 DELIVERY, STORAGE AND HANDLING

A. Store steel above ground on platforms, skids, or other supports; separate with wooden
PART 2 PRODUCTS

2.1 MANUFACTURERS – NOT USED

2.2 MATERIALS – STEEL

A. Shapes: ASTM A36.
B. Plate: ASTM A283.
C. Checkered Plate: ASTM A1011, diamond pattern.
D. Sheet: ASTM A1008.
E. Pipe: ASTM A501.
F. Tube: ASTM A500.
G. Bars: ASTM A108.

2.3 MATERIALS - CAST IRON

A. Cast Iron: ASTM A48, Class 30, or ASTM A47.

2.4 MATERIALS – ALUMINUM

A. Extrusions: ASTM B221, 6063-T5 alloy and temper.
B. Sheet: ASTM B209, alloy and temper best suited to application.

2.5 MATERIALS - BAR GRATINGS

A. Formed Steel Sheet for Welding: ASTM A1011.
B. Steel Rod for Cross Bars: ASTM A510.

2.6 ACCESSORIES

A. Exposed Screws: Same material as metal being fastened; Phillips flat head, countersunk, unless noted otherwise.
B. Bolts: ASTM A307, hexagonal head type.
C. Primer Paint: SSPC Paint 15, Type 1, red oxide.
D. Anchoring Cement: Two component epoxy type.

2.7 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.
B. Fabricate items with joints tightly fitted and secured.
C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts, unobtrusively located, consistent with design of component except where specifically noted otherwise.
E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
F. Conceal fastenings where possible.

separators.
B. Protect steel from corrosion.
C. Prevent damage to prime coat and galvanized coatings.
G. Welding to conform to AWS D1.1, D1.2, and D1.6.
   1. Use welds for permanent connections where possible. Grind exposed welds smooth.
   2. Tack welds prohibited on exposed surfaces.

2.8 FINISHES

A. Exterior Ferrous Metal: Galvanized; ASTM A123 to 2.0 ounces per square foot.
B. Interior Ferrous Metal:
   1. Shop painted except steel to be encased in concrete and surfaces to be welded.
   2. Surface preparation: SSPC SP2 - Hand Tool Cleaning or SP3 - Power Tool Cleaning.
   3. Application: One coat; follow coating Manufacturer's instructions.
C. Aluminum: Mill finish.
D. Aluminum: AAMA 2603 thermosetting modified acrylic enamel coating, color to be selected from Manufacturer's full color range.
E. Stainless Steel: NAAMM AMP 503; No. 4 satin finish.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install items in accordance with approved Shop Drawings.
B. Install components plumb, level, and rigid.
C. Welding: AWS D1.1, D1.2, and D1.6. Grind and fill exposed welds; finish smooth and flush.
D. Install sleeved components with anchoring cement.
E. Prevent contact of aluminum and dissimilar metals by use of zinc rich paint, bituminous coating, or non-absorptive gaskets.

3.2 ADJUSTING

A. Clean and touch up damaged primer paint with same product as applied in shop.
B. Clean and touch up galvanized coatings at welded and abraded surfaces in accordance with ASTM A780.

3.3 SCHEDULE

A. Ladders:
   1. Side rails: Continuous steel flat bars, eased edges, spaced per Contract Documents.
   3. Fit rungs in centerline of side rails and plug weld on outer rail face.
   4. Support ladders at top, bottom, and at intermediate points spaced per Contract Documents with steel brackets, welded or bolted to supports.
B. Ladder Safety Cages:
   1. Primary hoops: 1/2 by 2 inch steel bars at top, bottom, and intermediate hoops spaced per Contract Documents.
   3. Vertical bars: 1/2 by 2 inch steel bars secured to each hoop, spaced per Contract Documents.
C. Bar Grating:
   1. NAAMM MBG 531, welded type.
   2. Fabricate supporting frame for opening size and configuration.
5. Top surface: Non slip.

END OF SECTION 05 51 33
### DIVISION 06 – WOOD, PLASTICS AND COMPOSITES

| Section 06 10 00 | Rough Carpentry | .......................................................... | 9 |
| Section 06 16 43 | Gypsum Sheathing | ......................................................................... | 3 |
| Section 06 20 00 | Finish Carpentry | ......................................................................... | 4 |
| Section 06 40 23 | Interior Architectural Woodwork | ......................................................................... | 8 |
SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Framing with dimension lumber.
   2. Framing with timber.
   3. Framing with engineered wood products.
   4. Rooftop equipment bases and support curbs.
   5. Wood blocking, cants, and nailers.
   6. Wood furring and grounds.
   7. Wood sleepers.
   8. Roof, floor and wall sheathing.
   9. Structural tongue and groove decking

B. Related Sections:
   1. Division 01 - Administrative, procedural, and temporary work requirements.
   2. Division 05 - Metals.
   3. Division 07 - Thermal and Moisture Protection.

1.3 DEFINITIONS

A. Exposed Framing: Framing not concealed by other construction.
B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
C. Lumber grading agencies, and the abbreviations used to reference them, include the following:
   2. NLGA: National Lumber Grades Authority.
   3. RIS: Redwood Inspection Service.
   5. WCLIB: West Coast Lumber Inspection Bureau.

1.4 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.
C. ASTM International (ASTM):
Steel.

D. Engineered Wood Association (APA) PRP-108 - Performance Standards and Qualification Policy for Structural-Use Panels.
E. Forest Stewardship Council (FSC) STD-40-004 - Chain of Custody Standard.
G. Northeastern Lumber Manufacturers Association (NELMA) - Standard Grading Rules for Northeastern Lumber.
H. National Lumber Grades Authority (NLGA) - Standard Grading Rules for Canadian Lumber.
I. Redwood Inspection Service (RIS) - Standard Specifications for Grades of California Redwood Lumber.
J. Southern Pine Inspection Bureau (SPIB) - Standard Grading Rules for Southern Pine Lumber.
K. West Coast Lumber Inspection Bureau (WCLIB) - Standard Grading Rules for West Coast Lumber.
L. Western Wood Products Association (WWPA) G-5 - Western Lumber Grading Rules.

1.5 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment Manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
   3. Include copies of warranties from chemical treatment Manufacturers for each type of treatment.
B. Fastener Patterns: Full-size templates for fasteners in exposed framing.
C. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
D. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
   1. Wood-preservative-treated wood.
   2. Engineered wood products.
5. Expansion anchors.
6. Metal framing anchors.

1.6 QUALITY ASSURANCE

A. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single Manufacturer.
B. Qualifications:
   1. Plywood grading agency: Certified by APA.
   2. Lumber grading agency: Certified by ALSC.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
   3. Provide dressed lumber, S4S, unless otherwise indicated.
B. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
   1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by Manufacturer that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
C. Plywood:
   1. Floor Sheathing – as indicated on Contract Documents.
   4. Framing – as indicated on Contract Documents.
D. Plywood Panels:
   1. 3/4 inch MDO (Medium Density Overlay) plywood with exterior glue.
   2. FSC Certified.
E. Sheet Products:
   1. Type: APA Plywood and Oriented Strand Board.
   4. Exposure:
      b. Interior applications: Interior.
2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA C2, except that lumber that is not in contact with the ground, masonry or concrete and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
   2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application; Treat items indicated on Drawings and the following:
   1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
   3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
   4. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Comply with performance requirements in AWPA C27 (plywood).
   1. Use Exterior type for exterior locations and where indicated.
   2. Use Interior Type A, High Temperature (HT) for enclosed roof framing and where indicated.
   3. Use Interior Type A, unless otherwise indicated.

B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

C. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

D. Application: Treat items indicated on Drawings, and the following:
   1. Plywood panels where indicated as fire retardant treated.

2.4 DIMENSION LUMBER FRAMING

A. Maximum Moisture Content: 19 percent.

B. Interior Partitions: As complies with Documents. See structural.

C. Joists, Rafters, and Other Framing Not Listed Above: As complies with Documents. See structural.

D. Tongue & Groove Structural Wood Decking:
   1. 3 by 6 tongue and groove decking minimum of w 3/16 inch thick of Douglas Fir/Larch material.
   2. E=1800000 psi, Fb=2585 psi, Fv=165 psi.
   3. Place in Random Length Continuous layout unless specified otherwise.
   4. Attach/Install per structural drawings and Manufacturer’s requirements.
   5. Material to be Decorative Grade unless specified otherwise.

2.5 ENGINEERED WOOD PRODUCTS
A. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D5456 and manufactured with an exterior-type adhesive complying with ASTM D2559 and containing no urea formaldehyde.

1. Manufacturers: Subject to compliance with requirements, Manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   e. Roseburg Forest Products Co. (www.roseburg.com).
   g. Substitutions: Under provisions of Division 01.

2. Extreme Fiber Stress in Bending, Edgewise: Per structural requirements.

3. Modulus of Elasticity, Edgewise: Per structural requirements.

B. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D5456 and manufactured with an exterior-type adhesive complying with ASTM D2559 and containing no urea formaldehyde.

1. Manufacturers: Subject to compliance with requirements, Manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   b. Substitutions: Under provisions of Division 01.

2. Extreme Fiber Stress in Bending, Edgewise: Per structural requirements.

3. Modulus of Elasticity, Edgewise: Per structural requirements.

C. Wood I-Joists: Prefabricated units, I-shaped in cross section, made with solid or structural composite lumber flanges and wood-based structural panel webs, let into and bonded to flanges. Provide units complying with material requirements of and with structural capacities established and monitored according to ASTM D5055.

1. Manufacturers: Subject to compliance with requirements, Manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   d. International Beams Inc. (www.internationalbeams.com).
   g. Nascor International. (www.nascorinternational.com).
   i. Roseburg Forest Products Co. (www.roseburg.com).
   m. Substitutions: Under provisions of Division 01.

2. Provide I-joists manufactured without urea formaldehyde.

3. Structural Properties: Provide units with depths and design values not less than those indicated.

4. Provide units complying with APA PRI-400, factory marked with APA trademark indicating nominal joist depth, joist class, span ratings, mill identification, and compliance with APA standard.
D. Rim Boards: Product designed to be used as a load-bearing member and to brace wood I-joists at bearing ends, complying with research/evaluation report for I-joists.
   1. Manufacturer: Provide products by same Manufacturer as I-joists.
   2. Provide performance-rated product complying with APA PRR-401, factory marked with APA trademark indicating thickness, grade, and compliance with APA standard.

2.6 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
   1. Blocking.
   2. Nailers.
   3. Rooftop equipment bases and support curbs.
   5. Furring.
   8. Skylight framing.

B. For items of dimension lumber size, provide grade lumber with 19 percent maximum moisture content of any species.

C. For concealed boards, provide lumber with 19 percent maximum moisture content.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.7 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels:
   1. DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.
   2. Paint to match adjacent wall surfaces.

2.8 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
   1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153.

B. Nails, Brads, and Staples: ASTM F1667.


D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A307, Grade A; with ASTM A563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E488 conducted by a qualified independent testing and inspecting agency.
2. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

2.9 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, Manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Cleveland Steel Specialty Co. (www.clevelandsteel.com).
   5. USP Structural Connectors. (www.uspconnectors.com).

B. Allowable Design Loads: Per structural requirements. Provide products with allowable design loads, as published by Manufacturer that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.10 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from Manufacturer's standard widths to suit width of sill members indicated.

B. Adhesives for Gluing: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive Manufacturer.
   1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Framing with Engineered Wood Products: Install engineered wood products to comply with Manufacturer's written instructions.

D. Metal Framing Anchors: Install metal framing to comply with Manufacturer's written instructions.

E. Do not splice structural members between supports, unless otherwise indicated.

F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
   1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
   2. Fire block concealed spaces of wood-framed walls and partitions at each floor level,
at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal-thickness.

3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.

4. Fire block concealed spaces behind combustible cornices as required.

H. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

I. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
   1. Use inorganic boron for items that are continuously protected from liquid water.
   2. Use copper naphthenate for items not continuously protected from liquid water.

J. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. NES NER-272 for power-driven fasteners.
   5. Table 2306.1, "Fastening Schedule," in SBCCI's Standard Building Code.
   7. Table 602.3(1), "Fastener Schedule for Structural Members," and Table 602.3(2), "Alternate Attachments," in ICC's International One- and Two-Family Dwelling Code.

K. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

L. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
   1. Comply with approved fastener patterns where applicable. Before fastening, mark fastener locations, using a template.
   2. Use finishing nails, unless otherwise indicated. Do not countersink nail heads.

3.2 WOOD GROUND, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as
required for tolerance of finish work.

B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal-size furring horizontally and vertically at 24 inches O.C.

C. Furring to Receive Gypsum Board or Plaster Lath: Install 1-by-2-inch nominal-size furring vertically at 16 inches O.C.

3.4 WALL AND PARTITION FRAMING INSTALLATION

A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs. Fasten plates to supporting construction, unless otherwise indicated.

B. Construct corners and intersections with three or more studs unless noted otherwise.

C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs per structural requirements.

3.5 PROTECTION

A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Install air/weather resistant barrier to protect wall sheathing and other rough carpentry components from weather.

END OF SECTION 06 10 00
PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes
   1. Exterior fiberglass-mat faced moisture and mold resistant gypsum wall sheathing.

B. Related Sections
   1. Division 01: Administrative, procedural, and temporary work requirements.
   2. Division 04: Masonry
   3. Division 05: Metals
   4. Division 07: Thermal and Moisture Protection

1.2 REFERENCES.

A. ASTM International (ASTM):
   3. C1002 Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.


1.3 SUBMITTALS

A. Submittals for Review:
   1. Product Data: Illustrate panel product types, thicknesses, and installation instructions for each product specified.

1.4 WARRANTY

A. Provide products that offer twelve months of coverage against in-place exposure damage (delamination, deterioration and decay).

B. Manufacturer’s Warranty:
   1. Five years against manufacturing defects.
   2. Ten years against manufacturing defects when used as a substrate in architecturally specified EIFS.
PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Design Basis: Contract Documents are based on products by:
   2. Product: As indicated.

B. Equivalent products by following manufacturers are acceptable:
   1. National Gypsum Co. (www.nationalgypsum.com)
   2. Temple Inland. (www.greenglassinfo.com)

C. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Fiberglass-Mat Faced Gypsum Sheathing: ASTM C1177
   1. Thickness: 5/8 inch.
   2. Width: 4 feet.
   3. Length: 8 feet, 10 feet.
   4. Weight: 1.9 lb/sq. ft.
   5. Edges: Square.
   6. Surfacing: Fiberglass mat on face, back, and long edges.
   7. Racking Strength (Ultimate, not design value) (ASTM E72): Not less than 540 pounds per square foot, dry.
   11. R-Value (ASTM C518): 0.56.

B. Acceptable Products:
   1. 5/8 inch DensGlass Fireguard Sheathing, Georgia-Pacific Gypsum.

2.3 ACCESSORIES

A. Fasteners: ASTM C1002, Type S screws, hot-dip galvanized or fluoropolymer coated steel, minimum 5/8 inch penetration into framing.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verification of conditions:
   1. Inspection: Verify that project conditions and substrates are acceptable, to the installer, to begin installation of work of this section.

3.2 INSTALLATION

A. Install in accordance with GA-253, ASTM C1280 and manufacturer's instructions.
B. Accurately cut panels to fit around openings and projections.
C. Apply panels perpendicular to framing with ends occurring over supports. Stagger end joints in adjacent rows.
D. Fasten panels to framing at maximum 12 inches on center. Place fasteners minimum 3/8 inch from edges of panels; drive heads flush with surface. Stagger fasteners at abutting edges.

3.3 PROTECTION

A. Protect gypsum board installations from damage and deterioration until date of Substantial Completion.

END OF SECTION 06 16 43
SECTION 06 20 00
FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
1. Providing and installing finish carpentry items, other than Architectural Woodwork.
2. Hardware and attachment accessories.

B. Related Sections:
1. Division 01: Administrative, procedural, and temporary work requirements.
2. Section 06 10 00 – Rough Carpentry.
3. Section 07 62 00 – Sheet Metal Flashing and Trim.
4. Section 07 92 00 – Joint Sealants.
5. Section 09 91 00 – Painting.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.


D. ASTM International (ASTM) (www.astm.org)
   2. A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.


J. West Coast Lumber Inspection Bureau (WCLIB) (www.wclib.org) - Standard Grading Rules for West Coast Lumber.

K. Western Red Cedar Lumber Association (WRCLA) (www.wcrla.org) - Grading Rules.

L. Western Wood Products Association (WWPA) (www.wwpa.org) G-5 - Western Lumber Grading Rules.

M. Forest Stewardship Council (FSC) (www.fscus.org) STD-40-004 - Chain of Custody Standard.

1.3 SUBMITTALS
A. Provide samples under provisions of Division 01.
B. Construct field sample, 48 inches long, illustrating edge trim, joint trim and applied finish.

1.4 QUALITY ASSURANCE
A. Fabricate and install work in accordance with NAAWS Custom Grade quality.
B. Conform to 2015 IBC /ASTM E84 for flame and smoke ratings of finished work.
C. Minimum five (5) years documented experience in work of this Section.
D. Certified under NAAWS Certified Compliance Program (CCP).

1.5 DELIVERY, STORAGE, AND HANDLING
A. Deliver products to site under provisions of Division 01.
B. Store and protect products under provisions of Division 01.

1.6 PROJECT/SITE CONDITIONS
A. Verify that field measurements are as indicated on drawings.

1.7 SEQUENCING AND SCHEDULING
A. Coordinate work under provisions of Division 01.
B. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.
C. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
   1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

1.8 EXTENDED WARRANTY – NOT USED.
1.9 MAINTENANCE – NOT USED.

PART 2 - PRODUCTS

2.1 MANUFACTURERS – NOT USED.

2.2 MATERIALS
A. Hardwood Lumber: NAAWS Premium Grade; White Pine or Red oak species, moisture content of 6 percent; with vertical grain.
B. Paint Grade Lumber: Finger joint pine, sanded, in dimensions as indicated on drawings, for concealed backing.
C. Dimensional Lumber: 2 and better, kiln dried, and in sizes indicated.

2.3 MANUFACTURED UNITS – NOT USED.
2.4 EQUIPMENT – NOT USED.
2.5 COMPONENTS – NOT USED.
2.6 ACCESSORIES
A. Nails: Size and type to suit application.
B. Blind Fasteners and Screws: Size and type to suit application; galvanized finish.
C. Screws and nails per referenced standards.
D. Screws exposed to view to be machine head stainless steel type and size as indicated on drawings.
E. Thru-bolts and anchor bolts to be cadmium plated steel of type and size as indicated on drawings.
G. Wood Filler: Solvent base.

2.7 MIXES – NOT USED.

2.8 FABRICATION
A. Fabricate all trim to shapes and profiles indicated on drawings. Provide sufficient quantity of lengths to account for field waste of shop finished trim cut and discarded to ensure installed trim meets specified NAAWS standards.
B. Shop Finishing: Comply with NAAWS standards section 5 for factory finish.
   1. Apply penetrating alkyd oil wiping type stain color selected by Architect (unless natural – unstained finish is specified).
   2. Apply two part catalyzed conversion varnish in multiple coats to achieve desired film build and sheen, provide satin sheen to match approved samples.

2.9 SOURCE QUALITY CONTROL – NOT USED.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Verify that surfaces and openings are ready to receive work.
B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
C. Proceed with installation only after unsatisfactory conditions have been corrected.
D. Beginning of installation means acceptance of substrate.

3.2 PREPARATION
A. Job site sort and store material to condition trim materials to meet/match requirements for 48 hours prior to installation.
B. Clean substrates of projections and substances detrimental to application.
C. Comply with requirements in Division 09 – Finishes.

3.3 INSTALLATION
A. Set and secure materials and components in place, plumb and level.
B. Install components and trim with nails, screws and bolts with blind fasteners at 16 inch on center maximum.
C. Apply wood filler in exposed fastener indentations. Sand work smooth – match/blend with shop finish.
D. Window Sills: Use one full length piece only.
E. Tolerances
   1. Maximum Variation from True Position: 1/16 inch.

F. Do not use materials that are unsound, warped, damaged, improperly finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.

G. Do not use manufactured units with defective surfaces, sizes, or patterns.

H. Install finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.

I. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by Manufacturer.

J. Coordinate finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate finish carpentry.

K. Standing and Running trim:
   1. Install with bark texture side exposed to weather.
   2. Install trim with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 48 inches long except where necessary.
      a. Stagger end joints in adjacent and related members.
   3. Fit exterior joints to exclude water. Produce tight-fitting joints with full-surface contact throughout length of joint.

3.4 FIELD QUALITY CONTROL – NOT USED.

3.5 ADJUSTING

A. Replace finish carpentry that is damaged or does not comply with requirements.

B. Finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

C. Adjust joinery for uniform appearance.

3.6 CLEANING

A. Clean finish carpentry on exposed and semi-exposed surfaces.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

3.7 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
   1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 06 20 00
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
1. Special fabricated cabinet units
2. Plastic laminate countertops.
3. Cabinet hardware
4. Shop finishing.
5. Pre-finished surfaces
6. Metal knee brace

B. Related Sections
1. Division 01 - Administrative, procedural, and temporary work requirements.
2. Division 05 - Metals.
3. Division 06 - Wood, Plastics, and Composites
4. Division 07 - Joint Sealants
5. Division 09 - Finishes.
6. Division 22 - Plumbing.
7. Division 26 - Electrical service fixtures.

C. Definitions
1. Identification of casework components and related products by surface visibility.
2. Open Interiors: Any open storage unit without solid door or drawer fronts.
3. Closed Interiors: Any closed storage unit behind solid door or drawer front.
4. Exposed Ends: Any storage unit exterior side surface that is visible after installation.
5. Other Exposed Surfaces: Faces of doors and drawers when closed, and tops of cabinets less than 72 inches above furnished floor.
6. Semi-Exposed Surfaces: Interior surfaces which are visible, bottoms of wall cabinets and tops of cabinets 72 inches or more above finished floor.
7. Concealed Surfaces: Any surface not visible after installation.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.


C. Association of Electrical and Medical Imaging Equipment Manufacturers (NEMA) (www.nema.org) LD-3 - High Pressure Decorative Laminates.

D. Forest Stewardship Council (FSC) (www.fscus.org) STD-40-004 - Chain of Custody Standard.

1. A135.4 - Basic Hardboard
2. A208.1 - Mat Formed Wood Particle board.


2. A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
3. A1011 - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon,
Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.


   1. A156.9 - Cabinet Hardware


K. Construction and Industrial Plywood Standards. (www.iccsafe.org) PS 1


1.3 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location, and schedule of finishes.

C. Samples: Manufacturer’s color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated:
   1. Shop-applied transparent finishes
   2. Shop-applied opaque finishes
   3. Plastic laminates
   4. Thermoset decorative overlays
   5. Chemical resistant laminates
   6. Solid surfacing materials

1.4 QUALITY ASSURANCE

A. Perform work in accordance with NAAWS Custom Grade standards, as a minimum requirement:
   1. Manufacturer: Minimum five (5) years documented experience in work of this Section.
   2. Installer: Minimum five (5) years documented experience in work of this Section.
   3. Single Source Responsibility: A single manufacturer shall provide and install the Work of described in this section.

B. Mock-Up:
   1. Provide mockup of full size base cabinet and upper cabinet under provisions of Division 01.
   2. Provide units with specified countertop; with hardware installed.
   3. Units will be examined to ascertain quality and conformity to NAAWS quality level standards and specification requirements.
   4. Upon acceptance, mockup may remain as part of the Work.

C. Pre-installation Conference:
   1. Convene two weeks prior to commencing work of this section, under provisions of Instructions to Bidders.
   2. Review, discuss and resolve:
   3. Critical dimensions.
   4. Product delivery and storage.
   5. Staging and sequencing.
   6. Protection of completed work.

1.5 DELIVERY, STORAGE AND HANDLING
A. Transfer, handle, store, and protect products under provisions of Division 01.
B. Protect units from moisture damage.

1.6 PROJECT/SITE CONDITIONS
A. During and after installation of work of this section, maintain the same temperature and humidity conditions in building spaces as will occur after occupancy.
B. Field Measurements: Verify that field measurements are as indicated on shop drawings.

1.7 SEQUENCING AND SCHEDULING
A. Coordinate work under provisions of Division 01.
B. Coordinate the work with plumbing and electrical rough-in and wall finish.

1.8 EXTENDED WARRANTY – NOT USED.
1.9 MAINTENANCE – NOT USED.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. High Pressure Decorative Laminate:
   2. Wilsonart, Inc. (www.wilsonart.com)
B. Wood Composite Board:
   2. Product: Roseburg Ultrablend
C. Substitutions: Under provisions of Division 01.
D. Wood Materials:
   1. Softwood Lumber: PS 20; graded in accordance with NAAWS Architectural Woodwork Standards, Section 3 requirements for quality grade specified, average moisture content of 8 percent. Species and grade at woodworker’s option.
   2. Hardwood Lumber: NHLA; graded in accordance with NAAWS Architectural Woodwork Standards, Section 3 requirements. Hardwood to be Premium grade, average moisture content of 8 percent. Species to be Birch grade 1, cabinet rails and stiles and edge banding; in areas indicated only. Base cabinets to have 3/4 inch industrial grade, 44 lb. density, particle board subtop. Softwood Plywood: PS 1; Graded in accordance with NAAWS Architectural Woodwork Standards, Section 4 requirements. Softwood to be Custom Grade.
   3. Thermoset Decorative Panels: ALA, polyester or melamine resin impregnated web, pressure bonded and thermally fused to a core of 45 pound wood composite board; all interior semi-exposed surfaces including: Drawer Construction; Gables and Backs, Shelving. Unless Noted Otherwise, the interiors and the shelves in the open shelving units shall be thermoset decorative panels. Adjustable shelves shall have the same lamination both faces.
   5. Particle Board: ANSI A 208.1, where indicated on drawings.

2.2 MATERIALS
A. General: Provide materials that comply with requirements of the NAAWS Architectural
Woodwork Standards quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. High Pressure Decorative Laminate: NEMA LD3
   1. Plastic Laminate: NAAWS Architectural Woodwork Standards, 0.039 inch, Horizontal General Purpose quality for countertops.
   2. Plastic Laminate: NAAWS Architectural Woodwork Standards, 0.028 inch for all exposed exterior vertical surfaces of casework.
   3. Up to five (5) colors of plastic laminate may be selected by Architect from Manufacturer’s standard colors.

C. Wood Species and Cut for Transparent Finish: White Maple or, Red oak; plain sawn or sliced.

D. Wood Species for Opaque Finish: Poplar, Grade 1.

E. Wood Products: Comply with the following:

F. Thermoset Decorative Overlay: Particleboard complying with ANSI A208.1, Grade M-2, or medium-density fiberboard complying with ANSI A208.2, Grade MD, with surface of thermally fused to a core of 45 pound wood particle board, melamine-impregnated decorative paper complying with LMA SAT-1. Two colors may be selected by Architect from manufacturer’s standard and premium colors.

G. Stainless Steel (S/S): AISI Type 302/304, hardest workable temper, 14 gauge, No. 4 directional polish.

H. Galvanized Steel Sheet (G.I.): ASTM A653, 14 gauge, G90 zinc coating, and chemical treatment.

I. Steel Sheet: ASTM A1011 hot-rolled carbon steel.

2.3 MANUFACTURED UNITS – NOT USED.
2.4 EQUIPMENT – NOT USED.
2.5 COMPONENTS – NOT USED.

2.6 ACCESSORIES

A. Adhesive: Type recommended by laminate manufacturer to suit application.

B. PVC Edge trim molding to match plastic laminate colors, or color as selected by Architect from manufacturer’s standard colors (up to three colors per material type).
   1. Door and drawer edging – 3 mm.
   2. Body front edging – 1 mm.
   3. Cabinet shelf edges – 1 mm.
   4. All other misc. shelf edges – 3 mm.

C. Fasteners: Size and type to suit application.

D. Bolts, Nuts, Washers, Lags, Pins, and Screws: of size and type to suit application. Brushed aluminum finish where exposed.

E. Concealed Joint Fasteners: Doweled construction, 10 mm at tops, and 8 mm elsewhere with threaded steel only if necessary.

F. Grommets: Two part, 60 mm with spring closure in top. Manufactured by Hafele or equal. 30 each to be located by Architect and installed by Contractor upon completion of millwork installation.
G. **Hardware:** Acceptable Manufacturers: Blum, Melpa, Hafele, Grass and Approved Equals.

1. **Standards:** Hardware: BHMA A156.9 "American National Standard for Cabinet Hardware".
2. Adjustable Shelves: Polycarbonate shelf clips, adjustable on 32 mm system.
3. Drawer and Door Pulls: Back mounted, 4 inch ‘U’-shaped pulls, epoxy coated: BHMA 630, or brushed aluminum finish.
4. Cabinet Locks: Where indicated, standard 5-pin or 5 disc-type tumbler cam locks; all locks in a specific room keyed alike, properly tagged and identified upon delivery.
   a. Best 5L Series Latchbolt, removable core, disc tumbler, cam style lock with strike. Furnish 2 keys. Lock for sliding 3/4 inch thick doors is a disc type plunger lock, sliding door type with strike. Lock for sliding glass/acrylic doors is a ratchet type sliding showcase lock.
   b. Hafele 245.74.200, Automatic door bolt, used to secure inactive door on all locked cabinets.
5. Drawer Glides: Side or bottom mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, BHMA A156.9, B05091, and rated for the following loads:
   a. Box Drawer Slides: 100 lbf (440 N).
   c. Pencil Drawer Slides: 45 lbf (200 N).
8. Hinges: “Blum” model 71T6580 or equivalent. Heavy gauge steel, 270 degree opening, dull chrome. ANSI/BHMA A156 Series Standards.
   a. Magnetic door catch with maximum 5 pound pull provided, attached with screws and slotted for adjustment.
   b. Doors 36 inch high and under shall have two (2) hinges per door. Doors over 37 inch and under 60 inch high shall have three (3) hinges per door. Doors over 60 inches high shall have four (4) per door.
9. Closet Hanger Bar and Supports: Telescoping steel or brass tubing, with forged end brackets; size and wall-thickness to support hanging of clothing full length.
10. Casters: Three, 3-inch in diameter swivel type, two with brakes, with non-marking rubber tires.
11. Support Members and Exposed Hardware Finishes: Furniture grade, epoxy powder coated steel (unless otherwise noted). For concealed hardware, provide manufacturer’s standard finish.
13. Door/drawer silencers: Minimum of 2 per door and drawer, with 4 on doors larger than 36 inch high.
14. Double Acting Gate Spring Pivot Hinge: Adjustable tension spring hinge and top socket bracket. McKinney #4007 MRB 626 plated finish or equivalent.

2.7 **MIXES – NOT USED.**

2.8 **FABRICATION**

A. Fabricate in accordance with NAAWS Architectural Woodwork Standards.
B. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
C. Fit shelves, doors, drawer fronts, and exposed edges with edge trim. Use one piece for full length only.
D. Cap exposed plastic laminate finish edges with Edge Trim. Use one piece for full length.

E. Drawers, as follows, or equal:
   1. Drawer Fronts: Minimum 3/4 inch thick; overlay style except match door thickness.
   2. Drawer Sides and Back: Minimum 1/2 inch thick thermoset decorative panel with lock shoulder joint, glued, doweled or nailed where Metabox is not used.
   3. Drawer Bottom: Minimum 1/4 inch thick thermoset decorative panel dadoed into front and sides, glued, doweled or nailed into back, except where Metabox is used, use 5/8" thick.
   4. Keyboard trays: Keyboard trays shall be sized to accommodate a standard keyboard and mouse pad.
   5. File Drawers: The depth of file drawers (Type 'BS') cabinets shall be sized to accommodate hanging files (11 inches I.D. Clear).

F. Doors:
   1. Doors under 30 inches wide and/or 80 inches high: Minimum 3/4 inch thick particle board panel, identical laminate applied to both faces; overlay style.
   2. Doors over 30 inches wide and/or 80 inches high: shall be 1-3/8 or 1-3/4 inch hollow or solid core doors. Identical laminate applied to both faces overlay style.
   3. If hinge screws enter only the edge of a door, 3/4 inch lumber edges shall be glued to the core prior to laminating.
   4. Drilling of pilot holes and use of full-threaded screws is required in hanging fiber board and particle board core doors.

G. Shelves:
   2. Shelves 30 Inches Wide to 42 Inches Wide: Minimum 1 inch thermoset decorative panel with edge trim at exposed edges.
   3. Shelves over 30 Inches deep: Minimum 1 inch thermoset decorative panel with edge trim at exposed edges.
   4. Shelves wider than 42 inches shall have intermediate support with edge trim at exposed edges.

H. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

I. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

J. Mechanically fasten back splash to countertops with steel screws at 12 inches on center.

K. Provide cutouts for plumbing and light fixtures, inserts, appliances, outlet boxes, light fixtures and fittings. Verify locations of cutouts from on-site dimensions. Prime paint contact surfaces of cut edges.

L. Unless otherwise noted, all shelves are to be adjustable.

M. Balanced construction of all laminated panels is mandatory. Unfinished core stock surfaces, even on concealed surfaces (excluding edges), not permitted.

2.9 SOURCE QUALITY CONTROL – NOT USED.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing before installation.
B. Prior to installation, condition cabinets to average humidity that will prevail after installation.
3.2 PREPARATION – NOT USED.

3.3 INSTALLATION

A. Install in accordance with NAAWS Architectural Woodwork Standards.
B. Set and secure casework in place; rigid, plumb, and level. Install steel knee braces at counter tops.
C. Use fixture attachments in concealed locations for wall mounted components.
D. Use concealed joint fasteners to align and secure adjoining cabinet units and countertops.
E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
F. Secure cabinet and counter bases to floor using appropriate angles and anchorages.
G. Countersink anchorage devices at exposed locations. Conceal with plugs to match surrounding surface; finish flush with surrounding surfaces.
H. Install cable grommets in location as directed by Architect.
I. Coordinate installation of outlets indicated to be installed in bookcase toe kick.
J. Coordinate installation of outlets and conduit indicated to be installed in Media and Office counters.
K. Provide closure panels of matching materials to assure gaps or openings larger than 1/32 do not exist.
L. Provide flush, hairline joints in countertops.
M. Cover all exposed wood with laminate.
N. Provide laminate covered closure at upper cabinets at inside corners, top and bottom.
O. Adjust and provide consistent spacing between doors and drawers.
P. Fill all nail holes to match laminate.
Q. Provide covers for all exposed screws in cabinets.
R. Follow any special Manufacturer’s installation requirements for Chemical Resistant laminate.

3.4 FIELD QUALITY CONTROL – NOT USED.

3.5 ADJUSTING

A. Adjust work under provisions of Division 01.
B. Adjust moving or operating parts to function smoothly and correctly.
C. Adjust all cabinet doors and drawers for consistent reveal.

3.6 CLEANING

A. Clean work under provisions of Division 01.
B. Clean casework, counters, shelves, hardware, fittings and fixtures.

3.7 DEMONSTRATION – NOT USED.

3.8 PROTECTION

A. Protect finishes until Substantial Completion.

3.9 PLASTIC LAMINATE SCHEDULE

A. Each area listed may have a separate and unique vertical laminate, edge band, and countertop to be selected by Architect.
   1. Area 1 – Classrooms.
2. Area 2 – Storage/Custodial.
3. Area 3 – Office.

END OF SECTION 06 40 23
# DIVISION 07 - THERMAL AND MOISTURE PROTECTION

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PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Cold applied asphalt dampproofing for concrete stem walls.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.

B. ASTM International (ASTM):
   2. D4258 - Standard Practice for Surface Cleaning Concrete for Coating.
   3. D4261 - Standard Practice for Surface Cleaning Concrete Masonry Units for Coating.


1.3 SUBMITTALS

A. Submittals for Review:
   1. Product Data: Include product description and performance characteristics.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials in enclosed space, protected from weather and direct sun.

B. Maintain temperature range in storage area of 40 to 90 degrees F.

1.5 PROJECT CONDITIONS

A. Do not apply at ambient or surface temperatures below 40 degrees F, nor during inclement weather.

B. Substrate: Cured minimum seven (7) days.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Type II or Type III Bituminous Dampproofing.

B. Equivalent products by the following Manufacturers are acceptable:
   1. BASF Building Systems. (www.buildingsystems.basf.com)
   2. Euclid Chemical Company. (www.tamms.com)

C. Substitutions: Under provisions of Division 01.

2.2 MATERIALS
A. Asphalt Emulsion:
   1. Type: ASTM D1187, solvent based, fibered, consisting of refined asphalt, emulsifiers, and clay fillers.
   2. Water vapor permeance: Maximum 1.0 grams/100 square inches/24 hours, tested to ASTM E96.

2.3 ACCESSORIES
   
   A. Flashing Sheet: Minimum 32 mil thick rubberized asphalt laminated to HDPE film, release paper facing, self adhering.
   B. Mastic: ASTM D1187, fibrated, consisting of refined asphalt, non asbestos fibers, emulsifiers, and clay fillers, trowel grade.
   C. Reinforcing Fabric: Woven glass fiber type.
   D. Patching Compound: Type recommended by dampproofing Manufacturer.
   E. Primer: Type and product as recommended by dampproofing Manufacturer.

PART 3 – EXECUTION

3.1 PREPARATION
   
   A. Clean stem wall surfaces to ASTM D4261.
   B. Remove loose and foreign matter that could impede adhesion or performance of dampproofing.
   C. Seal cracks and holes less than 1/4 inch wide with mastic and reinforcing fabric. Extend minimum 4 inches beyond edges of crack or hole.
   D. Fill cracks over 1/4 inch in width with patching compound.
   E. Apply primer in strict accordance to Manufacturers written instructions.
   F. Dampen dry surfaces before applying dampproofing.

3.2 APPLICATION
   
   A. Apply emulsion by roller or spray to continuous and uniform coverage of stem walls.
   B. Apply at minimum rate of 75 square feet per gallon min. or as directed by Manufacturer.
   C. Allow to dry until tack free.
   D. Seal to door and window frames, around penetrations, and at perimeter with flashing sheet.
   E. Press to full bond with substrate without voids, wrinkles, bridging, or fishmouths.

3.3 FIELD QUALITY CONTROL
   
   A. Repair voids and damaged areas with an additional coat of emulsion.

END OF SECTION 07 11 13
SECTION 07 21 13

BOARD INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
   1. Board insulation at exterior walls.
   2. Board insulation at perimeter foundation walls.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.

C. Performance Requirements
   1. Materials of this Section shall provide continuity of thermal barrier at building
      enclosure elements in conjunction with thermal insulating materials in this Section.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the
   Contract Documents.

B. ASTM International (ASTM):
   2. C203 - Standard Test Methods for Breaking Load and Flexural Properties of Block-Type
      Thermal Insulation.
      750 degrees C.


1.3 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: Provide data on product characteristics, performance criteria, and
   limitations.

C. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions
   requiring special attention.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Samples: 12 by 12 inch samples of each insulation.

1.4 QUALITY ASSURANCE

A. Qualifications
   1. Manufacturer: Company specializing in manufacturing the Products specified in this
      section with minimum three (3) years experience.
   2. Applicator: Company specializing in performing the work of this section with
      minimum three years experience, approved/certified by manufacturer.
1.5 DELIVERY, STORAGE, AND HANDLING
   A. Store insulation in clean, dry, sheltered area, off ground or floor, until used. Protect against wetting and moisture absorption.

1.6 PROJECT/SITE CONDITIONS
   A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

1.7 SEQUENCING AND SCHEDULING
   A. Coordinate Work under provisions of Instructions to Bidders.
   B. Sequence work to ensure timely placement of insulation within construction spaces.

1.8 EXTENDED WARRANTY – NOT USED.

1.9 MAINTENANCE – NOT USED.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Acceptable Manufacturers - Extruded Polystyrene Board Insulation XPS
      1. Dow Chemical. (www.building.dow.com)
      2. CertainTeed. (www.certainteed.com)
      3. Owens-Corning. (www.owenscorning.com)
   B. Substitutions: Under provisions of Division 01

2.2 MATERIALS
   A. Extruded Polystyrene Board Insulation XPS:
      1. Type: IV, ASTM C578
      2. Thickness: 2 inch thick.
      4. Edges: Square
      5. Compressive Strength: 25 psi
      6. Water vapor permeance: Maximum 1.0 perm, tested to ASTM E96.
      7. Flame Spread: ≤ 25
      8. Smoke Developed: ≤ 450

2.3 EQUIPMENT – NOT USED.

2.4 COMPONENTS – NOT USED.

2.5 ACCESSORIES
   A. Adhesive and anchoring attachment method as recommended by Manufacturer.
   B. Tape: Minimum 3 inches wide, pressure sensitive, waterproof, as recommended by Manufacturer.
   C. Liquid spray flashing: Provide insulation Manufacturer’s recommended board joint commercial liquid spray flashing and sealant for sealing joints, seams, openings, counter-flashing and penetrations through the insulation layer.
2.6 MIXES – NOT USED.
2.7 FABRICATION – NOT USED.
2.8 SOURCE QUALITY CONTROL – NOT USED.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Division 01.
B. Verify that substrate, adjacent materials, and insulation boards are dry and ready to receive insulation.
C. Verify substrate surface is flat, free of honeycomb, fins, irregularities, materials or substances that may impede installation.

3.2 PREPARATION

A. Substrate:
   1. Remove protrusions flush with adjacent surface.
   2. Remove dirt, dust, oil, grease, and other materials that could impair adhesion.

3.3 INSTALLATION

A. Foundation:
   1. Apply adhesive in continuous beads per board length at 1 bead per vertical foot minimum.
   2. Adhere boards to foundation wall perimeter, horizontally. Place boards in a method to maximize contact bedding. Butt ends tight to adjacent board and to protrusions.
   3. Install on inside face of wall from top of footing to top of concrete slab elevation.
   4. Butt edges and ends tight to adjacent boards, at perimeter, and around penetrations.
   5. Cut and fit insulation tight at perimeter and around penetrations.
   6. Tape seal to perimeter and at joints between insulation pieces.
B. Walls:
   1. Adhere or fasten boards to wall with veneer ties. Apply adhesive in continuous beads per board length at one bead per vertical foot minimum.
   2. Butt edges and ends tight to adjacent boards, at perimeter, and around penetrations.
   3. Cut and fit insulation tight at perimeter and around penetrations.
   4. Seal to perimeter, joints, seams, openings, counter-flashing and penetrations through the insulation layer using Manufacturers documented approved tape or liquid spray sealant.

3.4 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 01.

3.5 ADJUSTING – NOT USED.
3.6 CLEANING – NOT USED.
3.7 DEMONSTRATION – NOT USED.
3.8 PROTECTION
A. Protect finished Work under provisions of Instructions to Bidders.
B. Do not permit Work to be damaged prior to covering insulation.

3.9 SCHEDULES – NOT USED.

END OF SECTION 07 21 13
SECTION 07 21 16
BLANKET INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Blanket insulation in exterior wall, floor, ceiling, and roof assemblies.
   2. Acoustical blanket insulation in interior walls where shown on Drawings.
   4. Installation of vapor retarders specified in Section 07 26 00.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.

C. Performance Requirements:
   1. Materials of this Section shall provide continuity of thermal barrier at building enclosure elements in conjunction with thermal insulating materials in this Section.
   2. Materials of this Section shall provide continuity of vapor and air barrier at building enclosure elements in conjunction with vapor retarders and air barriers.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.


1.3 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: Provide data on product characteristics, performance criteria, and limitations.

C. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions.
requiring special attention.

D. Manufacturer’s Certificate: Certify that products meet or exceed specified requirements.

E. Quality Control Submittals:
   1. Certificates of Compliance: Certification from an independent testing laboratory that insulation meets fire hazard classification requirements.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.
   2. Applicator: Company specializing in performing the work of this section with minimum three (3) years experience, approved/certified by Manufacturer.

B. Fire Hazard Classification:
   1. Noncombustible, tested to ASTM E136.
   2. Flame spread/smoke developed rating of 25/50 or less, tested to ASTM E84.

C. Pre-Installation Conference
   1. Convene one week prior to commencing work of this section, under provisions of Division 01.

1.5 DELIVERY, STORAGE, AND HANDLING – NOT USED.

1.6 PROJECT/SITE CONDITIONS

A. Store insulation in clean, dry, sheltered area, off ground or floor, until used. Protect against wetting and moisture absorption.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate the Work with Section 07 26 00 – Vapor Retarder and Section 07 27 00 – Air Barrier.

B. Coordinate Work under provisions of Division 01.

C. Sequence work to ensure timely placement of insulation within construction spaces.

1.8 EXTENDED WARRANTY – NOT USED.

1.9 MAINTENANCE – NOT USED.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Batt and Blanket Insulation:
   2. Owens-Corning. (www.owenscorning.com)

B. Sound Insulation:
   2. Owens-Corning. (www.owenscorning.com)

C. Foam-in-Place Insulation:
   1. C.P. Chemical Co. Inc. (www.tripolymer.com)
2.2 MATERIALS

A. Exterior Stud Walls: Unfaced pre-formed glass mineral fiber batt, friction fit (where interior vapor barrier and wall finish is indicated).
   1. Thermal Insulation
      a. Thermal resistance: R of 13 (4 inch nominal walls), R of 21 (6 inch nominal walls) and R of 25 (8 inch nominal walls).
      b. Batt width: Match framing spacing
      c. Stapling flanges: Stapling flanges on both edges.

B. Miscellaneous wall infill framing (above finish): Faced pre-formed glass mineral fiber batt.
   1. Thermal Insulation
      a. Thermal Resistance: R of 21 (6 inch nominal walls)
      b. Batt width: Match framing spacing and provide extra wide stapling flanges as required for installation shown.
      c. Facing FSK (Foil-Scrim-Kraft) vapor retarder facing.

C. Interior stud walls: Unfaced pre-formed glass mineral fiber sound attenuation batt insulation, friction fit.
   1. Acoustic insulation, ASTM C665 Type I, ASTM E136
      a. Thickness as required to fill nominal stud cavity.
      b. Batt width (5-1/4 inch, width as required for friction fit).

2.3 EQUIPMENT – NOT USED.

2.4 COMPONENTS – NOT USED.

2.5 ACCESSORIES, MATERIALS AND FASTENERS

A. Adhesive and anchoring attachment method as recommended by Manufacturer. Provide all materials required for complete and proper installation of insulation.

B. Include insulation baffles where indicated and as required. Include dimensional lumber furring strips as staple flanges to span truss webs where insulation is indicated at margin below top chord of trusses.

C. Tape: Minimum 4 inches wide, pressure sensitive, foil faced, waterproof.

2.6 MIXES – NOT USED.

2.7 FABRICATION – NOT USED.

2.8 SOURCE QUALITY CONTROL – NOT USED.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Division 01.
B. Verify that substrate, adjacent materials, and insulation boards are dry and ready to receive insulation.
C. Verify substrate surface is flat, free of honeycomb, fins, irregularities, materials or substances that may impede installation.

3.2 PREPARATION – NOT USED.
3.3 INSTALLATION

A. Install in accordance with NAIMA “Recommendations for Installation in Residential and Other Light-Frame Construction – Fiber Glass Building Insulation” and manufacturer’s instructions.

B. Surface Application: Apply insulation directly to surface with appropriate spindle or prong-type anchors.
   1. Fasten anchors to steel surfaces by welding the pin to metal or by using pre-attached heads and welded through the insulation.
   2. Fasten anchors to other substrates with adhesive. Follow manufacturer’s recommendations for surface preparation and adhesive pattern.
   3. Impale insulation on anchor and secure with washer.
   4. Select pin lengths to ensure tight fit. Protect pin tips where subject to human contact.
   5. See manufacturer’s diagram for impaling pin pattern.

C. Between Studs, Rafters, and Joists:
   1. Unfaced Insulation: Friction fit insulation between framing members after cover material has been installed on one side of cavity. In applications without a cover material, use wire or metal straps to hold insulation in place.
   2. Faced Insulation: Staple attachment flanges to face or side of framing member every 8 to 12 inches (200 to 305 mm) on verticals, every 6 to 8 inches (150 to 200 mm) on horizontals and slopes.
   3. Faced Insulation: Friction fit insulation between framing members after cover material has been installed on one side of cavity. In applications without a cover material, use wire or metal straps to hold insulation in place.

D. Over Suspended Ceilings:
   1. Install insulation with face contacting back of ceiling panels; butt insulation tightly together at edges to prevent thermal leaks.

E. Maintain vapor retarder integrity by tightly abutting adjacent insulation.

F. Insulation Tape:
   1. Repair punctures or tears in vapor retarder facing by taping.
   2. Follow tape Manufacture’s application recommendations.
   3. Apply with vapor barrier facing towards interior of structure.
   4. Tape seal lapped flanges, butt ends, and tears and holes in facings.

3.4 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 01.

3.5 ADJUSTING – NOT USED.
3.6 CLEANING – NOT USED.
3.7 DEMONSTRATION – NOT USED.

3.8 PROTECTION

A. Protect finished Work under provisions of Division 01.
B. Do not permit Work to be damaged prior to covering insulation.

3.9 SCHEDULES – NOT USED.

END OF SECTION 07 21 16
SECTION 07 22 16

ROOF BOARD INSULATION

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Rigid roof board insulation.
   2. Rigid roof board tapered insulation.
   3. Cover board.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.
   2. Section 07 54 00 – Thermoplastic Membrane Roofing.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.

B. American Society of Civil Engineers (ASCE) 7 - Minimum Design Loads for Buildings and Other Structures.

C. ASTM International (ASTM):


1.3 SYSTEM DESCRIPTION

A. Design Requirements: Design roofing system to resist minimum wind loads in accordance with FM I-28.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Submittals for Review:
   1. Product Data: Manufacturer's descriptive data including thermal values.
   2. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
   3. Shop drawings indicating taper plan.
1.5 QUALITY ASSURANCE

A. Installer Qualifications: Minimum five (5) years documented experience in work of this Section.
B. Roof Insulation Attachment: Conform to requirements for FM 1-90 Windstorm Classification.

1.6 DELIVERY, STORAGE AND HANDLING

A. Protect materials against moisture absorption, direct sunlight, damage, and temperatures above 110 degrees F and below 30 degrees F.
B. Store materials off ground or roof deck on pallets. Cover materials stored outside with breathable covering, properly vented.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers - Insulation:
   2. Substitutions: Under provisions of Division 01.
B. Acceptable Manufacturers – Tapered Insulation.
   1. Insulfoam. (www.insulfoam.com).
   2. Substitutions: Under provisions of Division 01.
C. Acceptable Manufacturers – Cover Board:
   2. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Roof Board Insulation:
   1. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, 25 PSI Min., felt or glass-fiber mat facer on both major surfaces. LTTR R Value of 30.6 Min. Roof insulation must be installed in multiple offset layers as directed by Membrane Manufacturer. Roof insulation materials must pass FM 4450 or UL 1256 for limits of support of combustion or roofing system must include a thermal barrier complying with ASTM E 119.
B. Roof Board Tapered Insulation:
   1. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per foot min. unless otherwise indicated. Provide ASTM C 578, Type II, 1.5 lb/ft min. density closed cell expanded polystyrene board contour taper tile. Tapered insulation to sandwich between layers of polyisocyanurate board.
   2. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated. Fabricate all saddles, crickets, tapered edge strips, cants and other insulation shapes in polyisocyanurate to match board insulation.
C. Cover Board:
   1. As indicated on Contract Documents.
   2. Type: ASTM C1177 or ASTM C1278, glass-matt, water resistant gypsum substrate.
   3. 48 inches wide by thickness indicated, maximum practical length, square cut ends and edges.
5. As required by roofing Manufacturer.

2.3 ACCESSORIES

A. Fasteners:
   1. Factory-coated steel fasteners and metal plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system Manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION OF INSULATION

A. Coordinate installing membrane roofing system components so insulation 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 insulation.
C. Install tapered insulation under area of roofing to conform to slopes indicated.
D. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 1-1/2 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.
E. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
F. Mechanically fasten to substrate in Manufacturer's documented fastening pattern.
G. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.
H. Leave 1/4 inch expansion space at panel ends and edges.
I. Fit insulation to other boards and at perimeter and around penetrations with maximum 1/4 inch voids.

3.2 INSTALLATION OF COVER BOARD

A. Apply panels with long edges continuous and perpendicular to direction of insulation. Stagger end joints in adjacent rows. Offset joints from those in insulation.
B. Mechanically fasten to substrate in Manufacturer's documented fastening pattern.
C. Fit sheathing to other boards and at perimeter and around penetrations with maximum 1/4 inch voids.
D. Install on walls as indicated in Contract Documents.

3.3 TOLERANCES

A. Surface Flatness of Insulation: Plus or minus 1/4 inch in 10 feet maximum.

END OF SECTION 07 22 16
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SECTION 07 26 00

VAPOR RETARDERS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Sheet and sealant materials for controlling vapor diffusion at exterior walls.
   2. Sheet and sealant materials for controlling vapor diffusion at floors.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.

B. ASTM International (ASTM):
   5. E154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
   7. E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
   8. E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.


1.3 SUBMITTALS

A. Submittals for Review:
   1. Product Data: Include product description and performance characteristics.
   2. Samples: 12 by 12 inch vapor retarder samples.
   3. Independent laboratory test results showing compliance with ASTM standards.
   4. All mandatory ASTM testing must be performed on a single product roll.
   5. Manufacturer’s installation instructions.

1.4 QUALITY ASSURANCE

A. Permeance of less than 0.01 perms per ASTM E96 or ASTM E1249 as tested in accordance with mandatory conditioning tests per ASTM E1745.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Wall, Roof, and Wood Floor Vapor Retarder Manufacturers:
   1. CertainTeed. (www.certainteed.com)
B. Concrete Floor Vapor Retarder Manufacturers
   1. Griffolyn, Division of Reef Industries. (www.reefindustries.com)
   2. Raven Industries. (www.rufco.com)
   3. Stego Industries. (www.stegoindustries.com)
   5. Substitutions: Under provisions of Division 01.

2.2 MATERIALS
A. Wall and Roof Vapor Retarder:
   1. Exceed requirements of ASTM D4397 and E154.
B. Concrete Floor Vapor Retarder:
   1. Exceed requirements of ASTM E1745 Class A.
   2. Description: Extruded non-reinforced polyolefin film.
   3. Thickness: Minimum 15 mils.
   4. Water vapor permeance: Maximum 0.01perms, tested to ASTM E96.
   5. Tensile strength: Minimum 45 pound-force per inch. and minimum 45 pound-force per inch after soak, tested to ASTM D882.

2.3 ACCESSORIES
A. Adhesive:
   1. Compatible with vapor retarder and substrate, permanently non hardening.
B. Joint Tape:
   1. Minimum 3 inches wide, pressure sensitive, waterproof, and documented compatible with vapor retarder.
C. Vapor Proofing Mastic:
   1. Waterproof and documented compatible with vapor retarder.
D. Perimeter Seal Accessories.
   1. Tack tape and termination bar documented compatible with vapor retarder.

PART 3 - EXECUTION
3.1 INSTALLATION – WALLS, ROOF AND WOOD FLOOR
A. Install in accordance with Manufacturer’s instructions.
B. Provide complete and continuous vapor retarder at exterior walls except where interrupted by glazing or other openings.
C. Locate wall vapor retarder on interior side of wall framing and insulation.
D. Apply adhesive to substrate in accordance with Manufacturer's instructions for application and coverage.
E. Install vapor retarder without tears, voids, and holes.
F. Lap ends and edges minimum 4 inches over adjacent sheets. Seal laps with tape.
G. Extend vapor retarder to full perimeter of adjacent door frames, window frames, openings, and to utility and other penetrations interrupting plane of membrane.
H. Tape seal lapped joints, tears, holes, perimeter, and penetrations through vapor retarder.

3.2 INSTALLATION - UNDER SLABS ON GRADE
A. Install in accordance with Manufacturer’s published instructions and ASTM E1643.
B. Remove sharp objects that could puncture vapor retarder.
C. Install vapor retarder without tears, voids, and holes.
D. Lap ends and edges minimum 6 inches over adjacent sheets.
E. Lap over footings and seal to foundation wall.
F. Tape seal lapped joints, tears, holes, perimeter, and penetrations through vapor retarder.

3.3 REPAIR
A. Inspect vapor retarder for damage just prior to covering.
B. Clean damaged areas and cover with additional vapor retarder material cut minimum 6 inches larger than damaged area on all sides. Seal to main vapor retarder with continuous tape.

END OF SECTION 07 26 00
SECTION 07 27 00

AIR BARRIERS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fluid applied materials for controlling moisture movement at exterior wall assemblies.
B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.
B. ASTM International (ASTM):
C. National Fire Protection Association (NFPA)

1.3 QUALITY ASSURANCE

A. Provide continuous barrier to moisture infiltration, air infiltration, and water vapor transmission, flashed to discharge incidental condensation and water penetration.
B. Mockup
1. Construct mockup of typical exterior wall section, minimum 8 by 8 feet.
2. Incorporate back-up construction, air barrier, typical opening, flashings, and critical junctions.
3. Approved mockup may not remain as part of the Work.

C. Pre-Installation Conference:
   1. Convene at site two (2) weeks prior to beginning work of this Section.
   2. Attendance: Architect, Contractor, Construction Manager, moisture barrier installer, and related trades whose work proceeds, follows, or affects moisture barrier.
   3. Review and discuss:
      a. Surface preparation, minimum substrate curing period, and installation procedures.
      b. Special details and flashings.
      c. Sequence of construction, responsibilities, and schedule for subsequent operations.
      d. Mock-up requirements.
      e. Inspection, protection, and repair procedures.

1.4 SUBMITTALS

A. Submittals for Review:
   1. Manufacturer’s specifications, details and product data.
   2. Manufacturer’s standard Warranty.
   3. Manufacturer’s ICC evaluation report confirming compliance with the IBC, IRC, and IECC as an air barrier and water-resistive barrier.
   4. Shop drawings: substrate joints, cracks, flashing transitions, penetrations, corners, terminations, and tie-ins with adjoining construction, and interfaces with separate materials that form part of the air barrier assembly.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers - Fluid Applied Air Barriers
   1. Carlisle Coatings and Waterproofing. (www.carlisle-ccw.com)
   2. Henry Company. (www.henry.com)
   3. STO. (www.stocorp.com)
   5. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Air Barrier:
   1. Type: Fluid applied, water based latex coating, roller or spray grade.
   2. Flexibility: ASTM D522, primary air barrier material, no cracking or delamination before and after aging using 1/8 inch mandrel at 14º F.
   3. Resistance to mold: ASTM D3273, no mold growth after 28 day exposure
   4. Adhesion: Joint treatment and primary air barrier material, ASTM C297 or exceeds strength of glass mat facing on glass mat gypsum substrates
   5. Surface burning: ASTM E84, joint treatment and primary air barrier material flame spread < 25, smoke developed < 450, Class A building material.
8. Building envelope air leakage: ASTM E779 < 0.4 cfm/ft².
9. Material air leakage: ASTM E2178, primary air barrier and joint treatment < 0.004 cfm/ft² at 1.57 psf.
10. Assembly air leakage: ASTM E2357, < 0.04 cfm/ft² air leakage after conditioning protocol.
11. Fire propagation: NFPA 285, meets requirements for use on all Types of construction.

2.3 ACCESSORIES

A. Sheathing Joint Treatments
   1. Manufacturer’s single component rapid drying gun-applied joint treatment for sheathing joints.
   2. Manufacturer’s ready mixed coating applied by trowel or knife over nominal 4.2 oz/ self-adhesive, flexible, symmetrical, interlaced glass fiber mesh.
   3. Manufacturer’s flexible air barrier membrane material for embedding non-woven integrally reinforced cloth reinforcement.

B. Rough Opening Treatments
   1. Manufacturer’s single component rapid drying gun-applied joint treatment for sheathing joints.
   2. Manufacturer’s ready mixed coating applied by trowel or knife over nominal 4.2 oz/ self-adhesive, flexible, symmetrical, interlaced glass fiber mesh.
   3. Manufacturer’s flexible air barrier membrane material for embedding non-woven integrally reinforced cloth reinforcement.

C. Transition Membrane
   1. Manufacturer’s flexible air barrier membrane for continuity at transitions.
   2. Manufacturer’s single component gun-applied air barrier membrane material for continuity at static transitions.

D. Sealant
   1. Manufacturer’s single component rapid drying air barrier membrane material for sealing gaps, holes, or other voids in air barrier materials

E. Primers
   1. Manufacturer’s rubber resin emulsion primer for use to enhance adhesion.

F. Auxiliary Materials
   1. Manufacturer’s approved pre-cured sealant tape.
   2. Manufacturer’s approved spray adhesive.
   3. Manufacturer’s approved spray foam insulation.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean surfaces to receive air barrier; remove loose and foreign matter that could impair adhesion or performance.
B. Protect adjacent and underlying surfaces.
C. Fill voids, holes, penetrations, and cracks over 1/16 inch in width with patching compound; finish flush with adjacent surfaces. Apply one coat of air barrier over patched areas and allow to dry.
D. Apply joint treatment over sheathing joints. Apply one coat of air barrier over patched areas and allow to dry.
E. Apply rough opening treatment at openings. Apply one coat of air barrier over patched areas and allow to dry.

3.2 INSTALLATION

A. Apply Air Barrier in strict accordance with Manufacturer’s published instructions.
B. Apply primer to joints in substrate, inside and outside corners, and around perimeter and penetrations.
C. Seal door and window openings, around penetrations, and at perimeter with applicable treatment. Press to full bond with substrate without voids, wrinkles, bridging, or fishmouths.
D. Apply air barrier by roller or spray to continuous and uniform coverage with minimum mil thickness as recommended by Manufacturer.

3.3 FIELD QUALITY CONTROL

A. Inspect air barrier for damage just prior to covering.
B. Clean damaged areas and cover with additional air barrier material minimum 6 inches larger than damaged area on all sides.

3.4 PROTECTION AND CLEANING

A. Protect air barrier materials from damage during construction caused by wind, rain, freezing, continuous high humidity, or prolonged exposure to sun light.
B. Protect air barrier materials from damage from trades, vandals, and water infiltration during construction.
C. Repair damaged materials to meet project specification requirements.
D. Clean spills, stains, soilings from finishes or other construction materials that will be exposed in the completed work with compatible cleaners.
E. Remove all masking materials after work is completed.

END OF SECTION 07 27 00
SECTION 07 54 00

THERMOPLASTIC MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Includes:
   1. Mechanically fastened thermoplastic membrane roofing system including membrane, flashings, and other components.
   2. PVC coated metal flashings.
   3. Walkway Protection.

B. System Description:
   1. Thermoplastic sheet membrane roof assembly to conform to UL, IBC requirements for a Class “B” fire classification assembly.

C. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.
   2. Division 05 – Metal Decking
   3. Section 06 10 00 – Rough Carpentry
   4. Section 07 22 16 – Roof Board Insulation
   5. Section 07 62 00 – Sheet Metal Flashing and Trim
   6. Section 07 92 00 – Joint Sealants
   7. Division 22 – Plumbing
   8. Division 23 – HVAC
   9. Division 26 – Electrical

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.

B. American Society of Civil Engineers (ASCE) 7 - Minimum Design Loads for Buildings and Other Structures.

C. ASTM International (ASTM):
   2. D751 - Standard Test Methods for Coated Fabrics
   3. D 4397 – Standard specification for Polyethylene sheeting for construction, industrial and agricultural applications.

D. Energy Star - Qualified Products.

E. Factory Mutual Insurance Co. (FM):
   1. 4470 - Approval Standard for Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Assemblies for Use in Class 1 and Noncombustible Roof Deck Construction.

F. National Roofing Contractors Association (NRCA) - Roofing and waterproofing manual.


1.3 SYSTEM DESCRIPTION

A. Design Requirements:
   1. Design roofing system to resist minimum wind loads in accordance with FM 1-28.
   3. UL 790 Class “B”.

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.
B. Submit Manufacturer’s installation instructions under provisions of Division 01.
C. Literature: Copies of current relevant information pertaining to the primary components to be used in the roof system including but not limited to:
   1. Specifications
   2. Manufacturer’s Roofing’s Warranty
   3. Applicator’s Warranty
   4. Product Data Sheets
   5. Material Safety Data Sheets
   6. Submit support data and test results showing that roofing system and accessories comply with FM I-28, Class I-90, and UL 790 Class A.
D. Samples for Verification: Representative samples of primary components to be used in the roof system.
E. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work, including:
   1. Base flashings and membrane terminations.
   2. Tapered insulation, including slopes.
   3. Roof plan showing orientation of roof deck, orientation of roofing membrane, pattern for insulation attachment, and membrane fastening spacing.
   4. Fastening patterns for corner, perimeter, and field-of-roof locations.
   5. Special joint or termination conditions and conditions of interface with other materials.
F. Maintenance data under provisions of Division 01.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Membrane Manufacturer: Company specializing in sheet roof membranes with five (5) years experience. Installer shall be approved by Manufacturer to install Manufacturer’s product.
   2. Applicator: Company specializing in installation of sheet roof membranes with five (5) years experience, has completed five (5) projects totaling 50,000 square feet in the last year, and approved by membrane Manufacturer.
   3. Source limitations: Obtain all components for membrane roofing system from a single roofing membrane Manufacturer.
B. Regulatory Requirements
   1. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction.
3. Life Cycle (LCA) and Sustainability Requirements: Provide membrane certified by independent third party testing/evaluation that roof membrane satisfies the following criteria:
   a. 10% recycled content as certified by Underwriters Environment
   b. Satisfy NSF/ANSI 347 Platinum Sustainability level.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials, other than membrane, in protected, dry area, until used; provide proper ventilation.
B. Protect sheet goods from damage and wetting.

1.7 PROJECT/SITE CONDITIONS

A. Roofing installed during inclement weather conditions shall satisfy Owner and Roofing Manufacturer’s requirements.
B. Moisture shall not be allowed into roofing assembly during installation.

1.8 SEQUENCING AND SCHEDULING

A. Pre-Installation Conference:
   1. Roofing Manufacturer’s representative, Owner, Architect, Roofing Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
   2. Review methods and procedures related to roofing installation, including Manufacturer's most current requirements.
   3. Review base flashings, special roofing details and transitions, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
   4. Review temporary protection requirements for roofing system during and after installation.
   5. Deviations from the Contract Documents or the approved shop drawings are not permitted without prior written approval by the roofing Manufacturer, the Owner, and the Architect.

1.9 EXTENDED WARRANTY

A. Under provisions of Division 01.
B. Base Bid: Provide Manufacturer’s Twenty (20) year water tightness warranty for water penetration and integrity of seals from date of substantial completion.
C. Bid Alternate No. 1: Provide manufacturers’ Thirty (30) year water tightness warranty for water penetration and integrity of seals from date of substantial completion.
D. Warranty: Include coverage of materials and installation for repairs resulting from failure of roofing system to resist penetration of moisture and to resist 90 M.P.H. winds.
E. Provide Installer’s extended warranty for a period of two (2) years from date of substantial completion.
F. Warranty shall be no dollar limit (NDL). Manufacturer’s standard without monetary limitations. Warranty shall state that ponding conditions will not void warranty.

1.10 MAINTENANCE – NOT USED.

PART 2 - PRODUCTS
2.1 MANUFACTURERS

A. Contract Documents are based on products by:
   1. Sika Sarnafil. ([www.sika.com](http://www.sika.com)).

B. Products by following Manufacturers are acceptable:
   1. Carlisle Syntec. ([www.carlisleysyntec.com](http://www.carlisleysyntec.com)).
      Product: 60 mil SureFlex PVC KEE, Inseam Mechanically Fastened.
   2. GAF. ([www.gaf.com](http://www.gaf.com)).
      Product: 60 mil Everguard PVC XK, Inseam Mechanically Fastened.
   3. Johns Manville. ([www.johnsmanville.com](http://www.johnsmanville.com)).
      Product: 60 mil PVC/ES KEE, Inseam Mechanically Fastened.

2.2 ALTERNATE NO. 01

A. Products by following Manufacturers are acceptable:
   1. Carlisle Syntec. ([www.carlisleysyntec.com](http://www.carlisleysyntec.com)).
      Product: 80 mil SureFlex PVC KEE.
   2. GAF. ([www.gaf.com](http://www.gaf.com)).
      Product: 80 mil Everguard PVC XK.
   3. Johns Manville. ([www.johnsmanville.com](http://www.johnsmanville.com)).
      Product: 80 mil PVC/ES KEE.
   4. Sika Sarnafil. ([www.sika.com](http://www.sika.com)).
      Product: 80 mil S327 PVC.
   5. Substitutions: Under provisions of Division 01.

2.3 MATERIALS

A. PVC Roofing Membrane:
   1. PVC Sheet: ASTM D 4434, Type III, polyester reinforced.
   3. Thickness: 60 mils minimum thickness with published, manufacturing variance no greater than +/- .02 mils. ASTM nominal +/- 10% thickness variation is not acceptable.
   4. Membrane thickness over reinforcement shall by a minimum of .028 mils. Membrane reinforcement shall be balance within the membrane thickness.
   5. Exposed membrane surface color:
      a. Energy Star white with the following certified values:
         i. Solar reflectance 83%
         ii. Thermal emissivity 90%
         iii. Solar reflective index 104

2.4 AUXILIARY MATERIALS

A. General: Auxiliary materials supplied by roofing system Manufacturer for intended use and compatible with membrane roofing.

B. Sheet Flashing: Manufacturer's standard sheet flashing of thickness, and color as sheet membrane.

C. Pre-formed or field formed boots, collars and miscellaneous accessories supplied by roofing system manufacturer.
   1. PVC membrane requires chemically resistant reinforced membrane sheet flashing when used over contaminated surfaces such as curbs, walls, penetrations and roof equipment. Also used as a separation layer over membrane when non compatible.
substances will come in contact with primary membrane. Substance such as oils, processed animal fats etc.


D. Bonding Adhesive: Manufacturer's standard solvent-based bonding adhesive for bonding membrane to substrate.

E. Termination Bars and accessories: Manufacturer's standard predrilled stainless-steel, galvanized or aluminum bars, approximately 1 by 1/8 inch thick; with bumper cord and anchors.

F. Fasteners: Factory-coated steel fasteners and metal plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

G. PVC-coated metal flashing: Heat weldable sheet metal capable of being formed into a variety of shapes and profiles. 24 gauge, G90 galvanized metal sheet with a 20 mil unsupported PVC membrane laminated on one side. 4 by 8 foot or 4 by 10 foot.

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, slip sheet, CSPE reactivation solution cut edge sealant and other accessories.

2.5 ROOF BOARD INSULATION

A. Roof Board Insulation per Specification Section 07 22 16.

2.6 COVER BOARDS

A. Cover boards per Specification Section 07 22 16.

2.7 INSULATION ACCESSORIES

A. Fasteners: Factory-coated steel fasteners and metal plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system Manufacturer.

2.8 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, textured surface walkway rolls, approximately 3/16 inch thick, and acceptable to membrane roofing system Manufacturer.

1. Gray embossed walkway rolls with textured surface.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify deck is clean and smooth, free of depressions, waves, or projections and properly sloped to drain.

B. Verify roof openings and penetrating elements through roof are solidly set.

C. Verify existing adjoining membrane surface has been properly prepared for watertight attachment of new membrane.

D. Do not apply roofing materials to damp, frozen, dirty, dusty, or deck surfaces unacceptable to manufacturer or applicator.

E. Verify deck surfaces are dry and free of snow or ice. Confirm dry deck by moisture meter with 12 percent moisture maximum.
F. Ensure flatness and verify tight joints of deck, seal joints of decking with tape.

G. Beginning installation means acceptance of existing surfaces and substrate.

3.2 VAPOR RETARDER INSTALLATION

A. Install vapor retarder in accordance with Specification Section 07 26 00.

3.3 INSULATION INSTALLATION

A. Install roof board insulation in accordance with Specification Section 07 22 16.

3.4 MECHANICALLY FASTENED ROOFING MEMBRANE INSTALLATION

A. Install roofing membrane over area to receive roofing according to roofing system manufacturer’s written instructions and wind uplift requirements.
   1. Unroll roofing membrane and allow to relax before installing.
   2. Overlap edges and ends as required by Manufacturer.
   3. Install mechanical fasteners in accordance with Manufacturer’s instructions.
   4. Shingle joints on sloped substrate in direction of drainage.
   5. Seal adjoining surfaces.
   6. Continue membrane or coated metal up vertical surfaces minimum 8 inches unless otherwise noted. Terminate per Manufacturers requirements. Fully adhere vertical wall flashings.
   7. Seal items penetrating membrane with counterflashing membrane material. Install flashing. Seal watertight to membrane.
   8. Do not expose material vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.
   9. Install protection board where required or indicated.

3.5 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
B. Apply solvent-based bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.
C. Flash penetrations and field-formed inside and outside corners with 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 then mechanically anchor sheet to substrate through termination bars.

3.6 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Adhere walkway products to membrane then hot air weld perimeter of walkway to membrane according to roofing system manufacturer’s written instructions.

3.7 FIELD QUALITY CONTROL

A. Pre-job start and final roof inspection. Membrane Manufacturer shall supply and pay for a technical representative to meet for a pre-job discussion involving expectations and requirements for roof installation and upon completion to review compliant roof
application. All roof assembly conditions shall be observed and approved prior to roof installation. Arrange for roofing system Manufacturer’s technical personnel to inspect roofing installation on completion and submit report to Architect.

B. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.
C. Field inspection will be performed under provisions of Division 01.
D. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.
E. A representative of the roofing Manufacturer is to perform an on-site inspection of the completed system and certify, in writing, that the system has been installed per manufacturer’s requirements and as required for the specified warranty.
F. Contractor shall immediately correct identified defects or irregularities.

3.8 PROTECTION

A. Protect finished installation under provisions of Instructions to Bidders.
B. After installation, close off area to prevent unauthorized traffic.

END OF SECTION 07 54 00
ROOFING MATERIALS SUBSTITUTION REQUEST FORM
(Submit not less than 10 days prior to Bid Date)

DWA Project No. 17094

TO: Design West Architects, P.A.
216 SW Fifth Avenue
Meridian, ID 83642

We hereby submit for your consideration the following products in lieu of those specified for the above-referenced project:

<table>
<thead>
<tr>
<th>Material</th>
<th>Specified</th>
<th>Proposed Substitution</th>
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<td>Roof Insulation</td>
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<td>Roof Membrane</td>
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<td>Other</td>
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Description of Proposed Components: ____________________________________________________________
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Differences between specified and proposed components, including type of insulation, method of anchoring, details, surfacing, application methods, etc.: ____________________________________________________________
__________________________________________________________________________________________
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Attach complete technical data, including Manufacturer's published specifications, standard details, laboratory tests and certifications, material samples and similar information to fully describe the products and method of application.

If changes are required in specifications, drawings or details, provide revised specifications and details for consideration.
INSTRUCTIONS

This form is to be submitted to the Architect not less than seven (7) days prior to bid date. For Manufacturers not approved in the specifications, they must obtain prior approval of their product in addition to submittal of this form. If a Manufacturer indicates exceptions or modifications to the drawings and specifications as a condition of acceptance, those exceptions and modifications must be approved by Addendum before the Manufacturer may bid on the project.

DWA PROJECT NO. 17094

________________________________________________

________________________________________________

MANUFACTURER'S CERTIFICATION

The undersigned roofing Manufacturer hereby certifies that he has reviewed the drawings, specifications and conditions of the site and the terms of the roofing guarantee included in the specification and find them acceptable, and if the Manufacturer’s materials are installed on the project in accordance with the drawings and specifications and upon inspection by the Manufacturer’s technical representative, Manufacturer will issue the guarantee in the form specified.

Dated this ___________ day of ____________________________________________ 20______.

_______________________________________
Manufacturer

_______________________________________
Authorized Representative

EXCEPTIONS: Subject to the following exceptions and/or modifications (attach any details or added verbiage that is required), the undersigned roofing Manufacturer will certify to the conditions stated above:

_______________________________________________________________________________________________________
_______________________________________________________________________________________________________
_______________________________________________________________________________________________________
_______________________________________________________________________________________________________

Dated this ___________ day of ____________________________________________ 20______.

_______________________________________
Manufacturer

_______________________________________
Authorized Representative

APPROVED APPLICATORS: The following roofing Contractors are approved applicators of the roofing system specified (or approved) and as manufactured by the above named Manufacturer:

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PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Metal flashings and trim.
   2. Parapet caps and copings.
   3. Edge flashings.
   4. Gutters, scuppers, conductor heads, and downspouts.
   5. Counterflashings over membrane roof base flashings.
   6. Counterflashings at roof mounted equipment and utility penetrations.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.
   2. Section 05 50 00 - Metal Fabrications.
   3. Section 07 42 93 - Soffit Panels.
   4. Section 07 54 00 - Thermoplastic Membrane Roofing.
   5. Section 07 92 00 - Joint Sealants.
   6. Division 08: Openings.
   7. Section 09 24 00 - Cement Plastering.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the
   Contract Documents.

B. American Architectural Manufacturers Association (AAMA):
   1. 611 - Voluntary Specification for Anodized Architectural Aluminum.
   2. 621 - Voluntary Specifications for High Performance Organic Coatings on Coil
      Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated
      Steel Substrates.
   3. 2604 - Voluntary Specification, Performance Requirements and Test Procedures
      for High Performance Organic Coatings on Architectural Extrusions and Panels.
   4. 2605 - Voluntary Specification, Performance Requirements and Test Procedures
      for Superior Performing Organic Coatings on Architectural Extrusions and
      Panels.

C. American National Standards Institute/Single Ply Roofing Institute (ANSI/SPRI) ES-1
   - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.

D. 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. A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless
      Steel Sheet, Strip, Plate, and Flat Bar.
   3. A755 - Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip
      Process and Prepainted by the Coil-Coating Process for Exterior Exposed
      Building Products.
   4. A792 - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated
      by the Hot-Dip Process.
   5. A1011 - Standard Specification for Sheet, Sheet and Strip, Hot-Rolled, Carbon,
      Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved
      Formability, and Ultra-High Strength.

E. Copper Development Association (CDA) - Contemporary Copper, A Handbook of Sheet Copper Fundamentals, Design, Details and Specifications.
F. Sheet Metal and Air Conditioning Manufacturer’s Association International (SMACNA) - Architectural Sheet Metal Manual.

1.3 SUBMITTALS

A. Submittals for Review:
   1. Submit shop drawings and product data under provisions of Division 01.
   2. Shop Drawings: Show locations, types and thicknesses of metal, profiles, dimensions, fastening methods, provisions for expansion and contraction, and joint details.
   3. Samples:
      a. Each flashing and trim profile, minimum 12 inches long. Include corners where applicable.
      b. 4 by 4 inch prefinished metal samples showing available colors.

1.4 QUALITY ASSURANCE

A. Fabricator and Installer Qualifications: Minimum five (5) years documented experience in work of this Section.
B. Design, fabricate, and install metal components in accordance with ANSI/SPRI ES-1 and SMACNA.
C. Conform to SMACNA Manual for nominal sizing of gutters, scuppers, collector boxes, and downspouts for rainfall intensity determined by a storm occurrence of 1 in 100 years.
D. Mockup: May be requested by Architect of any sheet metal flashing and trim.

1.5 EXTENDED WARRANTY

A. Under provisions of Division 01.
B. Special Panel Finish Warranty: On Manufacturer’s standard form, in which Manufacturer agrees to repair or replace metal panels that evidence deterioration of factory-applied finish within 25 years from date of Substantial Completion, including:
   1. Color fading in excess of 5 Hunter units per ASTM D2244.
   2. Chalking in excess of No. 6 rating per ASTM D4214.
   3. Failure of adhesion, peeling, checking, or cracking.

PART 2 - PRODUCTS
2.1 MATERIALS

A. Galvanized Steel Sheet:
   1. ASTM A653, Structural Quality, G90, galvanized coating class, 24 gage core steel unless noted otherwise.

B. Aluminum-Zinc Alloy-Coated Steel Sheet:
   1. ASTM A792, Structural Quality, Grade 50, Coating Class AZ50 (Grade 340, Coating Class AZM150), prepainted by the coil-coating process per ASTM A755.
   2. Finish: Fluoropolymer Two-Coat System: 0.2 – 0.3 mil primer with 0.7 - 0.8 mil 70 percent PVDF fluoropolymer color coat, AAMA 62.
   3. Finish: Fluoropolymer Two-Coat Metallic System: 0.2 – 0.3 mil primer with 0.7 - 0.8 mil 70 percent PVDF metallic fluoropolymer color coat, AAMA 621.
   4. Interior Finish: 0.5 mil total dry film thickness consisting of primer coat and wash coat of Manufacturer's standard light-colored acrylic or polyester backer finish.

C. Stainless Steel Sheet (S/S):
   1. AISI Type 302/304, hardest workable temper, 14 gauge, No. 4 directional polish.

D. Steel Sheet:
   1. ASTM A1011 hot-rolled carbon steel.

E. Copper Sheet:
   1. ASTM B370, 0.027 inch thick.
   2. Finish: CDA

F. Copper-Clad Stainless Steel Sheet:
   1. ASTM B506, 0.020 inch thick, copper cladding on each side equivalent to 10 percent of total thickness.
   2. Finish: Bright

G. Aluminum Sheet:
   1. ASTM B209, alloy 3003, temper H14, 0.032 inch thick.
   2. Finish: Natural.

H. Lead Sheet:
   1. ASTM B749, Type L50049, common lead, weighing 4 pounds per square foot.

2.2 MANUFACTURED UNITS

A. Reglet Flashing System with counter flashing and gasketed fasteners.
   1. FryReglet Architectural Metals. (www.fryreglet.com)
   2. Substitutions: Under provisions of Division 01.

B. Reglet types “MA” Masonry Reglet, “ST” Stucco Reglet, or “SM” surface mounted Reglet as indicated on Contract Documents.

C. Material and thickness
   1. 24 gage galvanized steel.
   2. Standard zinc finish for concealed locations.
   3. Factory applied Kynar 500 finish for exposed locations.
   4. Fasteners in stainless steel, drive pin type with neoprene faced stainless steel washers.

2.3 ACCESSORIES

A. Solder: ASTM B32.

B. Fasteners: Stainless steel, same finish as sheet metal, with neoprene gasketed washers where exposed.

C. Joint Sealants: Specified in Section 07 92 00. Color to match metal finish.
2.4 FABRICATION

A. Provide sheet metal flashing and trim components gauge and finish equal to system component material gauge and finish.
B. Fabricate components in accordance with SMACNA Manual, Contract Documents, and System Manufacturer’s documented profiles.
C. Gutters: SMACNA Rectangular style profile F with bronze wire ball downspout strainer, laptype expansion joints. Accessories profiled to suit gutters.
D. Downspouts: SMACNA Rectangular per Contract Documents. Accessories profiled to fit downspouts.
E. Gutter Hanger: 1/8 by 1-1/2 inch gutter hanger at 30 inches OC. Staggered 15 inches from strap. Wrap 2 inch wide prefinished cover over hanger.
F. Gutter Strap: 24 gauge prefinished metal gutter strap at 30 inches OC maximum.
G. Downspout Strap: 24 Gauge prefinished metal downspout strap at 5 feet OC maximum.
H. Pop rivet and seal joints at prefinished metal details.
I. Solder shop formed joints. After soldering, remove flux and wash clean.
J. Fabricate corners in single units with minimum 18 inch long legs.
K. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.
L. Form sections accurate to size and shape, square and free from distortion and defects.
M. Provide for thermal expansion and contraction in sheet metal:
   1. Gutters:
      a. Place expansion joints at maximum 50 feet on center.
      b. Locate expansion joints between downspouts; prevent water flow over joint.
   2. Other sheet metal:
      a. Provide expansion joints in sheet metal exceeding 20 feet in running length.
      b. Place expansion joints at 20 feet on center maximum and maximum 2 feet from corners and intersections.
   3. Joint width: Consistent with types and sizes of materials, minimum width 1/4 inch.
N. Fabricate expansion joints in metal copings and edge flashings with backing and cover plates formed to flashing profile, minimum 8 inches long.
O. Unless otherwise indicated, provide minimum 3/4 inch wide flat lock seams; lap in direction of water flow.
P. Fabricate cleats and starter strips of same material as sheet metal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install flashing and sheet metal as indicated and in accordance with SMACNA Manual and Contract Documents.
B. Install cleats and starter strips before starting installation of sheet metal. Fasten at 6 inches on center maximum.
C. Expansion Joints in Metal Copings and Edge Flashings:
   1. Center backing plate between flashing pieces at end joints.
   2. Apply two continuous beads of joint sealer between backing plate and flashing sections at each end.
   3. Install flashing pieces with 1/2 inch expansion space at abutting ends; apply sealer to expansion space.
   4. Apply two continuous beads of joint sealer between cover plate and flashing sections at each end.

D. Secure flashings with concealed fasteners where possible.

E. Apply plastic cement between metal and bituminous flashings.

F. Fit flashings tight, with square corners and surfaces true and straight.

G. Seam and seal field joints.

H. Separate dissimilar metals with bituminous coating or non-absorptive gaskets.

I. Reglets:
   1. Install reglets true to line and level. Seal top of surface mounted reglet with joint sealer.
   2. Install flashings into reglets to form tight fit. Secure with lead or plastic wedges at 12 inches on center maximum. Seal remaining space with joint sealer.

J. Gutters:
   1. Secure with hangers and straps spaced maximum 36 inches on center and within 12 inches of ends.

K. Downspouts:
   1. Secure with straps spaced maximum 8 feet on center and within 2 feet of ends and elbows.
   2. Flash downspouts into gutters or conductor heads, seal, and fasten.
   3. Flash upper sections into lower sections minimum 2 inches at joints; fasten sections together.
   4. Flash into tube steel downspout.

L. Apply joint sealant as specified in Section 07 92 00.

M. Provide splash blocks under each downspout not accommodated by underground drain system.

3.2 CLEANING

A. Clean sheet metal; remove slag, flux, stains, spots, and minor abrasions without etching surfaces.

END OF SECTION 07 62 00
SECTION 07 72 00
ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
   1. Prefabricated Roof Hatch with integral support curbs, operable hardware, and counter-flashings.

B. Products Installed but not Furnished under this Section.
   1. Section 07 61 13 - Sheet Metal Flashing & Trim: Supply of counter flashing for placement by this Section.

1.2 REFERENCES

   2. A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.


1.3 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: Provide data on unit construction, sizes, configuration, jointing methods and locations when applicable, and attachment method.

C. Manufacturer’s Installation Instructions: Indicate special installation criteria, interface with adjacent components.

1.4 QUALITY ASSURANCE - NOT USED.

1.5 DELIVERY, STORAGE, AND HANDLING – NOT USED.

1.6 PROJECT/SITE CONDITIONS – NOT USED.

1.7 SEQUENCING AND SCHEDULING – NOT USED.

1.8 EXTENDED WARRANTY

1.9 MAINTENANCE – NOT USED.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Roof Hatch
   1. Bilco. (www.bilco.com)
      a. Roof Hatch type NB with Bil-Guard railing RL-NB and LadderUp safety post model LU-1.
   2. Milcor. (www.milcorinc.com)
      a. Roof Hatch model M-2 with safety railing and Upright safety bar.

2.2 MATERIALS – NOT USED.

2.3 MANUFACTURED UNITS

A. Roof Hatches
1. Unit: Single leaf type, 30”x54”.
2. Integral Steel Curb:
   a. 14 gauge galvanized steel with 1 inch rigid glass fiber insulation; integral cap flashing to receive roof flashing; extended flange for mounting.
3. Curb to extend 12 inches above roofing materials min.
4. Hardware:
   a. Compression spring operator;
   b. Steel manual pull handle for interior and exterior operation;
   c. Steel hold open arm with vinyl covered grip handle for easy release,
   d. Components zinc plated finish;
5. Hinges: Heavy duty piano type.
6. Safety Post: Ladder up safety post attached to steel ladder per manufacturer’s instructions.

2.4 EQUIPMENT – NOT USED.
2.5 COMPONENTS – NOT USED.

2.6 ACCESSORIES

A. In strict accordance with Manufacturers instructions, Architectural, and Structural drawings.

2.7 MIXES – NOT USED.

2.8 FABRICATION

A. Fabricate components free of visual distortion or defects. Weld corners and joints.
B. Provide for removal of condensation occurring within components or assembly.
C. Fit components for weathertight assembly.

2.9 SOURCE QUALITY CONTROL – NOT USED.

PART 3 - EXECUTION

3.2 EXAMINATION – NOT USED.
3.3 PREPARATION – NOT USED.

3.4 INSTALLATION

A. Install in accordance with Manufacturer’s instructions.
B. Coordinate with installation of roofing system and related flashings for weathertight installation.
C. Apply bituminous paint on surfaces of units in contact with cementitious materials or dissimilar metals.
D. Comply with Architectural drawings and Manufacturers recommendations for location of systems. Comply with Manufacturers written installation instructions for installation and layout.

3.5 FIELD QUALITY CONTROL – NOT USED.
3.6 ADJUSTING – NOT USED.
3.7 CLEANING – NOT USED.
3.8 DEMONSTRATION – NOT USED.
3.9 PROTECTION – NOT USED.
3.10 SCHEDULE – NOT USED.

END OF SECTION 07 72 00
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
   1. Snow Guard that attach directly to roof deck with ferrules.

B. Related Sections.
   1. Division 01: Administrative, procedural, and temporary work requirements.
   2. Section 07 54 00 – Thermoplastic Roofing Membrane
   3. Section 07 62 00 – Sheet Metal Flashing And Trim.
   4. Section 07 92 00 – Joint Sealants.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.

B. ASTM International (ASTM):
   2. A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.


1.3 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: Provide data on unit construction, sizes, configuration, and layout.

C. Manufacturer's Installation Instructions: Indicate special installation criteria, interface with adjacent components.

1.4 QUALITY ASSURANCE

A. Installer to be experienced in the installation of specified roofing material and snow guards for not less than five (5) years in the area of the project.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inspect material upon delivery and order replacements for any missing or defective items.

B. Keep material dry, covered and off the ground until installed.

1.6 PROJECT/SITE CONDITIONS – NOT USED.

1.7 SEQUENCING AND SCHEDULING – NOT USED.

1.8 EXTENDED WARRANTY

1.9 MAINTENANCE – NOT USED.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Snow Guards:

2.2 MATERIALS – NOT USED.

2.3 MANUFACTURED UNITS

A. Snow Guards:
1. Snow Guard Bracket: 6000 Series Aluminum.
2. Base Plate: 11 gauge stainless steel
3. Tubing: 6000 Series Aluminum, 1 inch outside diameter and 0.120 inch wall thickness, extruded.
5. End Caps: 304 Stainless Steel.
7. Ice Flags: 6000 Series Aluminum, 3 inch wide by length required.
8. Ferrules: 6000 Series Aluminum, 1 inch O.D., 0.120 inch wall

2.4 FINISH

A. Mill Finish - Standard

2.5 ACCESSORIES

A. In strict accordance with Manufacturers documented instructions.

2.6 MIXES – NOT USED.

2.7 FABRICATION

A. Fabricate components free of visual distortion or defects.
B. Fit components for weathertight assembly.

2.8 SOURCE QUALITY CONTROL – NOT USED.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Substrate
1. Inspect structure on which snow guard system is to be installed and verify that it will withstand any additional loading that it may incur.
2. Notify general contractor of any deficiencies before installing SnowGuards.
3. Verify that roofing material has been installed correctly prior to installing snow guards.

3.2 PREPARATION – NOT USED.

3.3 INSTALLATION

A. Comply with Contract Documents and snow guard Manufacturer’s recommendations for location of system.
B. Comply with Manufacturer's written installation instructions for installation.
C. Install additional snow guard system at utility roof penetrations.
D. Coordinate with installation of roofing system and related flashings for weathertight installation.
E. Apply bituminous paint on surfaces of units in contact with dissimilar metals.

3.4 FIELD QUALITY CONTROL – NOT USED.
3.5 ADJUSTING – NOT USED.
3.6 CLEANING – NOT USED.
3.7 DEMONSTRATION – NOT USED.
3.8 PROTECTION – NOT USED.
3.9 SCHEDULE – NOT USED.

END OF SECTION 07 72 53
SECTION 07 84 00

FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Provide and install all firestopping and smoke seal materials, assemblies, systems, and accessories at all penetrations of fire or smoke rated building elements or assemblies.
   2. Trade making penetration shall be responsible for firestopping.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.

B. ASTM International (ASTM):

C. Underwriters Laboratories, Inc. (UL):
   1. 1479 - Fire Tests of Through-Penetration Firestops.


1.3 SUBMITTALS

A. Submit complete package of information indicating which products and assemblies are proposed for use in anticipated penetrations requiring firestopping and smoke seal.

B. Make subsequent submittals of products and assemblies for penetrations encountered, but unanticipated and found after construction begins; or for penetrations which may have been anticipated, but upon examination are found to be outside the application constraints as provided by the Manufacturer or as presented in the listing of the product or assembly.

C. Each submittal shall contain a copy of the Manufacturer's written application instructions, which shall contain all application constraints, as well as the UL Listing for each product or assembly.

1.4 QUALITY ASSURANCE

A. Firestopping installer shall have five (5) years documented experience in providing and installing firestopping systems or assemblies, and a significant portion of his business shall be firestopping.

B. References:
   1. Firestopping installer shall provide a reference list of projects completed within the last five years. Include what percentage (on a project cost basis) of each listed project was for firestopping.
C. Firestopping installer shall submit a list of proposed firestopping applicators for this project. The list shall include names and experience of each applicator and name of applicator’s foreman.

1.5 DELIVERY, STORAGE AND HANDLING – NOT USED.
1.6 PROJECT/SITE CONDITIONS – NOT USED.

1.7 SEQUENCING AND SCHEDULING

A. Properly coordinate with other trades so that no additional penetrations requiring firestopping are made after an area has been firestopped.
B. Notify Construction Manager and Architect one week in advance of work ready for inspection.
C. Firestopping of all rated assemblies is the responsibility of the trade making the penetration.
D. Materials used for Firestopping are to be those as specified in this Section.

1.8 PERFORMANCE REQUIREMENTS

A. General: For the following constructions, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly penetrated.
   1. Fire-resistance-rated load-bearing walls, including partitions, with fire-protection-rated openings.
   2. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.
   3. Fire-resistance-rated floor assemblies.
B. F-Rated Systems: Provide through-penetration firestop systems with F-Ratings indicated, as determined per ASTM E814, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
C. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-Ratings, as determined per ASTM E814, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas.
   1. Penetrations located outside wall cavities.
   2. Penetrations located outside fire-resistive shaft enclosures.
   3. Penetrations located in construction containing fire-protection-rated openings.
   4. Penetrating items larger than 4 inch (100 mm) diameter nominal pipe or 16 square inch (100 sq. cm) in overall cross-sectional area.
D. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.
   1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
   2. For floor penetrations with annular spaces exceeding 4 inches (100 mm) in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means.
   3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
E. For through-penetration firestop systems exposed to view, provide products with flame-spread ratings of less than 25 and smoke-developed ratings of less than 450, as
determined per ASTM E84.

1.9 MAINTENANCE – NOT USED.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. 3M Fire Protection Products. (www.solutions.3m.com)
B. Carboline Company. (www.carboline.com)
C. Hilti Construction Corp. (www.hilti.com)
D. Tremco Sealants. (www.tremcosealants.com)
E. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Materials, assemblies, products and accessories shall be as listed in the latest edition of the UL Fire Resistance Directory or tested by an approved laboratory using ASTM E814.
B. Firestopping materials shall be free of asbestos - and PCB's
C. Materials, assemblies, products and accessories used shall be appropriate for the following parameters:
   1. Fire-rated Building Element or Assembly: Penetrated:
      a. Floor/ceiling, wall, roof, roof/ceiling.
      b. Rating: 1 hour, 2 hour, 3 hour, or 4 hour.
      c. Material: concrete, gypsum wallboard, wood, metal decking.
      d. Thickness
   2. Item(s) Penetrating Fire-Rated Building Element or Assembly:
      a. Pipe(s), conduit(s), cable(s), etc.
      b. Material: steel, cast iron, copper, plastic, etc.
      c. Size: diameter, dimensions, thickness: e.g. 4 inch schedule 40 steel pipe, 4 by 4 inch opening.
      d. Insulation: material and thickness.
   3. Size of annulus between Item Penetrating and Building Element Penetrated.
   4. Include all Joints, voids, abandoned openings, and openings for future use.

2.3 MANUFACTURED UNITS – NOT USED.

2.4 EQUIPMENT – NOT USED.

2.5 COMPONENTS – NOT USED.

2.6 ACCESSORIES

A. Compatibility: Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with “Performance Requirements” Article. Use only components specified by through-penetration firestop system manufacturer and approved by the qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:
   1. Permanent forming/damming/backing materials, including the following:
      a. Slag-/rock-wool-fiber insulation.
b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.

c. Fire-rated form board.

d. Fillers for sealants.

2. Temporary forming materials.


5. Steel sleeves.

C. Warning Labels:

1. Each label shall be approximately 5 by 3 inches tall, shall have an adhesive backing, shall be bright orange in color, and shall contain the following lettering in black:

   a. The word “FIRE BARRIER – PROTECT ALL OPENINGS” shall be centered across the top in 1-inch high letters.

   b. The following words, 1/4 inch high, shall be printed below:

      "THIS [WALL][FLOOR/CEILING][ROOF/CEILING] IS A FIRE-RATED ASSEMBLY. NO PENETRATIONS OF THIS ASSEMBLY SHALL BE MADE WITHOUT INSTALLATION OF AN APPROVED FIRESTOPPING ASSEMBLY AT EACH PENETRATION. EACH FIRESTOPPING ASSEMBLY SHALL BE UL LISTED FOR THE RATED ASSEMBLY PENETRATED, THE PENETRATION ITEM, AND THE SIZE OF THE OPENING."

2. Warning labels shall be posted every 16 linear feet near each penetration of a smoke and/or fire-rated assembly.

2.7 MIXES – NOT USED.

2.8 FABRICATION – NOT USED.

2.9 SOURCE QUALITY CONTROL – NOT USED.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions

1. Thoroughly examine Contract Documents to identify smoke and/or fire-rated building elements or assemblies that will require firestopping at penetrations.

2. Verify that penetrations can be firestopped by use of a listed firestopping assembly. In the event a penetration cannot be firestopped within the constraints of a firestopping assembly’s UL listing. Prepare a written report to the Architect containing the following information:

   a. The building element or assembly penetrated.

   b. The penetrating item and characteristics.

   c. The number and location of such penetrating items.

   d. The reason(s) the penetration cannot be firestopped within the constraints of the proposed firestopping assembly’s listing.

   e. A UL listed firestopping assembly that can be used in this instance.

3.2 PREPARATION

A. Protect adjacent building elements and finishes.

B. Clean surfaces to come into contact with firestopping materials of dirt, grease, oil, loose materials, rust, and other substances that may affect performance of the firestopping assembly.

3.3 APPLICATION
A. Provide proper ventilation for all solvent-based products as per Manufacturer's instructions.
B. Apply primers and other preparatory products in accordance with Manufacturer's instructions and in conformance with its listing.
C. Apply damming and backing materials in accordance with Manufacturer's instructions and in conformance with its listing.
D. Apply smoke seal and firestopping products in conformance with Manufacturer's instructions.
E. Apply all accessories in accordance with Manufacturer's instructions for a complete listed assembly.
F. Seal all holes or voids with approved firestopping caulk or approved product to ensure effective smoke barrier.
G. Neatly cut and trim excess materials.

3.4 FIELD QUALITY CONTROL

A. Inspection
   1. Job Foreman or Supervisor shall observe 50% of all firestopping applications prior to cover-up and certify that all penetrations have been addressed.

3.5 ADJUSTING – NOT USED.

3.6 CLEANING

A. Clean all spills of liquid components as per manufacturer's cleaning and safety instructions.
B. Dispose of all toxic materials as per requirements of authority having jurisdiction.
C. Remove all materials, accessories and tools from project.

3.7 DEMONSTRATION – NOT USED.
3.8 PROTECTION – NOT USED.
3.9 SCHEDULES – NOT USED.
TYPICAL UL FIRE STOPPING DETAIL

PENETRATIONS AT 1 AND 2 HOUR WALLS.

1 OR 2 HR RATED ASSEMBLY (2 HOUR SHOWN)

FENCETRATING ITEM TO BE ONE OF THE FOLLOWING:

A. MAXIMUM 2" NOMINAL DIAMETER PVC PLASTIC PIPE
B. MAXIMUM 2" NOMINAL DIAMETER CPVC PLASTIC PIPE
C. MAXIMUM 2" NOMINAL DIAMETER PEX TUBING
D. MAXIMUM 2" NOMINAL DIAMETER RNC-PVC CONDUIT
TYPICAL UL FIRE DAMPER DETAIL

PENETRATIONS AT 1 AND 2 HOUR WALLS.

NOTES:
1. FIRE DAMPER SHALL BE MINIMUM UL CLASSIFIED (UL555).
2. THE OPERATING TEMPERATURE OF THE FIRE DAMPER ACTUATING DEVICE SHALL BE RATED AT 160° F, OR APPROXIMATELY 50° F ABOVE THE NORMAL TEMPERATURE WITHIN THE DUCT SYSTEM THAT IT SERVES. THE OPERATING TEMPERATURE OF FIRE DAMPERS SERVING A SMOKE-CONTROL SYSTEM (COMPLYING WITH SECTION 607.13 OF THE 2009 IFC) SHALL BE RATED AT 266° F.
3. ONLY FIRE DAMPERS LABELED FOR USE IN DYNAMIC SYSTEMS SHALL BE INSTALLED IN HEATING, VENTILATION AND AIR-CONDITIONING SYSTEMS INTENDED TO OPERATE WITH FANS ON DURING A FIRE. FIRE DAMPERS LABELED FOR USE IN STATIC SYSTEMS SHALL BE INSTALLED IN NON-PRESSURIZED DUCT SYSTEMS.
4. FIRE DAMPER SHALL BE INSTALLED WITH APPROVED MANUFACTURER'S INSTALLATION INSTRUCTIONS.
5. FIRE DAMPER SHALL BE ‘TYPE B’ AS SHOWN.
6. APPROVED MANUFACTURER'S SHALL INCLUDE: RUBIN, NAILOR, PRESCO, CESCO, AIR BALANCE, SAFE-AIRDOWCO, NCA MANUFACTURING, OR APPROVED EQUAL.
TYPICAL UL FIRE STOPPING DETAIL

PENETRATIONS AT 1 AND 2 HOUR WALLS.

MAXIMUM DUCT DIMENSION | DUCT THICKNESS | ANNULAR SPACE MIN. - MAX | INSULATION THICKNESS | RETAINING ANGLE REQUIRED
--- | --- | --- | --- | ---
24 IN. | 24 GA. (OR HEAVIER) | 1/2" - 1" | MAXIMUM 1-1/2" | NO

NOTES:
1. MAXIMUM SIZE OF OPENING = 63" x 39".
2. INSULATION TO BE COMPRESSED MINIMUM 50% SUCH THAT THE ANNULAR SPACE = MIN. 1/4", MAX 1-1/4".
3. AFTER SEALING SPACE BETWEEN DUCT AND WALL ASSEMBLY WITH FIRESTOP SEALANT, FASTEN STEEL ANGLE (MIN. 18 GA. OR 16 GA. WHEN DUCT DIMENSION EXCEEDS 46") TO DUCT, THROUGH INSULATION, WITH 3/4" LONG NO. 8 SHEET METAL SCREWS SPACED 6" C.C. STEEL ANGLE TO OVERLAP DUCT MINIMUM 20" AND RATED WALL ASSEMBLY BY MINIMUM 1". ANGLE DOES NOT HAVE TO BE FASTENED TO RATED WALL ASSEMBLY.

END OF SECTION 07 84 00
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Joint backup materials.
   2. Joint sealants.
   3. Expandable expansion joints.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.
   2. Section 03 30 00 - Cast-in-Place Concrete
   3. Section 04 20 00 - Concrete Unit Masonry
   4. Section 06 20 00 - Finish Carpentry
   5. Section 06 40 00 - Architectural Woodwork
   6. Section 07 42 13 - Metal Wall Panels
   7. Section 07 42 93 - Soffit Panels
   8. Section 07 54 00 - Thermoplastic Membrane Roofing
   9. Section 07 62 00 - Sheet Metal Flashing and Trim
   10. Section 08 11 13 - Hollow Metal Doors and Frames
   11. Section 08 41 13 - Aluminum Framed Entrances and Storefronts
   12. Section 08 45 23 - Fiberglass Sandwich Panel Assemblies
   13. Section 08 51 13 - Aluminum Windows
   14. Section 09 29 00 - Gypsum Board
   15. Section 09 30 00 - Tiling
   16. Section 09 65 00 - Resilient Flooring
   17. Section 09 91 00 - Painting
   18. Miscellaneous locations as shown on drawings.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.

B. ASTM International (ASTM):
   11. C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing...
Sealant Joints.


1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.
B. Product Data: Indicate sealers, primers, backup materials, bond breakers, and accessories proposed for use.
C. Samples:
   1. 4 inch long joint sealer samples showing available colors.
   2. 6 inch long joint backup material samples.
D. Warranty: Sample warranty form.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: Minimum five (5) years documented experience in work of this Section.
B. Laboratory Pre-Construction Testing:
   1. Obtain representative samples of actual substrate materials.
   2. Test sealers and accessories for following:
      b. Compatibility: Test to ASTM C1087; determine that materials in contact with sealers do not adversely affect sealant materials or sealant color.
      c. Staining: Test to ASTM D2203, ASTM C510, or ASTM C1248; determine that sealants will not stain joint substrates.
      d. Pre-construction testing is not required when sealant manufacturer furnishes data acceptable to Architect based on previous testing for materials matching those of this Project.
C. Field Pre-Construction Testing:
   1. Perform field testing for sealant adhesion in accordance with ASTM C1521 on exterior mockup, prior to beginning application, and for each 1000 feet of installed sealer.
   2. Install sealers using joint preparation methods and materials recommended by sealer manufacturer.
   3. When tests indicate sealant adhesion failure, modify joint preparation, primer, or both and retest until joint passes sealant adhesion test.

1.5 PROJECT CONDITIONS

A. Do not apply sealers at temperatures below 40 degrees F unless approved by sealer Manufacturer.
B. Coordinate the work of this Section with all sections referencing this Section.

1.6 WARRANTIES

A. Furnish Manufacturer’s Ten (10) year warranty providing coverage for sealants and accessories that fail to provide air and water tight seal, exhibit loss of adhesion or cohesion, or do not cure.
B. Special Manufacturer’s Warranty: Written warranty, signed by elastomeric sealant Manufacturer agreeing to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within Ten (10) years from date of Substantial Completion.
C. Special Installer’s Warranty: Written warranty, signed by Installer agreeing to repair or replace elastomeric joint sealants that do not comply with performance and other requirement specified in this Section within two (2) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Expandable Expansion Joint:
   2. Polytite Manufacturing Corp. (www.polytite.com)

B. Acceptable Manufacturers:
   1. BASF Building Systems. (www.buildingsystems.basf.com)
   3. DAP. (www.dap.com)
   4. Dow Corning Corp. (www.dowcorning.com)
   5. GE Silicones. (www.siliconeforbuilding.com)
   6. Pecora Corp. (www.pecora.com)
   7. Sika Corp. (www.sikausa.com)
   8. Tremco, Inc. (www.tremco.com)

2.2 MATERIALS

A. Joint Sealant Type A:
   1. ASTM C920, Grade P, multiple component polyurethane type, self-leveling grade.
   3. Color: To be selected from Manufacturer’s full color range.

B. Joint Sealant Type B1:
   1. ASTM C920, Grade NS, single or multiple component polyurethane type, non sag.
   3. Color: To be selected from Manufacturer’s full color range.

C. Joint Sealer Type B2:
   1. ASTM C920, Grade NS, single or multiple component silicone type, non sag.
   3. Color: To be selected from Manufacturer’s full color range.

D. Joint Sealer Type C:
   1. ASTM C920, Grade NS, single component butyl rubber type, non sag.
   2. Movement capability: Plus or minus 12-1/2 percent.
   3. Color: To be selected from Manufacturer’s full color range.

E. Joint Sealer Type D:
   1. ASTM C834, single component acrylic latex, non sag.
   2. Movement capability: Plus or minus 7-1/2 percent.
   3. Color: To be selected from Manufacturer’s full color range.

F. Joint Sealer Type E:
   1. ASTM C920, Grade NS, single component silicone, non sag, mildew resistant.
   3. Color: To be selected from Manufacturer’s full color range.

G. Joint Sealer Type F:
1. ASTM C920, Grade NS, single component polyurethane type, non sag, recommended by Manufacturer for continuous water immersion.
3. Color: To be selected from Manufacturer's full color range.

H. Joint Sealer Type G:
1. ASTM C834, single component acrylic latex, non sag, non-hardening, non-corrosive, recommended by Manufacturer for acoustical applications.
2. Movement capability: Plus or minus 7-1/2 percent.
3. Color: To be selected from Manufacturer's full color range.

2.3 ACCESSORIES

A. Primers, Bondbreakers, and Solvents: As recommended by sealant Manufacturer.
B. Joint Backing:
1. ASTM C1330, closed cell polyethylene foam, preformed round joint filler, non absorbing, non staining, resilient, compatible with sealer and primer, recommended by sealer manufacturer for each sealer type.
2. Size: Minimum 1-1/4 times joint width.

2.4 MIXES

A. Mix multiple component sealers in accordance with Manufacturer's instructions.
   1. Mix with mechanical mixer; prevent air entrainment and overheating.
   2. Continue mixing until color is uniform.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove loose and foreign matter that could impair adhesion. If surface has been subject to chemical contamination, contact sealer manufacturer for recommendation.
B. Clean and prime joints in accordance with manufacturer’s instructions.
C. Protect adjacent surfaces with masking tape or protective coverings.
D. Sealer Dimensions:
   1. Minimum joint size: 1/4 by 1/4 inch.
   2. Joints 1/4 to 1/2 inch wide: Depth equal to width.
   3. Joints over 1/2 inch wide: Depth equal to one half of width.

3.2 APPLICATION

A. Apply Products in strict accordance with Manufacturer's documented assembly types and instructions.
B. Install sealers and accessories in accordance with ASTM C1193.
C. Install acoustical sealers and accessories in accordance with ASTM C919.
D. Install joint backing to maintain required sealer dimensions. Compress backing approximately 25 percent without puncturing skin. Do not twist or stretch.
E. Use bondbreaker tape where joint backing is not installed.
F. Fill joints full without air pockets, embedded materials, ridges, and sags.
G. Tool sealer to smooth profile.
H. Apply sealer within Manufacturer’s recommended temperature range.

3.3 CLEANING
A. Remove masking tape and protective coverings after sealer has cured.
B. Clean adjacent surfaces.

3.4 SCHEDULE

A. Joint Sealant Type A:
   1. Self-leveling polyurethane sealer for traffic-bearing applications.
   2. Joints in horizontal surfaces subject to pedestrian or vehicular traffic

B. Joint Sealant Type B1:
   1. Non-sag polyurethane sealer for vertical and non-traffic bearing horizontal applications where a high amount of movement is anticipated.
   2. Joints in above grade surfaces.

C. Joint Sealant Type B2:
   1. Non-sag polyurethane sealer for vertical and non-traffic bearing horizontal applications where a high amount of movement is anticipated.
   2. Joints in above grade surfaces.

D. Joint Sealant Type C:
   1. Non-sag sealer for vertical and non-traffic bearing horizontal applications where a moderate amount of movement is anticipated.
   2. Joints in above grade surfaces.

E. Joint Sealant Type D:
   1. Non-sag sealer for vertical applications where a minimal amount of movement is anticipated.

F. Joint Sealant Type E:
   1. Non-sag sealer for applications in potentially damp areas where mildew could occur.
   2. Joints in toilet rooms, countertops, kitchens, etc.

G. Joint Sealant Type F:
   1. Applications for continuous water immersion.
   2. Joints in showers, fountains, water features, etc.

H. Joint Sealant Type G:
   1. Non-sag sealant for acoustical applications.
   2. Joints in acoustical assemblies.

I. Specialized Joint Sealants:
   1. Applications in strict accordance to Manufacturers documented assembly types.

END OF SECTION 07 92 00
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PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
   1. Hollow Steel Doors and Frames.
   2. Interior light frames.
   3. Door light kits.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.
   2. Section 08 71 00 - Door Hardware.
   3. Section 08 80 00 - Glazing.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.

B. American National Standards Institute (ANSI)/Steel Door Institute (SDI):
   2. A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcing.
   3. A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
   5. A250.11 - Recommended Erection Instructions for Steel Frames.

C. ASTM International (ASTM) (www.astm.org):
   1. A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) 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.
   5. E413 - Classification for Rating Sound Insulation.

D. National Fire Protection Association (NFPA) (www.nfpa.org)
   1. 80 - Standard for Fire Doors and Fire Windows.
   2. 252 - Fire Tests for Door Assemblies.

E. American National Standards Institute (ANSI)/Steel Door Institute (SDI)
   (www.steeldoor.org):
   2. A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcing.
   3. A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
   5. A250.11 - Recommended Erection Instructions for Steel Frames.
F. Underwriters Laboratories (UL) (www.ul.com):
   1. 10B - Standard for Fire Tests of Door Assemblies.
   2. 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.

G. Door Hardware Institute. (DHI) - The Installation of Commercial Steel Doors and Steel Frames Insulated Steel Doors in Wood Frames and Builder’s Hardware.


1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.
B. Indicate frame configuration, anchor types and spacings, location of cutouts for hardware, reinforcement, and finish.
C. Indicate door elevations, internal reinforcement, closure method, and cutouts for glazing.
D. Certificates of Compliance: Certification that products furnished comply with ANSI/SDI A250.3, ANSI/SDI 250.4, and ANSI/SDI A250.10.E. Submit Manufacturer’s installation instructions under provisions of Division 01.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Conform to requirements of ANSI/SDI A250.8
   2. Fire rated door and frame construction to conform to NFPA 252.
   3. Installed frame and door assembly to conform to NFPA 80 for fire-rating indicated in Door Schedule, Section 08 06 10.
   4. Installed H.M. light assemblies to conform to NFPA 80 for fire-rated classification.
   5. Provide door and frame labeling required as per 2015 IBC.
   6. Perform work in accordance with ANSI/SDI A250.11

1.5 DELIVERY, STORAGE AND PROTECTION

A. Deliver, Store, and Protect products under provisions of Division 01.
B. Protect doors with resilient packaging sealed with heat shrunk plastic.
C. Break seal on site to permit ventilation.
D. Store doors upright in protected, dry area, off ground or floor, with at least 1/4 inch space between individual units.
E. Do not cover with non vented coverings that create excessive humidity.
F. Remove wet coverings immediately.

1.6 PROJECT/SITE CONDITIONS – NOT USED.

1.7 SEQUENCING AND SCHEDULING – NOT USED.

1.8 EXTENDED WARRANTY – NOT USED.

1.9 MAINTENANCE – NOT USED.

PART 2 - PRODUCTS

2.1 MANUFACTURERS - DOORS AND FRAMES.

A. Ceco Door. (www.cecodoor.com)
B. Curries. (www.curries.com)
C. Pioneer Industries, Inc. (www.pioneerindustries.com)
D. Steelcraft. (www.steelcraft.com)
E. Benchmark Commercial Doors. (www.benchmarkdoors.com).
F. Deansteel Manufacturing, Inc. (www.deansteel.com).

H. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Doors: ANSI/SDI A250.8
   1. Half Glass and Exterior Flush Doors:
      a. Level III – Extra Heavy Duty.
      b. Gauge - 16 gauge,
      c. Model 2 – Seamless.
   2. Full Glass Doors:
      a. Level III – Extra Heavy Duty
      b. Gauge – 14 gauge.
      c. Model 2 – Seamless.
   3. Other Doors:
      a. Level II – Heavy Duty
      b. Gauge – 18 Gauge
      c. Model 2 – Seamless.

B. Frames: ANSI/SDI A250.8
   1. Exterior Doors and Frames:
      a. 16 gauge thick (doors and frames) material, metallic-coated steel sheets meeting ASTM A653, commercial steel (CS), Level III, type B with an A40 zinc-coated alloy (Galvannealed) coating; Stretcher – leveled standard of flatness.  
   2. Interior Doors and Frames:
      a. 16 gauge thick (frames only) material, cold-rolled steel sheet meeting ASTM A366, commercial steel (CS), or ASTM A620, drawing steel (DS), Level III, type B; Stretcher – leveled standard of flatness.

C. Door Core:
   1. Non-fire-rated Interior Doors: Impregnated cardboard honeycomb.
   2. Fire-Rated Interior Doors: Honeycomb, Styrene, or Urethane.
   3. Exterior Doors: Polyurethane insulation, “R” value of 14.97; “U” value of 0.067, or better.

D. Protective Coatings:
   2. Primer: Zinc chromate type.

2.3 MANUFACTURED UNITS – NOT USED.

2.4 EQUIPMENT – NOT USED.

2.5 COMPONENTS – NOT USED.

2.6 ACCESSORIES

A. Silencers: Resilient rubber at all doors except fire rated assemblies.

B. Glazing Stops: 3/4 inch high rolled steel channel shape, mitered corners; prepared for and including countersink style tamperproof screws. Rated and sized to accommodate glazing as per schedule and including Section 08 80 00 – Glazing.

C. Door Light Kits: Rated and sized as per schedule and door type. Coordinate with Section 08 80 00 – Glazing.

2.7 MIXES – NOT USED.
2.8 FABRICATION

A. Fabricate frames as welded units. Verify frame widths and single rabbet/double rabbet profiles as required for installation conditions indicated.
B. Mullions for Double Doors: Removable type. Provide metal T-shaped astragals for double doors where shown on Schedule.
C. Fabricate frames and doors with hardware reinforcement plates welded in place. Provide mortar guard boxes.
D. Reinforce frames wider than 48 inches with roll formed steel channels fitted tightly into frame head, flush with top.
E. Prepare frame for silencers. Provide three single rubber silencers for single doors and mullions of double doors on strike side, and two single silencers on frame head at double doors without mullions.
F. Attach fire rated label to each frame and door unit.
G. Close top edge of exterior door flush with inverted steel channel closure. Seal joints watertight.
H. Verify undercut of door is adequate for floor finishes.
I. Fabricate frames used for masonry wall coursing with 4 inch head member.
J. Finish:
   1. Exterior Units: 0.60 oz/sq ft galvanized, primed for suitable base for paint finish specified in Section 09 91 00 - Painting.
   2. Interior Units: primed, air-dried or baked-on for suitable base for paint finish specified in Section 09 91 00 – Painting.
K. Clearances for Non-Fire-Rated Doors: Not more than 1/8 inch at jambs and heads, except no more than 1/4 inch between pairs of doors. Not more than 3/4 inch at bottom.
L. Clearances for Fire-Rated Doors: As required by NFPA 80.
M. All hollow metal doors provided for this project shall be seamless (no visible seams on vertical edges), in compliance with SDI (Steel Door Institute) with flush end closure at top and bottom of all exterior doors, and recessed closure at all other locations. Adjust all door closure hardware as necessary.

2.9 SOURCE QUALITY CONTROL – NOT USED.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that opening sizes and tolerances are acceptable.

3.2 PREPARATION

A. Protect inside (concealed) faces of door and window frames using fibered asphalt emulsion coating on exterior openings and in masonry walls. Apply approximately 1/8 inch thick and allow to dry before handling.
B. Prepare doors for closure installation to “inside” of room.

3.3 INSTALLATION

A. Install frames in accordance with ANSI/SDI A250.11
B. Install doors in accordance with DHI.
C. Coordinate with masonry and wallboard wall construction for anchor placement.
D. Coordinate installation of glass and glazing. Install in accordance with NFPA 80.
E. Tolerances:
1. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.4 FIELD QUALITY CONTROL – NOT USED

3.5 ADJUSTING

A. Adjust hardware for smooth and balanced door movement.

3.6 CLEANING – NOT USED.
3.7 DEMONSTRATION – NOT USED.
3.8 PROTECTION – NOT USED.

3.9 SCHEDULE

A. See Door Schedule - Sheet A3.31.

END OF SECTION 08 11 13
SECTION 08 14 00
WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
   1. Wood veneer faced flush doors.
   2. Wood doors; flush and flush glazed configuration; fire rated and non-rated, factory finished.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.
   2. Section 08 71 00 - Door Hardware.
   3. Section 08 80 00 - Glazing.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.
C. ASTM International (ASTM)
D. Forest Stewardship Council (FSC) STD-40-004 - Chain of Custody Standard.
E. National Fire Protection Association (NFPA)
   1. 80 - Standard for Fire Doors and Fire Windows.
F. 252 - Standard Method of Fire Tests for Door Assemblies.
G. Underwriters Laboratories (UL):
   1. 10B - Standard for Fire Tests of Door Assemblies.
   2. 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.
H. Window and Door Manufacturers Association (WDMA) - I.S.1A - Industry Standard for Architectural Flush Wood Doors.
I. Warnock Hersey - Certification Listings for Fire Doors.
J. Forest Stewardship Council – FSC Certification Policy

1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.
B. Indicate door elevations, stile and rail reinforcement, integral blocking and cutouts for door light kits and hardware.
C. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
D. Samples: Submit two samples of door veneer, 9 by 9 inch in size illustrating wood grain, stain color, and sheen (for factory finished doors).
E. Certificates of Compliance: Manufacturer's certification that doors comply with specified acoustical requirements.
F. Submit Manufacturer’s certification that doors meet or exceed specified fire rated requirements.
1.4 QUALITY ASSURANCE
A. Conform to requirements of NAAWS Quality Standard, Division 01 Premium Grade.
B. Installed doors conform to NFPA 80 for rating indicated.
C. Fire Door Construction: Conform to UL 10B.
D. Provide door labeling required as per 2015 IBC.

1.5 DELIVERY, STORAGE AND HANDLING
A. Protect products under provisions of Instructions to Bidders.
B. Package, deliver, and store doors in accordance with NAAWS, NWMA requirements.

1.6 PROJECT/SITE CONDITIONS – NOT USED.
1.7 SEQUENCING AND SCHEDULING – NOT USED.

1.8 EXTENDED WARRANTY
A. Provide manufacturer’s Limited Lifetime Warranty on interior applications under provisions of Division 01.

1.9 MAINTENANCE – NOT USED.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Algoma Hardwoods, Inc. (www.algomahardwoods.com).
C. Eggers Industries. (www.eggersindustries.com).
D. Oshkosh Door Co. (www.oshkoshdoor.com).
E. Marshfield Door Systems, Inc. (www.marshfielddoors.com).
F. VT Industries, Inc. (www.vtindustries.com).
H. Substitutions: Under provisions of Division 01.

2.2 MATERIALS – NOT USED.

2.3 MANUFACTURED UNITS
A. NAAWS Architectural Woodwork Standards, Section 9.
B. Solid core construction for fire rated and non-rated doors. (Mineral core for doors rated over 20 minutes.) Cores to carry FSC and Smartwood label endorsing 70 percent certified content and low VOC’s.
C. 7-ply or 5-ply construction, NAAWS Premium Grade.
D. Hardwood stiles and rails to match face veneer, bonded to core.
E. Wood veneer facing:
   1. Plain sliced white maple, book match and flitch matched veneers.
F. Factory installed blocking for hardware.
G. All fire-rated doors to be factory machined to maintain fire ratings.
H. Attach fire rating label to door edge per Warnock Hersey requirements.

2.4 EQUIPMENT – NOT USED.
2.5 COMPONENTS – NOT USED.
2.6 ACCESSORIES
   A. Glass and Glazing Accessories: Specified in Section 08 80 00 – Glazing.

2.7 MIXES – NOT USED.

2.8 FABRICATION
   A. NAAWS Architectural Woodwork Standards, Section 5.
   B. Factory Finish:
      1. Catalyzed Conversion Varnish; stain color and sheen as selected by Architect. Provide low VOC finish.

2.9 SOURCE QUALITY CONTROL – NOT USED.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Verify that frame is plumb and level, and ready to accept door.

3.2 PREPARATION – NOT USED.

3.3 INSTALLATION
   A. Install doors in accordance with Manufacturer’s instructions.
   B. Prepare doors to receive finish hardware in accordance with NAAWS Architectural Woodwork Standards.
   C. Install doors plumb and level. Conform to NAAWS Architectural Woodwork Standards, for fit tolerances.
   D. Coordinate installation of glass and glazing in door lites.

3.4 FIELD QUALITY CONTROL – NOT USED.

3.5 ADJUSTING
   A. Adjust for smooth and balanced door movement.

3.6 CLEANING – NOT USED.

3.7 DEMONSTRATION – NOT USED.

3.8 PROTECTION
   A. Protect factory finished doors from surface damage. Replace damaged doors.

3.9 SCHEDULE
   A. See Door Schedule - Sheet A3.31.

END OF SECTION 08 14 00
SECTION 08 31 13

ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
   1. Fire-resistive-rated and non-rated wall and ceiling access doors and frame units.
   2. Furnish inserts and anchoring devices that must be built into other work for installation of access doors.

B. Related Sections:
   1. Division 01: General Conditions.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.

B. UL-Fire Resistance Directory.
   1. 10B – Fire Tests of Door Assemblies.

C. ASTM International (ASTM):
   5. A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

D. Underwriters Laboratories (UL)
   1. 10B - Standard for Fire Tests of Door Assemblies.


1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Product Data: Provide data on unit construction, size, configuration and attachment method.

C. Manufacturer's Installation Instructions.

1.4 QUALITY ASSURANCE

A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are labeled and listed by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction:
   1. UL 10B for vertical access doors.
   2. UL 263 for horizontal access doors and frames.
B. Size Variations: Obtain Architect’s acceptance of manufacturer’s standard-size units, which may vary slightly from sizes indicated.

1.5 DELIVERY, STORAGE AND HANDLING – NOT USED.
1.6 PROJECT/SITE CONDITIONS – NOT USED.

1.7 SEQUENCING AND SCHEDULING

A. Under provisions of Division 1.
B. Coordinate delivery with other work requiring access doors to avoid delay.

1.8 EXTENDED WARRANTY – NOT USED.
1.9 MAINTENANCE – NOT USED.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Fire Resistive and Non-Rated Wall and Ceiling Access Panels:
1. Acudor Products, Inc. (www.acudor.com)
2. Babcock-Davis Hatchways, Inc. (www.babcockdavis.com)
5. J.L. Industries. (www.jlindustries.com)
7. Milcor. (www.milcorinc.com)
8. Nystrom Building Products, Inc. (www.nystrom.com)
9. Or equal substitution under provisions of Division 01.

2.2 MATERIALS

A. Steel Plates, Shapes and Bars: ASTM A 36/A 36M.
B. Cold-Rolled Steel Sheets: Commercial Steel (CS), ASTM A1008/A1008M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified nominal thickness according to ASTM A 568/A 568M. Electrolytic zinc-coated steel sheet, Class C coating, may be substituted at fabricator’s option.
C. Shop Primer for Ferrous Metal: Fast-drying, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

2.3 MANUFACTURED UNITS

A. Wall and Ceiling Access Doors - fire resistive rated.
1. UL “B” labeled, insulated.
2. Size: As indicated on drawings.
B. Wall and Ceiling Access Door - non-rated.
1. Size: As indicated in schedule and/or drawings.

2.4 EQUIPMENT – NOT USED.
2.5 COMPONENTS – NOT USED.
2.6 ACCESSORIES – NOT USED.
2.7 MIXES – NOT USED.

2.8 FABRICATION

A. Door: Flush panel with core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch for frame and 0.060 inch for panel with 1” wide surface mounted trim.
B. Hinge: Continuous concealed
C. Automatic Closer: Spring type.
D. Latch: Self-latching bolt operated by gnarled knob with interior release.
E. Lock: Key-operated cylinder locksets, 7 pin removable and interchangeable core cylinders equal to Section 08 71 00.

2.9 SOURCE QUALITY CONTROL – NOT USED.

PART 3 - EXECUTION

3.1 EXAMINATION – NOT USED.
3.2 PREPARATION – NOT USED.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Install plumb and level in openings. Secure rigidly in place.
C. Position units where indicated or where required to provide convenient access to concealed work requiring maintenance.

3.4 FIELD QUALITY CONTROL – NOT USED.

3.5 ADJUSTING

A. Adjust unit for smooth operation.

3.6 CLEANING

A. Under provisions of Division 01.

3.7 DEMONSTRATION – NOT USED.
3.8 PROTECTION – NOT USED.

3.9 SCHEDULE

A. Each contractor shall provide access doors in size and rating required for access to their systems and equipment requiring access for operation, maintenance, or cleaning.

END OF SECTION 08 31 13
SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Commercial door hardware for the following:
      a. Swinging doors.
      b. Other doors to the extent indicated.
   2. Cylinders for doors specified in other Sections.
   3. Electrified door hardware.

B. Related Sections include the following:
   1. Division 08 Section "Hollow Metal Doors and Frames"
   2. Division 08 Section "Flush Wood Doors"
   3. Division 26 Sections for connections to electrical power system and for low-voltage wiring work.
   4. Division 28 Section "Access Control" for access control devices installed at door openings and provided as part of a security access system.

C. Products furnished, but not installed, under this Section include the following.
   Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.
   1. Thresholds, weather stripping, and cylinders for locks specified in other Sections.

1.3 PRICING AND PAYMENT PROCEDURES — NOT USED

A. Alternates
   1. Provide base bid hardware as scheduled. Provide alternate pricing to convert scheduled base bid products to the alternate products approved in this section.

1.4 REFERENCED STANDARDS

A. Provide hardware in accordance with the following standards in addition to those specified in Division 01 Section “References”.
   2. Builders Hardware Manufacturer’s Association (BHMA)
      a. ANSI/BHMA A156.3: Exit Devices, 2008 edition
      b. ANSI/BHMA A156.4: Door Controls - Closers, 2008 edition
      e. ANSI/BHMA A156.18: Materials and Finishes, 2006 edition
      e.f. ANSI/BHMA A156.2: Bored and Preassembled Locks and Latches, 2011 edition
   3. Door and Hardware Institute (DHI)
      a. Recommended Locations for Architectural Hardware for Flush Wood
Doors, 1993 edition
e. Sequence and Format for the Hardware Schedule, 2001 edition
4. National Fire Protection Association (NFPA)
a. NFPA 70: National Electrical Code, edition as adopted by local AHJ.
b. NFPA 80: Standard for Fire Doors and Other Opening Protectives, edition as adopted by local AHJ.
c. NFPA 252: Standard Methods of Fire Tests of Door Assemblies, edition as adopted by local AHJ.

1.5 SUBMITTALS

A. Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Details of electrified door hardware, indicating the following:
   1. Wiring Diagrams: Power, signal, and control wiring. Include the following:
      a. System schematic.
      b. Point-to-point wiring diagram.
      c. Riser diagram.
      d. Elevation of each door.
   2. Detail interface between electrified door hardware and fire alarm, access control, security, building control system.
   3. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.

C. Samples for Verification: For exposed door hardware of each type, in specified finish, full size. Tag with full description for coordination with the door hardware sets. Submit Samples before, or concurrent with, submission of the final door hardware sets, if requested.
   1. Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.

D. Qualification Data: For Installer

E. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for locks, latches, and closers as requested.

F. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

G. Warranty: Special warranty specified in this Section.

H. Door Hardware Sets: Prepared by or under the supervision of Architectural Hardware Consultant, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final door hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
   1. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
   2. Content: Include the following information:
      a. Identification number, location, hand, fire rating, and material of each door and frame.
      b. Type, style, function, size, quantity, and finish of each door hardware item.
c. Complete designations of every item required for each door or opening including name and manufacturer.

d. Fastenings and other pertinent information.

e. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.

f. Explanation of abbreviations, symbols, and codes contained in schedule.

g. Mounting locations for door hardware.

h. Door and frame sizes and materials.

i. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.

1) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.

j. List of related door devices specified in other Sections for each door and frame.

3. Submittal Sequence: Submit the final door hardware sets at earliest possible date, particularly where approval of the door hardware sets must precede fabrication of other work that is critical in Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the door hardware sets.

3.1 Keying Schedule: Prepared by or under the supervision of Architectural Hardware Consultant, detailing Owner’s final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

1.6 QUALITY ASSURANCE

A. INSTALLER QUALIFICATIONS: AN EMPLOYER OF WORKERS TRAINED AND APPROVED BY LOCK MANUFACTURER.

1. Installer’s responsibilities include supplying and installing door hardware and providing a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

2. Installer shall have warehousing facilities in Project’s vicinity.


4. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer’s standard units in assemblies similar to those indicated for this Project.

B. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant 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.

C. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

D. Fire-Rated Door Assemblies: 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 and UBC Standard 7-2.

1. Test Pressure: After 5 minutes into the test, neutral pressure level in furnace shall
be established at 40 inches (1016 mm) or less above the sill.

A. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

F. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." In addition to Owner, Construction Manager, Contractor, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant and Owner's Security Consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2. Preliminary key system schematic diagram.
3. Requirements for key control system.
4. Address for delivery of keys.

G. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
B. Tag each item or package separately with identification related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.
C. Deliver keys to Owner’s Representative by registered mail or overnight package service.

1.8 COORDINATION

A. Coordinate layout and installation of recessed hardware with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.
B. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
C. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control system, security system, and building control system.
C.D. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control system, security system, and building control system.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
a. Structural failures including excessive deflection, cracking, or breakage.
b. Faulty operation of operators and door hardware.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Three (3) years from date of Substantial Completion, except as follows:
   a. Continuous Hinges: Lifetime of Building
   b. Mortise Locks: Five (5) years from date of Substantial Completion.
   c. Grade 1 Cylindrical Locks: Ten (10) years from date of Substantial Completion.
   d. Exit Devices: Three (3) years from date of Substantial Completion.
   e. Manual Closers: Thirty (30) years from date of Substantial Completion.
   f. Electrified Hardware Items: One (1) year from date of Substantial Completion.

1.10 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, provide six (6) months' full maintenance by skilled employees of door hardware installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies same as those used in the manufacture and installation of original products.

1.11 EXTRA MATERIALS

A. Furnish full-size units of door hardware described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Door Hardware:
   1. 1 each Von Duprin 98-L x 626 Exit Devices
   2. 1 each Schlage L9071HD x 626 Locksets
   3. 1 each LCN 4050 EDA x 689 Closers

PART 2 - PRODUCTS

2.1 SCHEDULED HARDWARE

A. Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of finish hardware are indicated in the "Hardware Schedule" at the end of this Section. Products are identified by using hardware designation numbers of the following:

1. Manufacturer's Product Designations: The product designation and name of one manufacturer are listed for each hardware type required for the purpose of establishing minimum requirements. Provide either the product designated or, where more than one manufacturer is specified under the Article "Manufacturers" in Part 2 for each hardware type, the comparable product of one of the other manufacturers that complies with requirements.

2.2 MATERIALS AND FABRICATION

A. General
1. Manufacturer's Name Plate: Do not use manufacturers' products that have manufacturer's name or trade name displayed in a visible location ( omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise acceptable to Architect.
   a. Manufacturer's identification will be permitted on rim of lock cylinders only.
2. Base Metals: Produce hardware units of basic metal and forming method indicated using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units for finish designations indicated.
3. Provide hardware manufactured to conform to published templates generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.

B. Fasteners
1. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Furnish stainless steel (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
2. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners. Use through bolts only as indicated in this section unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Where thru-bolts are used as a means of reinforcing the work, provide sleeves for each thru-bolt or use sex screw fasteners.

2.3 Hinges

A. Basis of Design
1. Ives: 5BB1 5BB1HW

B. Acceptable Alternate
1. Hager: BB1279 BB1168
2. Stanley: FBB179 FBB168
3. McKinney: TB2714 T4B3386
4. Bommer: BB5000 BB5004

C. Requirements:
1. Quantity: Provide 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.
2. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
3. Hinge Weight: As indicated in hardware sets.
4. Hinge Base Metal: Unless otherwise indicated, provide the following:
   b. Interior Hinges: Steel with steel pin.
   c. Hinges for Fire-Rated Assemblies: Steel with steel pin.
5. Hinge Options: Where indicated in door hardware sets or on Drawings:
   a. Safety Stud: Designed for stud in one leaf to engage hole in opposing leaf.
   b. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for out-swinging doors.
   c. Corners: Square.
6. Fasteners: Comply with the following:
b. Wood Screws: For wood doors and frames.
c. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.

2.4 Continuous Hinges

A. Basis of Design:
   1. Ives: 112HD, 224HD

B. Acceptable Alternate:
   1. Stanley: 661HD, 662HD
   2. Hager: 780-112HD, 780-224HD
   5. Pemko: FMSLFHD, FMHD

C. Requirements:
   1. Geared Continuous Hinges: Shall utilize a single gear section for the door leaf and a separate gear section for the frame side of the door. Provide full mortise or surface applied hinge as scheduled in each set. Geared hinges are to be UL 10C tested and approved for 90 minutes.

2.5 OPERATING DOOR TRIM

A. Door Bolts

   1. Basis of Design:
      a. Ives: FB358/FB458 FB31/FB41

   2. Acceptable Alternate:
      a. Rockwood: 557/555 1842/1948
      b. Hager: 283D/282D 282D/291D
      c. Trimco: 3915/3917 3810/3815

   3. Requirements:
      a. Provide bolt model recommended by manufacturer for door material type.
      b. Provide 1 inch throw stainless steel bolt with 12 inch length unless otherwise scheduled in the sets.
      c. Provide a dust proof strike for bottom bolt at all locations where there is not a threshold.

B. Coordinators

   1. Basis of Design:
      a. Ives: COR x FL MB

   2. Acceptable Alternate:
      a. Rockwood: 1600 Series 1601 Series
      b. Hager: 297 Series 297 Series
      c. Trimco: 3094 3095

   3. Requirements:
      a. Provide bar type coordinator and filler bar of size as recommended by manufacturer for each opening.
      b. Provide mounting brackets as required for soffit mounted hardware to be compatible with coordinator.

C. Decorative Door Pulls

   1. Basis of Design:
      a. Ives: 9264F
3

Requirements:

a. Provide door pulls 1-1/4 inch diameter with flat tips. Pull shall be constructed of brass, bronze, or stainless steel.
b. Provide pull length and shape as indicated in the sets.

2.52.6 Electric Strikes

A. Basis of Design:
   1. Von Duprin: 6300 Series

B. Acceptable Alternate:
   1. HES: 9000 Series

C. Requirements:
   1. Provide electric strikes that are continuous duty rated without the use of external rectifiers.
   2. Provide electric strikes with function (fail safe, fail secure) and power requirements as scheduled.

2.62.7 LOCKS AND LATCHES

A. General:
   1. Lock Chassis: Shall be made from steel, with locking spindles of stainless steel.
   2. Latch Bolt: Shall be constructed of stainless steel with 3/4 inch throw on mortise locks and 1/2 inch throw otherwise. Latch to be deadlocking on keyed functions.
   3. Lever Trim: Shall be pressure cast brass, bronze, zinc, or steel with wrought rose design. Levers are to be solid with no voids or plastic inserts.
   4. Fire Rating: Lock shall be listed for up to 3 hours.
   5. Strike Plates: Provide ANSI 4-7/8 inch strike plates. At pairs of doors, provide strike with 7/8 inch flat lip. At single doors, provide round-lipped strike with lip length as required to minimally clear jamb and trim. Provide dust box at each strike location.

B. Mortise Locks

   1. Acceptable Products:
      a. Basis of Design:
         1) Schlage: L Series, 06A Trim Design
      b. Acceptable Alternate:
         1) Falcon: MA Series, Dane-Gala Trim Design
         2) Sargent: 8200 Series, LN Trim Design
         3) Best: 40H Series, 15R Trim Design
   2. Requirements:
      a. ANSI Grade: BHMA/ANSI A156.13, Series 1000, Grade 1.
      b. Deadbolt: Shall be constructed of stainless steel and include security roller pins. Shall have a minimum 1 inch throw.
      c. Spring Cages: Lock shall have individual external spring cages for each lever.
      d. Lever Spindles: Provide lockset with independent, breakaway type lever spindles. Spindles that are continuous through the lock case are not acceptable.
      e. Hub Blocking: Provide lockset with a hub blocking plate to resist unauthorized entry.
      f. Vandal Resistant Lever: Where scheduled, provide lockset with lever that freely rotates even when locked to resist vandalism and abuse.
g. Thumbturns: Provide thumbturns as enlarged, ADA designated style thumbturns.

h. Visual Indicator: Where scheduled, provide visual indicator showing “Vacant” or “Occupied”.

C. Grade 1 Bored Locks

1. Acceptable Products:
   a. Basis of Design:
      1) Schlage: ND Series, Rhodes Lever
   
   b. Acceptable Alternate:
      1) Falcon: T Series, Dane Lever
      2) Sargent: 10 Line, LL Lever
      3) Best: 9K Series, 15D Lever

2. Requirements:
   a. ANSI Grade: BHMA/ANSI A156.2, Series 4000, Grade 1.
   c. Anti-Rotation Plate: Provide lockset with a mechanically interlocked anti-rotation plate. Anti-Rotation teeth or “bite tabs” are not acceptable. Locks without any rotation prevention devices are not acceptable.
   d. Lever Return Springs: Provide each lever with two compression type return springs that are easily accessible without dismantling the lock chassis. Locks utilizing tension or torsion lever return springs are unacceptable. Locks with internal springs that require dismantling the lock chassis are unacceptable.
   e. Lever Spindles: Provide lock with either milled or 1-piece deep drawn spindles. 2-piece interlocking stamped spindles are not acceptable.
   f. Multi-Functionality: Provide modular lockset with capability to convert to a new lock function by changing key cams.
   g. Vandal Resistant Lever: Where scheduled, provide lockset with lever that freely rotates even when locked to resist vandalism and abuse.

D. Deadbolts

1. Requirements:
   a. Provide deadbolts by same manufacturer as the provided locksets.
   b. Provide chassis type, function, and grade as scheduled.

2.72.8 CYLINDERS AND CORES

A. Requirements:

1. Small Format Interchangeable Cylinders: Provide cylinders of quantity and type and with the appropriate cam/tailpiece to be compatible with the locking hardware provided. Provide cylinder housings ready to accept 7-pin, Small Format Interchangeable Cores (SFIC).
   a. Disposable Temporary Cores: Provide each cylinder housing and/or lock lever with disposable construction cores during the construction period.
   b. Keyed Temporary Cores: Provide each cylinder housing and/or lock lever with keyed construction core during the construction period. Cores will remain property of the contractor and will be returned upon installation of owner’s permanent key system.
   c. Permanent Cores: Provided by Owner

2. Keys: Provide cylinder manufacturer’s standard keys. Keys shall be shipped separate from cores directly to owner’s representative. For estimating purposes, provide keys in the following quantities:
   a. Construction Control Keys: 2 each
b. Construction Change Keys: 12 each
c. Split Key Voiding Keys: 2 each

2.92.9 EXIT DEVICES

A. Acceptable Products:
   1. Basis of Design:
      a. Von Duprin: 98/35A Series
   2. Acceptable Alternate:
      a. Falcon: 25/24 Series
      b. Sargent: 88 Series

B. Requirements:
   1. ANSI Grade: BHMA/ANSI A156.3, Grade 1.
   2. Device Construction:
      a. Exit device(s) shall have a mechanism case constructed of extruded aluminum or wrought stainless steel, base plates constructed of cold rolled or cast steel, push pad of extruded aluminum with stainless steel covering or wrought stainless steel, and end caps with flush mounted, sloped design. At full-glass doors, provide exit devices with no exposed fasteners or rivets visible through glass. Where required by stile width, provide narrow-stile type device.
      b. Latchbolt: Provide Pullman-type deadlocking latch bolts constructed of stainless steel. Where specified provide high security Pullman-type latchbolt that collapses to be square faced under high pull forces. Latch return springs shall be compression type. Tension and Torsion latch return springs are not acceptable.
      c. Dogging Mechanism: where dogging or latch-retraction options are not specifically scheduled for non-fire rated doors, provide device with a hex-key activated hook-type dogging mechanism constructed of steel.
      d. Sound Dampening: Device shall be provided with factory-installed sound dampening materials.
      e. Provide device type, function, and trim style as indicated in hardware schedules.
   3. Where exit device(s) are provided for fire rated door, provide with fire listing and label indicating “Fire Exit Hardware”. If device is mounted on wood doors, provide sex nuts and bolts.
   4. Provide shim kits, filler plates, and other accessories as required for each opening.
   5. Unless otherwise indicated in the sets, provide device with roller-type strike.
   6. Where scheduled, provide removable mullions by same manufacturer as provided exit devices. Provide mullion stabilizers, key removable option, strike preps, and fire rating as indicated in sets.

2.92.10 MECHANICAL DOOR CLOSERS

A. General:
   1. Valves: Closers shall have separate valves for latch speed, main speed, and back check. Valves shall be staked to prevent accidental removal. Provide the appropriate closer body, handing, and brackets to mount closer inside the building on the least-public side of the door.
      a. Where closers are to be mounted parallel arm, provide with heavy duty, fully forged arms.
      b. Where closers are to be mounted regular arm and the opening can otherwise be opened to 180 degrees, provide closer with the appropriate
special templating to allow 180 degree door swing. Where a special template is not available for 180 degree swing, provide closer arm with integrated stop.

2. Integrated Stop Closer Arms: Where a closer with integrated stop is required, provide the appropriate closer and arm as follows:
   a. Parallel arm with spring-cushioned stop arm: Provide where door is otherwise able to open to 95 degrees and requires a parallel arm mount closer.
   b. Parallel arm with dead stop arm: Provide where door is obstructed from opening to 95 degrees and requires a parallel arm mount closer.
   c. Regular arm with push side surface-mounted overhead stop: Provide where door closer should mount on pull side of door.

3. Hold Open Arms: Provide closer arms with mechanical hold-opens as scheduled.

4. Provide closers with any special templates, brackets, plates, or other accessories required for interface with header, door, wall, and other hardware. Provide closers with screw packs containing thru-bolts, machine screws, and wood screws.

5. Closers shall be provided with all-weather fluid and shall not require readjustment from 120 degrees F to -30 degrees F. Fluid shall be non-flaming and shall not fuel door or floor covering fires. Upon request, provide data indicating thermal properties of fluid.

6. Closers shall close and latch door when adjusted to meet accessibility requirements for door opening force: 8.5 lbs at exterior doors, 5 lbs at interior doors, and 15 lbs at labeled fire doors.

B. Heavy Duty Door Closers:
   1. Basis of Design:
      a. LCN 4050
   2. Acceptable Alternate:
      a. Sargent: 351
      b. Falcon: SC71

   3. Requirements:
      a. ANSI Grade: BHMA/ANSI A156.4, Grade 1.
      b. Closer Construction: Closer shall have cast iron or aluminum alloy body with 1-1/2 inch steel piston, double heat treated pinion, 5/8 inch bearing journals, and full complement needle or caged ball bearings. Closer shall be adjustable from sizes 1 through 6.

ARCHITECTURAL DOOR TRIM

A. Protection Plates and Edge Guards
   1. Basis of Design:
      a. Ives 8400 Series
   2. Acceptable Alternate:
      a. Rockwood: K1050
      b. Hager: 194S
      c. Trimco: K Series

   3. Requirements:
      a. Provide .050 inch thick stainless steel protection plates with height as scheduled. Plate shall have four beveled edges and countersunk screws. Provide plate with width as follows:
         1) Pairs of Doors: Provide plate to be 1 inch less door width.
         2) Single Doors: Provide plate to be 2 inches less door width on push side, pull side mounted plates to be 1 inch less door width.
      b. Where plate exceeding 16 inches in height is scheduled on fire rated door,
provide visual UL marking on plate and fasten using adhesive rather than screws.

B. Door Stops and Holders
   1. Basis of Design:
      a. Ives: WS401
   2. Acceptable Alternate:
      a. Rockwood: 405/406
      b. Hager: 236W
      c. Trimco: 1270
   3. Requirements:
      a. Provide stops and holders as indicated in the HW sets.
      b. Where wall bumpers are scheduled, provide concave rubber bumper where the adjacent lever trim incorporates a push-button. Otherwise, provide convex rubber bumpers.

2.12 OVERHEAD STOPS AND HOLDERS

A. Acceptable Products:
   1. Basis of Design:
      a. Glynn Johnson: 100 Series 90 Series
   2. Acceptable Alternate:
      a. Rixson-Firemark: 6 Series 9 Series
      b. ABH: 1000 Series 9000 Series

B. Requirements:
   1. Provide overhead stops and holders as scheduled, sized per manufacturer’s recommendations based on door width.
   2. Provide concealed overhead stops with adjustable jamb bracket.
   3. Where possible without conflicting with other hardware, mount surface overhead stops on least public side of door.
   4. Provide stops with any special templates, brackets, plates, or other accessories required for interface with header, door, wall, and other hardware.

2.12.13 SADDLE AND PANIC THRESHOLDS

A. Acceptable Products:
   1. Zero International: 655A
   2. National Guard: 425HD
   3. Pemko: 1715A

B. Requirements:
   1. Saddle thresholds: Provide with length equal to the width of the opening.
   2. Panic thresholds: Provide with length equal to the overall frame width. Provide with mitered and welded ends.
   3. Where floor closers are scheduled with thresholds, provide threshold with factory cut outs to be compatible with the provided floor closer.
   4. Provide stainless steel machine screws and lead anchors for each threshold.

2.12.14 WEATHERSTRIP AND GASKET

A. General:
   1. Provide weather strip and gasketing as scheduled.
   2. Size weather strip and gasket to provide a continuous seal around opening and at meeting stiles.

B. Perimeter Seals
1. Acceptable Products:
   a. Zero: 429A
   b. National Guard: 700SA
   c. Pemko: 2891AS

C. Astragals, Meeting Stiles, and Mullion Seals
1. Acceptable Products:
   a. Zero: 8780N
   b. National Guard: 5100
   c. Pemko: 5100SB

2. Requirements:
   a. Where overlapping astragals are scheduled on exterior doors, provide with thru-bolts.
   b. Where overlapping astragals are scheduled on out-swinging doors, provide for mounting on the pull-side of the active leaf. Otherwise, provide for mounting on the push-side of the inactive leaf.

D. Door Bottoms
1. Acceptable Products:
   a. Zero: 8198AA
   b. National Guard: C627A
   c. Pemko: 3452CNB

E. Rain Drips
1. Acceptable Products:
   a. Zero: 142A
   b. National Guard: 16A
   c. Pemko: 346C

2.132.15 MISCELLANEOUS HARDWARE

A. Silencers
1. Acceptable Products:
   a. Ives: SR64
   b. Rockwood: 608
   c. Hager: 307D
   d. Trimco: 1229A
2. Requirements:
   a. Where indicated on single openings, provide 3 each rubber silencers on lock jamb.
   b. Where indicated on paired openings, provide 2 each rubber silencers on header.

2.16 ELECTRONIC ACCESSORIES

A. Power Supplies
1. Basis of Design:
   a. Schlage Electronics: PS900 Series
2. Acceptable Alternate:
   a. Securitron: BPS Series
   b. Security Door Controls: 600 Series
   c. Precision: ELR Series
   d. Sargent: 3500 Series
3. Requirements:
   a. Provide power supplies, recommended and approved by the manufacturer of the electrified locking component, for the operation of
electrified locks, electrified exit devices, magnetic locks, electric strikes, and other components requiring a power supply.

b. Provide the appropriate quantity of power supplies necessary for the proper operation of the electrified locking component and/or components as recommended by the manufacturer of the electrified locking components with consideration for each electrified component utilizing the power supply, the location of the power supply, and the approved wiring diagrams. Locate the power supplies as directed by the Architect.

c. Provide a power supply that is regulated and filtered 24 VDC, or as required, and UL class 2 listed.

d. Options: Provide the following options.
   1) Provide a power supply, where specified, with the internal capability of charging optional sealed backup batteries 24 VDC, or as required, in addition to operating the DC load.
   2) Provide sealed batteries for battery back-up at each power supply where scheduled.
   3) Provide keyed power supply cabinet.
   4) Provide a power supply complete requiring only 120VAC to the fused input and shall be supplied in an enclosure.

e. Provide a power supply with emergency release terminals, where required, that allow the release of all devices upon activation of the fire alarm system complete with fire alarm input for initiating “no delay” exiting mode.

B. Electric Power Transfers
   1. Basis of Design:
      a. Von Duprin: EPT-10
   2. Acceptable Alternate:
      a. Falcon: EPT-10
      b. Securitron: CEPT
   3. Requirements:
      a. Provide edge-mounted electric power transfer with either two 18 gauge wires or ten 24 gauge wires as scheduled.
      b. Provide transfer capable of carrying a 16 Amp current for a minimum of .3 seconds.

2.14 HIGH SECURITY EMERGENCY KEY BOX

A. Acceptable Products:
   1. Knox, Inc. 3200 Series x RMK

B. Requirements:
   1. Provide recess mounted emergency key box as approved by the local fire jurisdiction. Key box to be master-keyed as dictated by local fire jurisdiction.

2.152.17 FINISHES

A. Match items to the manufacturer's standard color and texture finish for the latch and locksets (or push-pull units if no latch or locksets).

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

C. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18, "Materials and Finishes," including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.
D. The designations used in schedules and elsewhere to indicate hardware finishes are the industry-recognized standard commercial finishes, except as otherwise noted.
   1. Brushed Chrome and/or Stainless Steel Appearance
      e. Weatherstrip and Gasket: Clear Anodized Aluminum finish.

PART 3 - EXECUTION

3.1 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. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Steel Doors and Frames: Comply with DHI A115 Series.
   1. Surface-Applied Door Hardware: Drill and tap doors and frames according to ANSI A250.6.
B. Wood Doors: Comply with DHI A115-W Series.

3.3 INSTALLATION

A. Pre-installation conference shall be conducted prior to installation of hardware at Project site. Meet with the, Owner, Contractor, installer, and manufacturer’s representatives. A separate pre-installation conference shall be conducted prior to the installation of electronic security hardware with the electrical contractor Review catalogs, brochures, templates, installation instructions, and the approved hardware schedule. Survey installation procedures and workmanship, with special emphasis on unusual conditions, as to ensure correct technique of installation, and coordination with other work. Notify participants at least ten, 10 working days before conference.
B. Hardware Installers must have a minimum of five (5) years’ experience in installation of hardware. Provide verification of installer’s qualification to Consultant for approval. All installers to attend review meetings with the hardware distributor.
C. Install hardware using only manufacturer supplied and approved fasteners in strict adherence with manufacturers published installation instructions.
D. Install head seal prior to installation of “PA”-parallel arm mounted door closers and push side mounted door stops/holders. Trim, cut and notch thresholds and saddles neatly to minimally fit the profile of the door frame. Install thresholds and saddles in a bed of caulk completely sealing the underside from water and air penetration.
E. Counter sink through bolt of door pull under push plate during installation.
F. Mounting Heights: Mount door hardware units at heights indicated, as follows, unless otherwise indicated or required to comply with governing regulations.
   2. Custom Steel Doors and Frames: DHI’s "Recommended Locations for Builders’ Hardware for Custom Steel Doors and Frames."
Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

G. 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 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

H. Boxed Power Supplies: Locate power supplies as indicated. Verify location with Architect.

1. Configuration: Provide one power supply for each door opening.
2. Configuration: Provide the least number of power supplies required to adequately serve doors with electrified door hardware.

I. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

3.4 FIELD QUALITY CONTROL

A. Architectural Hardware Consultant: Architect shall engage a qualified Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

B. Architectural Hardware Consultant shall inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
2. Door Closers: Unless otherwise required by authorities having jurisdiction, 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 (75 mm) from the latch, measured to the leading edge of the door.

B. Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 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. Refer to Division 01 Section "Demonstration and Training."

3.8 DOOR HARDWARE SETS

A. The following schedule of hardware sets shall be considered a guide and the supplier is cautioned to refer to general conditions, special conditions, and the full requirements of this section. It shall be the hardware supplier's responsibility to furnish all required hardware.

B. Where items of hardware are not definitely or correctly specified and are required for completion of the Work, a written statement of such omission, error, conflict, or other discrepancy shall be sent to the Architect, prior to date specified for receipt of bids, for clarification by addendum.

C. Adjustments to the Contract Sum will not be allowed for omissions or items of hardware not clarified prior to bid opening.

HW SET NO: 01
DOOR NUMBER: (INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING DOORS) 106C

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114

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108

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1 EA CONTINUOUS HINGE 224HD 628 IVE

(Door 104)

3 EA HINGE 5BB1 4.5 X 4.5 NRP 652 IVE
1 EA CLASSROOM LOCK L9070HD 06A 626 SCH
1 EA PERMANENT CORE FURNISHED BY OWNER 626 MED
1 EA KICK PLATE 8400 10" X 2" LDW B-CS 630 IVE
1 EA WALL STOP WS401CVX 626 IVE
3 EA SILENCER SR64 GY IVE

HW SET NO: 05
DOOR NUMBER: (INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING DOORS)
103A 110A

EACH TO HAVE:

3 EA HINGE 5BB1 4.5 X 4.5 NRP 652 IVE
1 EA CLASSROOM SECURITY L9071HD 06A L283-711 (INDICATOR ON CLASSROOM SIDE) 626 SCH
2 EA PERMANENT CORE FURNISHED BY OWNER 626 MED
1 EA SURFACE CLOSER 4050 HEDA 689 LCN
1 EA KICK PLATE 8400 10" X 2" LDW B-CS 630 IVE
1 EA WALL STOP WS401CVX 626 IVE
3 EA SILENCER SR64 GY IVE

HW SET NO: 06
DOOR NUMBER: (INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING DOORS)
105

EACH TO HAVE:

3 EA HINGE 5BB1 4.5 X 4.5 NRP 652 IVE
1 EA STOREROOM LOCK L9080HD 06A 626 SCH
1 EA PERMANENT CORE FURNISHED BY OWNER 626 MED
1 EA KICK PLATE 8400 10" X 2" LDW B-CS 630 IVE
1 EA WALL STOP WS401CVX 626 IVE
3 EA SILENCER SR64 GY IVE

HW SET NO: 07
DOOR NUMBER: (INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING DOORS)
106B

EACH TO HAVE:

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**HW SET NO: 08**

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111

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**AUTO LOCK/UNLOCK THROUGH ACCESS CONTROL SYSTEM FOR PUSH/PULL OPERATION. CARD OR KEYPAD**
ENTRANCE AFTER HOURS. USER PRESENTS CREDENTIAL, EXIT DEVICE LATCH RETRACTS, USER OPENS DOOR TO ENTER.
CARD IN. USER PRESENTS CREDENTIAL, ELECTRIC STRIKE KEEPER RELEASES, USER OPENS DOOR TO ENTER.

**HW SET NO: 09**  
**DOOR NUMBER:** (INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING DOORS)  
103B 110B

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101 102

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106A

EACH TO HAVE:

- 6 EA HINGE 5BB1HW 4.5 X 4.5 NRP 652 IVE
- 1 EA REMOVABLE MULLION KR4954 689 VON
- 1 EA PANIC HARDWARE CD-99-DT 626 VON
- 1 EA PANIC HARDWARE CD-99-NL 626 VON
- 1 EA SFIC MULLION CYL 80-132 626 SCH
- 2 EA SFIC DOGGING CYL 80-132 XQ11-948 626 SCH
- 1 EA SFIC RIM CYLINDER 80-159 626 SCH
- 4 EA PERMANENT CORE FURNISHED BY OWNER 626 MED
- 2 EA SURFACE CLOSER 4050 HCUSH 689 LCN
- 2 EA CUSH SHOE SUPPORT 4050-30 689 LCN
- 2 EA KICK PLATE 8400 10" X 2" LDW B-CS 630 IVE
- 2 EA WALL STOP WS401CVX 626 IVE
- 3 EA SILENCER SR64 GY IVE
- 1 EA HALF-SADDLE THRESHOLD 655A MSLA-10 AL ZER

EXIT DEVICES MAY BE MECHANICALLY DOGGED BY CYLINDER FOR PUSH/PULL OPERATION.

HW SET NO: 12
DOOR NUMBER: (INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING DOORS)
100

EACH TO HAVE:

- 2 EA CONTINUOUS HINGE 224HD 628 IVE
- 1 EA KEYED REMOVABLE MULLION KR4954-STAB 689 VON
- 1 EA PANIC HARDWARE CD-99-DT 626 VON
- 1 EA PANIC HARDWARE CD-99-NL 626 VON
- 1 EA SFIC MULLION CYL 80-132 626 SCH
- 1 EA SFIC RIM CYLINDER 80-159 626 SCH
- 4 EA PERMANENT CORE FURNISHED BY OWNER 626 MED
- 2 EA SURFACE CLOSER 4050 SCUSH 689 LCN
- 2 EA CUSH SHOE SUPPORT 4050-30 689 LCN
- 2 EA KICK PLATE 8400 10" X 2" LDW B-CS 630 IVE
- 1 SET SEAL 429A AL ZER
- 1 EA MULLION SEAL 8780NBK PSA BK ZER
- 2 EA DOOR SWEEP 8198AA AL ZER
- 1 EA THRESHOLD 655A MSLA-10 AL ZER

EXIT DEVICES MAY BE MECHANICALLY DOGGED BY CYLINDER FOR PUSH/PULL OPERATION.

HW SET NO: 13
DOOR NUMBER: (Includes but is not limited to the following doors)
115

PIONEER SCHOOL OF THE ARTS GYMNASIUM ADDITION 08 71 00/22 04/18/2018
AUTO LOCK/UNLOCK THROUGH ACCESS CONTROL SYSTEM FOR PUSH/PULL OPERATION. CARD OR KEYPAD ENTRANCE AT ALL TIMES. USER PRESENTS CREDENTIAL, EXIT DEVICE LATCH RETRACTS, USER OPENS DOOR TO ENTER.

END OF SECTION 08 71 00
SECTION 08 80 00
GLAZING

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
1. Glass and glazing for hollow metal frames and doors.
2. Glass and glazing for aluminum framed entrances and storefronts.
3. Glass and glazing for wood doors.

B. Related Sections:
1. Division 01: Administrative, procedural, and temporary work requirements.
2. Section 07 92 00 - Joint Sealants.
4. Section 08 14 00 - Wood Doors.

C. Performance Requirements
1. Glass and glazing materials of this Section shall provide continuity of building enclosure air barrier and vapor retarder.
   a. In conjunction with materials described in Section 07 92 00 – Joint Sealants.
   b. To utilize the inner pane of multiple pane sealed units for the continuity of the air and vapor seal.
   c. Maintain continuous air barrier and vapor retarder throughout glazed assembly from glass pane to heel bead of glazing sealant.
2. Size glass to withstand dead loads and positive and negative live loads acting normal to plane of glass as calculated in accordance with 2015 IBC. Chapter 16.
3. All glazing shall be type and quality as required to meet 2015 IBC requirements for safety glazing. Provide labeling required as per 2015 IBC Section 2406.3.
4. All glazed openings in 2 hour fire rated occupancy separation walls shall be glazed with 3/16 inch thick ceramic glass, 90 minute fire rated where indicated on Drawings and Schedules.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.
D. American Society of Civil Engineers (ASCE) (www.asce.org) 7 - Minimum Design Loads for Buildings and Other Structures.
E. ASTM International (ASTM) (www.astm.org):
18. E546 - Test Method for Frost/Dew Point of Sealed Insulating Glass Units.


G. Glass Association of North America (GANA) (www.glasswebsite.com):

H. Insulating Glass Manufacturers Alliance (IGMA) (www.igmaonline.org):
1. IGMA TB-3001 - Sloped Glazing Guidelines.

I. National Fenestration Rating Council (NFRC) (www.nfrc.org):
1. 100 - Procedure for Determining Fenestration Product Thermal Properties.


1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.
B. Product Data on Glass Types Specified: Provide structural, physical and environmental characteristics, size limitations, and special handling or installation requirements.
C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
D. Manufacturer's Certificate: Certify that sealed insulated glass, meet or exceed specified requirements.
E. Test Report: Preconstruction adhesion and compatibility test report from glazing sealant manufacturer, based on submitted samples or acceptable data from previous testing of
current formulations with similar products.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Minimum five (5) years documented experience in work of this Section.
B. Regulatory Requirements:
   1. Provide safety glass for locations subject to human impact as required by Building Code.

1.5 DELIVERY, STORAGE, AND HANDLING – NOT USED.

1.6 PROJECT/SITE CONDITIONS

A. Project Measurements: Verify glass sizes match required opening prior to ordering glass. If discrepancy is found, notify Architect and request direction.
B. Field Measurements: Verify that field measurements are as indicated on Shop Drawings.
C. Perform glazing when ambient temperature is above 40 degrees F.
D. Perform glazing on dry surfaces.

1.7 SEQUENCING AND SCHEDULING

A. Coordination: Coordinate the Work with glazing frames, wall openings, and perimeter air barrier and vapor retarder to adjacent Work.

1.8 EXTENDED WARRANTY

A. Under provisions of Division 01.
B. Insulating Glass Units: Provide Manufacturer’s ten (10) year warranty against material obstruction of vision through unit due to:
   1. Intrusion of dust or moisture.
   2. Internal condensation.
   3. Film formation on internal glass surfaces caused by failure of hermetic seal except failure caused in whole or in part by breakage or fracturing of any portion of glass surface.
C. Glass Coatings: Provide Manufacturer’s ten (10) year warranty against peeling, cracking, or deterioration of coating under normal conditions.
D. Laminated Glass Units: Provide Manufacturer’s five (5) year warranty against manufacturing defects resulting in edge separation, delamination, or material obstruction of vision through glass surface.
E. Mirrors: Provide Manufacturer’s ten (10) year warranty against silver spoilage resulting from manufacturing defects.
F. Polycarbonate Sheet: Provide Manufacturer’s five (5) year warranty against breakage, yellowing, loss of abrasion resistance, and loss of light transmission.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Flat Glass Materials:
1. Guardian Industries Corp. (www.guardian.com)
2. Oldcastle Building Envelope. (www.oldcastlebe.com)
4. PPG Industries, Inc. (http://www.ppg.com/)
5. Viracon, Inc. (www.viracon.com)

B. Sealed Insulating Glass Components:
4. PPG Industries, Inc. (http://www.ppg.com/)
5. Viracon, Inc. (www.viracon.com)

C. Fire Rated Ceramic Glass:
2. TGP. (www.fireglass.com).

2.2 MATERIALS

A. Type A (FG-A): 1/4 inch Annealed Clear Glass; ASTM C1036, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select.
B. Type B (SG-A): 1/4 inch Clear Tempered Safety Glass; ASTM C1048, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select, Kind FT fully tempered, conforming to ANSI Z97.1.
C. Type C (SG-B): 1/4-inch Obscure Glass Units: ASTM C1048 1/4 inch obscure tempered safety glass, obscure glass equal to Pilkington ‘Optifloat Opal’.
D. Type D (FG-B): 1-inch Insulated Low-E Glass Unit; Non-Tempered, 1/4 inch in 1-inch insulated glazing unit, float type, annealed, gray tint, coating on inner surface, UV transmittance of 13 percent, visible light transmittance of 34 percent, solar energy transmittance of 18 percent, shading coefficient of 0.34, purge interpane space with dry hermetic air. Solarban 60.
E. Type E (FG-C): 1-inch Insulated High Performance Glass Unit; 1/4 inch in 1-inch insulated glazing unit, ASTM 2190, double pane with outer pane of Solarban 90 float glass, inner pane of float glass, gray tint, purge interpane space with dry hermetic air.
F. Type F (SG-C): 1-inch Insulated Tempered Safety Low E Glass Units; 1/4 inch in 1-inch insulated glazing unit, tempered safety type, annealed, gray tint, coating on inner surface, UV transmittance of 13 percent, visible light transmittance of 34 percent, solar energy transmittance of 18 percent, shading coefficient of 0.34, purge interpane space with dry hermetic air. Solarban 60.
G. Type G (SG-D): 1-inch Insulated Tempered High Performance Glass Unit; 1/4 inch in 1-inch insulated glazing unit, ASTM 2190, double pane with outer pane of Solarban 90 tempered safety glass, gray tint, inner pane of tempered safety glass, purge interpane space with dry hermetic air.
H. Type H (FG-D): Laminated safety glass unit; kind HS, heat strengthened with horizontal tempering, ASTM C148, two layers 3/16 inch clear float glass, laminated with 0.060 inch thick clear poly vinyl butyl interlayer.
I. Type J: Item by Section 07 42 00.

2.3 MANUFACTURED UNITS – NOT USED.
2.4 EQUIPMENT – NOT USED.
2.5 COMPONENTS
A. Glazing Sealant: ASTM C920, Type S, Grade NS, Class 25; single component silicone, low modulus, non sag, color to be selected from Manufacturer's full color range.
B. Sealant Backing: ASTM C1330, Type O, size and density to control glazing sealant depth and produce optimum glazing sealant performance.
C. Primer: As recommended by glazing sealant Manufacturer.

2.6 ACCESSORIES

A. Setting Blocks: ASTM C864, Neoprene or EPDM, 80 - 90 Shore A durometer hardness, length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) x width of glazing rabbet space minus 1/16 inch (1.5 mm) x height to suit glazing method and pane weight and area.
B. Spacer Shims: ASTM C864, Neoprene or EPDM, 50 - 60 Shore A durometer hardness, minimum 3 inch(75 mm) long x one half the height of the glazing stop by thickness to suit application.
C. Glazing Tape: ASTM C1281, Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent, designed for compression of 25 percent to affect an air and vapor seal; to suite applications.
D. Glazing Gaskets:
   1. Dense compression gaskets: ASTM C864, neoprene or EPDM, or ASTM C1115, silicone or thermoplastic polyolefin rubber, molded or extruded shape to fit glazing channel retaining slot; black color.
   2. Soft compression gaskets: ASTM C509, Type II, black, molded or extruded, neoprene, EPDM, silicone or thermoplastic polyolefin rubber, of profile and hardness required to maintain watertight seal; black color.

2.7 MIXES – NOT USED.
2.8 SOURCE QUALITY CONTROL – NOT USED.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerance.
B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

3.2 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.
B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
C. Install sealant in accordance with manufacturer's instructions.

3.3 APPLICATION

A. Exterior - Wet/Dry Method (Preformed Tape and Sealant).
   1. Cut glazing tape to length and set against permanent stops, 3/16 inch (5 mm) below sight line. Seal corners by butting tape and dabbing with sealant.
   2. Apply heel bead of sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.
   3. Place setting blocks at 1/4 points with edge block no more than 6 inches (150 mm) from corners.
4. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of pane or glass unit.

5. Install removable stops, with spacer strips inserted between glazing and applied stops, 1/4 inch below sight line. Place glazing tape on glazing pane or unit with tape 1/4 inch (6 mm) below sight line.

6. Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, but not more than 3/8 inch (9 mm) below sight line.

7. Apply cap bead of sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

B. Interior - Wet/Dry Method (Tape and Sealant).

1. Cut glazing tape to length and install against permanent stops, projecting 1/16 inch (1.5 mm) above sight line.

2. Place setting blocks at 1/4 points with edge block no more than 6 inches (150 mm) from corners.

3. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.

4. Install removable stops, with spacer shims inserted between glazing and applied stops at 24 inch intervals, 1/4 inch (6 mm) below sight line.

5. Fill gaps between pane and applied stop with sealant to depth equal to bite on glazing, to uniform and level line.

6. Trim protruding tape edge to a straight line.

C. Interior – Gasket Glazed Method

1. Fabricate gaskets to fit openings; allow for stretching of gaskets during installation.

2. Set soft compression gasket against fixed stop or frame with bonded miter cut joints at corners.

3. Set glass centered in openings on setting blocks.

4. Install removable stops and insert dense compression gaskets at corners, working toward centers of glass, compressing glass against soft compression gaskets to produce weathertight seal.

5. Seal joints in gaskets.

6. Allow gaskets to protrude past face of glazing stops.

3.4 FIELD QUALITY CONTROL – NOT USED.

3.5 ADJUSTING – NOT USED.

3.6 CLEANING

A. Clean work under provisions of Division 01.

B. Remove glazing materials from finish surfaces.

C. Remove labels after work is complete.

D. Clean glass and mirrors.

3.7 DEMONSTRATION – NOT USED.

3.8 PROTECTION – NOT USED.

3.9 SCHEDULES

A. See window and door type drawings, Sheet A8.00.

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SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Non-load bearing formed steel wall framing.
   2. Metal stud interior partition framing.
   3. Metal interior wall furring.
   4. Accessories for steel stud walls, including all related fasteners, clips, plates, bridging, straps, deflection head components and furring members.
   5. Concealed 16 gauge metal track backing in walls for support of wall cabinets, counter tops, door stops, grab bars, mirrors, shower seats, changing table and miscellaneous items.

B. System Description:
   1. Interior Walls: Metal stud framing system
   3. Design system to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
   4. Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

C. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.
   2. Section 09 29 00 – Gypsum Board.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.

B. ASTM International (ASTM) (www.astm.org):
   3. A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   4. A1003 - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
   9. C1002-Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
   11. E413 - Classification for Rating Sound Insulation.

C. Gypsum Association (GA) (www.gypsum.org)

D. Association of Wall and Ceiling Industries.  (AWCI).  Specifications Guide for Cold Formed Steel
Structural Members.
F. AWS D1.1 - Structural Welding Code.
G. FS TT-P-645B - Primer, Paint, Zinc-Chromate, Alkyd Type.

1.3 SUBMITTALS
A. Submit shop drawings and product data under provisions of Division 01.
B. Indicate on shop drawings, component details, framed openings, anchorage to structures, loading, welds, type and location of fasteners, and accessories or items required of other related work.
C. Describe method for securing studs to tracks, and for blocking and reinforcement to framing connections.
D. Provide product data describing standard framing member materials and finish, product criteria, load charts and limitations.
E. Submit Manufacturer’s installation instructions under provisions of Division 01.
   1. Indicate special procedures and perimeter conditions requiring special attention.
   2. Identify Specific U.L. listed assemblies where fire rated partition construction is indicated.

1.4 QUALITY ASSURANCE
A. Qualifications
   1. Installer: Company specializing in performing the work of this section with minimum five (5) years documented experience.
   2. Manufacturer: Current member of SSMA.
B. Perform Work in accordance with ASTM C754. Maintain one copy on site.
C. Acoustic Ratings: Construct assemblies to achieve acoustic ratings indicated on Drawings, tested to ASTM E90 and classified in accordance with ASTM E413.

1.5 DELIVERY, HANDLING AND STORAGE – NOT USED.

1.6 PROJECT/SITE CONDITIONS – NOT USED.

1.7 SEQUENCING AND SCHEDULING
A. Coordinate the placement of Specialties, Equipment, and items requiring backing within the stud framing system, under the provisions of Division 01 Documents.

1.8 EXTENDED WARRANTY – NOT USED.

1.9 MAINTENANCE – NOT USED.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Equivalent products by following manufacturers are acceptable:
   1. California Expanded Metal Company. (www.cemcosteel.com)
   2. Clark Dietrich Building Systems. (www.clarkdietrich.com)
   3. Marino Ware Industries. (www.marinoware.com)
   4. SCAFCO. (www.scafco.com).
B. Substitutions: Under provisions of Division 01.

2.2 MATERIALS
A. Studs & Furring Channel:
1. Protective Coatings: Comply with ASTM C645, roll-formed from hot-dipped galvanized steel; complying with ASTM A1003 and ASTM A653, MG40 (Z120) or having a coating that provides equivalent corrosion resistance. A40 Galvannealed products are not acceptable.

2. Non load bearing rolled steel, channel shaped, punched for utility access, as follows:
   a. Width: As shown on drawings.
   b. Thickness: 20 gauge minimum or as identified on the drawings.

B. Tracks and Headers: Same material and thickness as studs.

C. Ceiling Runners: Of same material and finish as studs, bent leg retainer to receive studs. Ceiling runners with extended legs. Provide deflection heads at all non-load bearing wall intersections with overhead floor or roof structures.

D. Furring and Bracing Members: Of same material as studs; thickness to suit purpose.

2.3 MANUFACTURED UNITS – NOT USED.

2.4 EQUIPMENT – NOT USED.

2.5 COMPONENTS

A. Provide components in accordance with ASTM C645.

2.6 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered, Manufacturer's standard shapes, same finish as framing members.

B. Plates, Gussets, Clips: Formed sheet steel, thickness determined for conditions encountered, manufacturer's standard shapes, same finish as framing members.

C. Fasteners:
   2. Anchorage Devices: Drilled expansion bolts or screws with sleeves
   3. Touch-up Primer for Galvanized Surfaces: SSPC - Paint 20, Type II organic zinc rich.

D. Wire: ASTM A641, galvanized steel.
   1. Hanger wire: 8 gauge.
   2. Tie wire: 18 gauge, soft annealed.

E. Touch-up Primer for Galvanized Surfaces: SSPC - Paint 20, Type II organic zinc rich.

F. Acoustical Sealant per Section 07 92 00 – Joint Sealants.

2.7 MIXES – NOT USED.

2.8 FABRICATION

A. Fabricate assemblies of framed sections of sizes and profiles required; with framing members fitted, reinforced, and braced to suit design requirements.

B. Finishes:
   1. Framing Members: Comply with ASTM C645; roll-formed from hot-dipped galvanized steel; complying with ASTM A1003 and ASTM A653, G40 (Z120) or having a coating that provides equivalent corrosion resistance. A40 galvannealed products are not acceptable.
   2. Accessories: Same finish as framing members.

2.9 SOURCE QUALITY CONTROL – NOT USED.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Verify that surfaces and building framing components are ready to receive work.
B. Verify that rough-in utilities are in proper location.
C. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION – NOT USED.

3.3 ERECTION

A. Install in accordance with ASTM C754 and manufacturer’s instructions.
B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches O.C.
C. Set all floor tracks on a continuous bead of sealant utilizing Acoustical Sealant products per Section 07 92 00 – Joint Sealants.
D. Place studs at spacing as shown on drawings; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using fasteners.
E. Fabricate corners using minimum three studs. Double stud at wall opening, door and window jambs, not more than 2 inches from each side of openings.
F. Coordinate erection of studs with requirements of door and window frame supports and attachments.
G. Align stud web openings horizontally.
H. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.
I. Install intermediate studs above and below openings to match wall stud spacing.
J. Provide deflection allowance in stud track, directly below horizontal building framing for non-load bearing framing.
K. Attach backing to studs for attachment of fixtures anchored to walls, including wall stops and millwork.
L. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.
M. Refer to Drawings for indication of partitions extending stud framing through the ceiling to the structure above. Maintain clearances under structural building members to avoid deflection transfer to studs. Provide extended leg ceiling runners, slotted deflection head tracks or two piece deflection track as conditions require. Comply with Fire-Rated assemblies installation criteria where fire-rated partition walls are indicated. Comply with U.L. Rated assembly installation requirements and specific component assemblies.
N. Touch-up damaged galvanized surfaces with primer.
O. Complete framing ready to receive covering.
P. Provide framed openings for duct work, access doors, fire extinguishers, etc.
Q. Tolerances:
   1. Maximum Variation from True Position: 1/8 inch in 10 feet.
   2. Maximum Variation of any Member from Plane: 1/8 inch.

3.4 FIELD QUALITY CONTROL – NOT USED.
3.5 ADJUSTING – NOT USED.
3.6 CLEANING – NOT USED.
3.7 DEMONSTRATION – NOT USED.
3.8 PROTECTION – NOT USED.
3.9 SCHEDULE – NOT USED.

END OF SECTION 09 22 16
PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Portland cement plaster on metal lath.
   2. Metal lath and Accessories.
   3. Stucco finishes and Trim.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.
   2. Division 06: Rough Carpentry.
   3. Section 07 27 00 – Air Barriers
   4. Section 07 62 00 – Sheet Metal Flashing and Trim
   5. Section 07 92 00 – Joint Sealants

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.

B. ASTM International (ASTM) (www.astm.org):
   10. C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

C. National Association of Architectural Metal Manufacturers (NAAMM) (www.naamm.org)
   ML/SFA 920 - Guide Specifications for Metal Lathing and Furring.


1.3 SUBMITTALS

A. Submit under provisions of Division 01 – General Conditions.

B. Product Data for each product specified.

C. Samples for initial selection in the form of Manufacturer's color charts consisting of actual color chips showing the full range of colors, textures, and patterns available for each type of finish.
indicated.
1. Where finish involves normal color and texture variations, include sample sets composed of two (2) or more units showing the full range of variations expected.
2. Include similar samples of material for joints and accessories involving color selection.
D. Samples for verification in units at least 12 inches square of each type of finish indicated; in sets of three (3) for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics.
E. Material Certificates: Submit certificate signed by Manufacturer for each kind of plaster aggregate certifying that materials comply with requirements.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Where fire-resistance-rated Portland cement plaster assemblies are indicated, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
B. Mockups: Prior to installing plaster work, construct panels for each type of finish and application required to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.
   1. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by Construction Manager.
   2. Erect mockups 48 by 48 inches by full thickness in presence of Construction Manager using materials, including lath, support system, and control joints, indicated for final Work.
   3. Notify Construction Manager 7 days in advance of the dates and times when mockups will be constructed.
   4. Demonstrate the proposed range of aesthetic effects and workmanship.
   5. Obtain Construction Manager Approval of mockups before start of plaster Work.
   6. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Portland cement plaster Work.
   7. When directed, remove mockups from Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver cementitious materials to Project site in original packages, containers, or bundles, labeled with Manufacturer’s name, product brand name, and lot number.
B. Store materials inside, under cover, and dry, protected from weather, direct sunlight, surface contamination, aging, corrosion, and damage from construction traffic and other causes.

1.6 PROJECT CONDITIONS

A. Environmental Requirements, General: Comply with requirements of referenced plaster application standards and recommendations of plaster manufacturer for environmental conditions before, during, and after plaster application.
B. Cold-Weather Requirements: Provide heat and protection, temporary or permanent, as required to protect each coat of plaster from freezing for at least 24 hours after application. Distribute heat uniformly to prevent concentration of heat on plaster near heat sources; provide deflection or protective screens.
C. Warm-Weather Requirements: Protect plaster against uneven and excessive evaporation and from strong flows of dry air, both natural and artificial. Apply and cure plaster as required by climatic and job conditions to prevent dry out during cure period. Provide suitable coverings, moist curing, barriers to deflect sunlight and wind, or combinations of these, as required.
D. Exterior Plaster Work: Do not apply plaster when ambient temperature is below 40 deg F.
E. Exterior Plaster Work: Protect plaster against freezing when ambient temperature is below 40 deg F by heating materials and providing temporary protection and heat as required by ACI
F. Protect contiguous work from soiling and moisture deterioration caused by plastering. Provide temporary covering and other provisions necessary to minimize harmful spattering of plaster on other work.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Paper Backed Wire-Metal Lath:
   1. Alabama Metal Industries Corp. (AMICO). (www.amicoglobal.com)
   2. California Expanded Metal Products Co. (CEMCO) (www.cemcosteel.com)
   4. Substitutions: Under the provisions of Division 01.

B. Stucco:
   1. Highland Stucco.
   2. Parex/Lahabra. (www.lahabrastucco.com)
   3. Substitutions: Under the provisions of Division 01.

C. Stucco Accessories:
   1. Alabama Metal Industries Corp. (AMICO). (www.amicoglobal.com)
   3. Fry Reglet Corporation. (www.fryreglet.com)
   4. Metalex (www.metlx.com)
   5. Vinyl Corp, Inc. (www.vinylcorp.com)

2.2 LATH

A. Paper Backed Diamond-Mesh Lath: Comply with ASTM C847 for material, type, configuration, and other characteristics indicated below.
   1. Material: Fabricate self-furred wire-metal lath from steel wire conforming to the following:
      a. Galvanized Steel Wire, 2.5 lb. weight, woven or welded wire lath complying with ASTM C933 or ASTM C1032.
      b. Factory applied Grade D, Style 2 Asphalt Saturated Paper.

B. To be installed over 072700 – Air Barrier.

2.3 ACCESSORIES

A. General: Comply with material provisions of ASTM C1063 and the requirements indicated below; coordinate depth of accessories with thicknesses and number of plaster coats required. 7/8 inch grounds are required for all accessories.
   1. Aluminum Components: Alloy, temper, and finish recommended by Manufacturer with not less than the strength and durability properties of aluminum extrusions complying with ASTM B221 for alloy and temper 6063-T5.
   3. Vinyl Components: ASTM D4216 and ASTM D1784

B. Casing Beads: Square edge, flat face return termination screed and single side expanded or perforated flange of material or type indicated below:
   1. Zinc Alloy: Minimum 0.0207 inch thick.
   2. Vinyl: Minimum 0.050 inch thick.
   3. Aluminum: Minimum 0.050 inch thick.
   4. Provide casing bead with weep holes for drainage at base of wall, holes space 4 inches o.c.
   5. Provide casing bead with back flange return for casing around door and window.
C. Cornerbeads: Small nose cornerbeads fabricated from the following material, with expanded flanges of large-mesh diamond lath or perforated vinyl flanges allowing full plaster encasement.
   1. Zinc Alloy: Minimum 0.0207 inch thick.
   2. Vinyl: Minimum 0.050 inch thick.
   3. Aluminum: Minimum 0.050 inch thick.

D. Control Joints: Prefabricated, of material and type indicated below:
   1. Zinc Alloy: Minimum 0.0207 inch thick.
   2. Vinyl: Minimum 0.050 inch thick.
   3. Aluminum: Minimum 0.050 inch thick.
   4. One-Piece Type: Folded pair of non-perforated screeds in M-shaped configuration, with expanded or perforated flanges.
   5. Two-Piece Type: Pair of casing beads with back flanges formed to provide slip-joint action, adjustable for joint widths from 1/8 to 5/8 inch.
   6. One Piece Type: Inside corner control joint in M-shaped configuration with expanded or perforated flanges.
   7. One-Piece Type: “F” control joint with M-shaped configuration with flat face termination screed and single side expanded or perforated flange.
   8. Pre-formed Control Joint Intersections: Match Type and M-shaped profile of control joint sections.
      a. Provide removable protective tape on plaster face of control joints.

E. Foundation Weep Screed: Folded drip edge perforated weep screed to allow drainage where stucco terminates at foundation wall. 4-1/4 inch overall height of material or type indicated below:
   1. Zinc Alloy: Minimum 0.0207 inch thick
   2. Vinyl: Minimum .050 inch thick.
   3. Aluminum: Minimum .050 inch thick

F. Lath Attachment Devices: Material and type required by ASTM C1063 for installations indicated.

2.4 PLASTER MATERIALS

A. Base-Coat Cements: Type as indicated below:
   1. Portland cement, ASTM C150, Type I.
   2. Portland cement, ASTM C150, Type II.

B. Finish-Coat: Factory-mixed, water-based elastomeric coating with integral color and texture as selected by Architect from Manufacturer’s standard colors. Provide Lahabra Elastomeric Finish or equivalent product from approved Manufacturers.
   1. 100% acrylic elastomeric polymer binder base. Water based VOC compliant.
   2. Aggregate: Pure crushed marble, Lahabra Fine-Aggregate Size: 0.75 mm.
   3. Lahabra Primer applied to stucco Portland cement base prior to application of textured colored elastomeric finish coat.

2.5 MISCELLANEOUS MATERIALS

A. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch long, free of contaminates, manufactured for use in portland cement plaster.


C. Bonding Agent: ASTM C932.

D. Dash-Coat Material: 2 parts Portland cement to 3 parts fine sand, mixed with water to a mushy-paste consistency.

E. Line Wire: 2 inch square mesh, self-furring at solid surfaces.

F. Steel drill screws complying with ASTM C1002 for fastening metal lath to wood.

2.6 PLASTER MIXES AND COMPOSITIONS

A. General: Comply with ASTM C926 for base- and finish-coat mixes as applicable to plaster bases,
materials, and other requirements indicated.

B. Base-Coat Mixes and Compositions: Proportion materials for respective base coats in parts by volume per sum of cementitious materials for aggregates to comply with the following requirements for each method of application and plaster base indicated. Adjust mix proportions below within limits specified to attain workability.

C. Fiber Content: Add fiber to following mixes after ingredients have mixed at least 2 minutes. Comply with fiber Manufacturer’s written instructions but do not exceed 1 lb/cu. ft. of cementitious materials. Reduce aggregate quantities accordingly to maintain workability.

D. Three-Coat Work (7/8 inch) over Metal Lath: Base-coat proportions as indicated below:
   1. Scratch Coat: 1 part portland cement, 0 to 3/4 parts lime, 2-1/2 to 4 parts aggregate.
   2. Brown Coat: 1 part portland cement, 0 to 3/4 parts lime, 3 to 5 parts aggregate.
   3. Finish Coat/Texture Coat: As indicated.

2.7 MIXING

A. Mechanically mix cementitious and aggregate materials for plasters to comply with applicable referenced application standard and with recommendations of plaster Manufacturer.

PART 3 – EXECUTION

3.1 INSTALLATION OF LATH AND FURRING, GENERAL


B. Isolation: Where lathing and metal support system abuts building structure horizontally and where partition or wall abuts overhead structure, sufficiently isolate from structural movement to prevent transfer of loading from building structure. Install slip- or cushion-type joints to absorb deflections but maintain lateral support.
   1. Frame both sides of control joints independently and do not bridge joints with furring and lathing or accessories.

3.2 LATHING

A. Install paper backed metal lath over air barrier for the following applications where plaster base coats are required. Provide appropriate type, configuration, and weight of metal lath selected from materials indicated that comply with referenced ML/SFA specifications and ASTM lathing installation standards.
   1. Exterior sheathed wall surfaces using paper backed woven-wire lath with 1-1/2-inch hexagonal-shaped mesh with minimum 0.0510-inch diameter, galvanized steel wire.
   2. Install over air barrier.

3.3 PREPARATIONS FOR PLASTERING

A. Clean plaster bases and substrates for direct application of plaster, removing loose material and substances that may impair the Work.

B. Install temporary grounds and screeds to ensure accurate rodding of plaster to true surfaces; coordinate with scratch-coat work.

C. Flashing: Refer to Section 07 62 00 – Sheet Metal Flashing and Trim.

3.4 INSTALLATION OF PLASTERING ACCESSORIES

A. General: Perform Work in accordance with ASTM C1063. Comply with referenced lathing and furring installation standards for provision and location of plaster accessories of type indicated. Miter or cope accessories at corners; install with tight joints and in alignment. Attach accessories securely to plaster bases to hold accessories in place and in alignment during plastering.

B. External Corners: Install corner beads at external corners.
C. Terminations of Plaster: Install casing beads, unless otherwise indicated.

D. Control Joints: Install at locations indicated or, if not indicated, at locations complying with the following criteria and approved by Architect:
1. Where an expansion or contraction joint occurs in surface of construction directly behind plaster membrane.
2. Distance between Control Joints: Not to exceed 10 feet in either direction or a length-to-width ratio of 2-1/2 to 1.
3. Wall Areas: Not more than 100 sq. ft.
4. Horizontal Surfaces: Not more than 50 sq. ft. in area.
5. Where plaster panel sizes or dimensions change, extend joints full width or height of plaster membrane.
6. At all inside corners.
7. Where plaster wall abuts soffit or fascia, install “F” Type control joint at stop of stucco.

E. Install pre-formed control joint intersections of vertical and horizontal control joints.

F. Termination of plaster at door and window openings. Install casing beads with back flange return.

G. Weep Screeds: Install casing bead with perforated ground where stucco bottom of wall terminates as it meets dissimilar materials. Install foundation weep screed at bottom edge of stucco at foundation wall.

H. Note that all plaster accessories to be provided with 7/8 inches ground.

I. Caulk joints to adjacent building materials per Section 07 92 00 – Joint Sealants.

3.5 PLASTER APPLICATION

A. Proportions:
1. Scratch and brown coats: ASTM C926, Type C.
2. Finish coat: ASTM C926, Type F. Add colorant in accordance with Manufacturer’s instructions.

B. Do not use materials that are frozen, caked, lumpy, dirty, or contaminated by foreign materials.

C. Do not use excessive water in mixing and applying plaster materials.

D. Flat Surface Tolerances: Do not deviate more than plus or minus 1/8 inch in 10 feet from a true plane in finished plaster surfaces, as measured by a 10-foot straightedge placed at any location on surface.

E. Sequence plaster application with installation and protection of other work so that neither will be damaged by installation of other.

F. Plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground, unless otherwise indicated. Where plaster is not terminated at metal frame by casing beads, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.

G. Corners: Make internal corners and angles square; finish external corners flush with cornerbeads, square and true with plaster faces.

H. Number of Coats: Apply plaster of composition indicated, to comply with the following requirements:
1. Three Coats (7/8 inch min.): Over the following plaster underlayment:
   a. Paper backed metal lath, air barrier, over APA rated structural wood sheathing.

2. 

I. Finish Coats: Apply finish coats to comply with the following requirements:
1. Prepared Finish: Apply acrylic-based elastomeric finish coats, and other factory-prepared finish coats according to Manufacturer’s written instructions, over approved primer.
2. Non-Directional troweled, floated finish texture with integral color and fine aggregate.
3. Texture to match approved samples and mock-ups for color and finish.
4. Spray apply acrylic elastomeric color coat (without aggregate) to all vinyl/metal stucco screeds, control joints and other exposed accessories.

J. Moist-cure plaster base and finish coats to comply with ASTM C926, including written instructions for time between coats and curing in "Annex A2 Design Considerations."
3.6 CUTTING AND PATCHING

A. Cut, patch, replace, repair, and point up plaster as necessary to accommodate other work.
B. Repair cracks and indented surfaces.
C. Point-up finish plaster surfaces around items that are built into or penetrate plaster surfaces.
D. Repair or replace work to eliminate blisters, buckles, check cracking, dry outs, efflorescence, excessive pinholes, and similar defects.
E. Repair or replace work as necessary to comply with required visual effects.

3.7 CLEANING AND PROTECTING

A. Remove temporary covering and other provisions made to minimize spattering of plaster on other work.
B. Promptly remove plaster from door frames, windows, and other surfaces not to be plastered. Repair surfaces stained, marred or otherwise damaged during plastering work.
C. When plastering work is completed, remove unused materials, containers, equipment, and plaster debris.
D. Provide final protection and maintain conditions, in a manner acceptable to Manufacturer and Installer, that ensure plaster work is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 09 24 00
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PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
   1. Gypsum board and Accessories.
   2. Metal suspension system.
   3. Furring channels and accessories.
   5. Texture finish.
   6. Sound rated construction and accessories.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.
   2. Section 07 92 00 - Joint Sealers.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.

B. American National Standards Institute (ANSI) (www.ansi.org):
   1. A108.11 - Interior Installation of Cementitious Backer Units.
   2. A118.9 - Test Methods and Specifications for Cementitious Backer Units.

C. ASTM International (ASTM):
   8. C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
Means of a Striker Impacted by a Falling Weight (Gardner Impact).

17. E413 - Classification for Rating Sound Insulation.

D. Gypsum Association (GA):
1. GA-201 - Gypsum Board for Walls and Ceilings.
3. GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board.


1.3 SUBMITTALS
A. Submit product data under provisions of Division 01.
B. Submit Plan and Detail for Drywall Control Joints in walls over 30 feet in length.
C. Submit specific criteria on direct suspension system components, spacing and installation requirements.

1.4 QUALITY ASSURANCE
A. Qualifications:
   1. Applicator: Company specializing in gypsum board systems work with three (3) years documented experience.
B. Regulatory Requirements:
   1. Perform work in accordance with ASTM C840, GA-201, and GA-216.
      a. Maintain one copy of each document on site.
   2. Conform to 2015 IBC applicable codes for fire rated assemblies.
   3. Fire Rated Partitions: Listed assembly by UL or GA file.
   4. Fire Rated Ceiling: Listed assembly by UL or GA file.
   5. Acoustic Ratings: Construct assemblies to achieve acoustic ratings indicated on Drawings, tested to ASTM E90 and classified in accordance with ASTM E413.

1.5 DELIVERY, STORAGE, AND HANDLING – NOT USED.
1.6 PROJECT/SITE CONDITIONS – NOT USED.

1.7 SEQUENCING AND SCHEDULING
A. Schedule installation of materials to allow adequate drying time as required by Manufacturer. Hot mud shall not be used in any condition without approval of the Architect.

1.8 EXTENDED WARRANTY – NOT USED.
1.9 MAINTENANCE – NOT USED.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Gypsum Board:
   1. CertainTeed Gypsum, Inc. (www.certainteed.com)
2. GP Gypsum Corporation. (www.gp.com)
4. Temple-Inland. (www.templeinland.com)
5. USG Corporation. (www.usg.com)

B. Direct Suspension System:
1. Chicago Metallic Corporation. (www.chicagometallic.com)

2.2 MATERIALS:

A. Gypsum Board:
1. Fire Rated Gypsum Board: ASTM C1396, Type X, UL rated; 5/8 inch thick, maximum permissible length; ends square cut, tapered and beveled edges.
2. Moisture Resistant Gypsum Board: ASTM C1396, 5/8 inch thick, maximum permissible length; ends square cut, tapered and beveled edges. Install in wet areas.
3. Regular Gypsum Board: ASTM C1396/C1396M; 48 inches wide x 5/8 inch thick, maximum practical length, tapered edge.

B. Impact Resistant Gypsum Board:
1. Core: Type X gypsum core, with additives to enhance fire resistance, surface indentation resistance and impact resistance, moisture and mold resistant.
2. Surface paper: Abrasion resistant, 100% recycled content moisture/mold/mildew resistant paper on front, back and long edges.
3. Embedded fiberglass mesh
4. Long Edges: Tapered
5. Overall thickness: 5/8 inch
6. Panel complies with requirements of ASTM C1396/C1396M and C1629/C1629M.
7. 48 inches wide x 5/8 inch thick, maximum practical length, tapered edge.
8. Surface Abrasion Resistance: Class 3, 0.010 inch maximum when tested in accordance with ASTM D4977.
9. Indentation Resistance: Class 1, 0.150 inch, maximum when tested in accordance with ASTM D5420.
10. Soft Body Impact: Class 3, 300 ft-lbf, minimum when tested in accordance with ASTM E695.
12. Mold/Mildew Resistance: scores a 10 when tested in accordance with ASTM D3273.
5. Wall Moldings: Single web with knurled face  
   DGWM-24  1-1/2 inches x 1 inch x 144 inches long wall molding  
   DGCM-27  144 inches x 1-5/8 inches x 1 inch x 1 inch channel molding  

6. Accessories:  Splice Clip DGSC-180  
   Compression Posts:  
   VSA 18/30    18 inches to 30 inches  
   VSA 30/48    30 inches to 48 inches  
   Transition Clip DGTC 90 for 90 degree inside and outside vertical transitions.

   1. Main Tees: Fire-Rated Heavy Duty classification 1.617 inches high x up to 14 feet long, integral reversible splice with 1-1/2 inches knurled face.  
   2. Wall Moldings: Single web with knurled face, 1-1/2 inches x 1 inch x 12 feet long, DGWM-24.  
   3. Wall Moldings: Single web with knurled face, 1-5/8 inches x 1 inch x 12 feet long, DGCM-27.  
   4. Cross Members: Cross channel: DGCL4 7/8 inches high x 1-1/2 inches wide hat shaped channel x 48 inches long.  
   5. Wire: Hanger wire (12 gauge) galvanized.  
   6. Flat ceiling applications:  
      a. Hanger Wire Installation: Secure hanger wires to upper structural elements and space hangers so that each hanger wire supports the maximum of 16 sq. ft. Follow manufacturer’s recommendations for installation of mid-span or 1/3 span hanger wire for wall-to-wall installations depending on span length of main tees.  
      b. Space main tee members a maximum span of 48 inches on center.  
      c. Space cross tees recommended 24 inches on center. Install extra cross tees where butt joints occur, 8 inches from each side of the butt joint.  
      d. Install compression struts per Manufacturer’s specifications and spacing.  
      e. Install gypsum board panels, tape, texture, and finish as indicated according to manufacturers specifications.  
      f. Install accessories and wall molding as indicated and as required according to Manufacturers specifications.

2.3 MANUFACTURED UNITS – NOT USED.  
2.4 EQUIPMENT – NOT USED.  
2.5 COMPONENTS – NOT USED.  

2.6 ACCESSORIES  
   A. Corner Beads: Metal.  
   B. Edge Trim: Equal to U.S.G. #200-A and #200-B.  
   C. Control Joints: Equal to U.S.G. #093.  
   D. Joint Materials: ASTM C475, GA 201, and GA 216; reinforcing tape, joint compound, adhesive, water, and fasteners.  
   E. Fasteners: ASTM C1002, Type S12 and W for specific application.  
   F. Resilient Furring Channel: Equal to U.S.G. #RC-1.  
   G. Z-Channels: 2 inches to match rigid wall insulation thickness, where indicated on drawings, if required.  
   H. X-molding Outside Corner Trim: Equal to Fry Reglet Architectural Metals #XDM-625-625, where indicated on drawings.  
   I. Hat Channel: ASTM C955, 7/8 inch, 18 gauge STR. G90 coating.
J. Reveal Channel Screed: Equal to Fry Reglet Architectural Metals # DCS-625-75. Clear anodized extruded aluminum, where indicated on drawings.
K. Offset edge trim: Equal to Fry Reglet Architectural Metals # DRME-625, clear anodized extruded aluminum where indicated on drawings.

2.7 MIXES – NOT USED.
2.8 FABRICATION – NOT USED.
2.9 SOURCE QUALITY CONTROL – NOT USED.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Division 01.
B. Verify that site conditions are ready to receive work and opening dimensions are as indicated on approved shop drawings.
C. Beginning of installation means acceptance of existing surfaces and substrate.

3.2 PREPARATION – NOT USED.

3.3 INSTALLATION

A. Ceiling Framing:
   1. Install in accordance with Manufacturer’s instructions.
   2. Place one bead of sealant each side at wall perimeters at sound rated walls.
   3. Coordinate location of hangers with other work.
   4. Install ceiling framing independent of walls, columns, and above ceiling work.
   5. 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.
   6. Laterally brace entire suspension system, as per 2015 IBC requirements.
   7. Provide framing in ceiling and walls as necessary for ductwork, access doors, fire extinguishers, etc. specified elsewhere.
B. Gypsum Board:
   1. Install gypsum board in accordance with GA-201, GA-216 and Manufacturer’s instructions.
   2. Erect single layer and double layer gypsum board as indicated by wall assembly, or, where not indicated by wall assembly perpendicular to direction of framing. Both ends shall occur over solid bearing. Space at floor/wall intersection shall not exceed 1/4 inches.
   3. Use screws when fastening gypsum board to support as required by manufacturer and applicable codes for fire-rated assembly.
   4. Type and spacing of screws shall be as indicated by wall assembly, or, where not indicated by wall assembly, use type ‘S’ screws when fastening gypsum board to metal furring or framing at 8 inches O.C. at edges and 12 inches O.C. at intermediate studs.
   5. Double Layer Applications: Use gypsum backing board for first layer, placed perpendicular to framing or furring members. Place second layer parallel to first layer. Offset joints of second layer from joints of first layer.
   6. Adhesive Applications: Secure to substrate with adhesive sufficient to support and hold in place. Apply adhesive in accordance with manufacturer’s instructions. Utilize low VOC type adhesives where available.
   7. Place corner beads at external corners. Use longest practical length. Place edge trim at all locations that gypsum board abuts dissimilar materials. Screw apply corner beads
to substrate. At Contractor's option, crimped corner beads may be installed only if tape and filler compound are applied to each side.

8. Install water resistant gypsum wall board at all window jambs and sills, and all plumbing fixture walls unless noted otherwise. At fixture walls, install from floor to ceiling in back of and within 2 feet of all plumbing fixtures including drinking fountains.

9. Fire tape all joints on concealed from view gypsum wallboard.

10. Fire tape all penetrations through rated assemblies.

11. Control Joints:
   a. At walls, ceilings, fascias and soffits greater than 30 feet in length, install control joints to create a maximum spacing between joints of 30 feet.
   b. At doors, windows, and openings, vertical control joint from floor to roof deck.

12. Joint Treatment:
   a. At locations per submittal on walls not to exceed 30 feet.
   b. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   c. Feather coats onto adjoining surfaces so that camber is maximum 1/16 inch.
   d. Filling and sanding is not required at surfaces that are concealed from view and in mechanical rooms.
   e. Tape joints and corners of cementitious backing board.
   f. Hot mud NOT allowed.

13. Texturing:
   a. Texture gypsum wall board scheduled for paint as a finish surface. Texture to be a light spray/orange peel.
   b. Apply a coat of primer to all gyp board surfaces prior to texture being applied. Coordinate with painting contractor.

14. Tolerances:
   a. Maximum Variation from True Flatness: 1/8 inch in 10 feet in any direction.

15. Walls:
   a. At all walls less than 12 feet in exposed height, install gypsum board in full length sheets in a vertical orientation.

16. Surface Finish:
   a. Provide GA-214 Level 4 and Level 5 finish as scheduled.
   b. For Level 4 gypsum board finish, embed tape in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration.
   c. Where Level 5 gypsum board finish is indicated, apply joint compound combination specified for Level 4 plus a thin, uniform skim coat of joint compound over entire surface. Use joint compound specified for the finish (third coat) or a product specially formulated for this purpose and acceptable to gypsum board manufacturer. Produce surfaces free of tool marks and ridges ready for decoration of type indicated.

17. Surface Texture:
   a. Provide smooth (no applied texture) to all gypsum board ceilings and soffit panels and vertical bulkhead returns.
   b. Provide light “orange peel” texture at all gypsum board wall surfaces to match acceptable texture sample mock-up panel approved by Architect.
   c. Provide smooth (no applied texture) to gypsum board wall surface and specific feature areas or panels as indicated on drawings and finish schedules.
   d. Coordinate with section 09 91 00 - Painting for preparation of all gypsum board surfaces to receive gypsum board primer sealer specified and applied by section 09 91 00 – Painting.
3.4 FIELD QUALITY CONTROL – NOT USED.
3.5 ADJUSTING – NOT USED.
3.6 CLEANING – NOT USED.
3.7 DEMONSTRATION – NOT USED.
3.8 PROTECTION – NOT USED.

3.9 SCHEDULE

A. See Finish Schedule.
B. Finish to be GA-214 Level 5 at all gypsum board walls greater than 12 feet in height. Level 4 finish at all other areas.
C. See finish schedule, general notes, and/or interior elevations for locations of Impact Resistant and/or moisture resistant gypsum board.
   1. Impact resistant gypsum board shall be installed in the following areas to 8'-0" min AFF:
      a. Vestibules 100 & 111.
      b. Gymnasium 106.
      c. Halls 101 & 102.
   2. Moisture resistant gypsum board shall be installed in the following areas:
      a. All wet areas (walls with plumbing, fixtures, valves, etc.)
      b. All drywall returns (jambs, head, sills) at all exterior doors and windows.

END OF SECTION 09 29 00
PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes
   1. Suspended metal grid ceiling system.
   3. Non-fire rated assembly.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.

C. System Description:
   1. Installed System: Comply with 2015 IBC Section 808, ASTM C635, and C636 Metal Suspension Systems for Acoustical Tile and for Lay-in Panel Ceilings.
   2. Suspension system to rigidly secure acoustical ceiling system including integral mechanical and electrical components with maximum deflection of 1/360.
   3. 2 by 4 foot grid systems.
   4. Install hanger wires for suspension of mechanical and electrical fixtures.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.

B. ASTM International (ASTM):
   4. E580 - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions
   5. E1264 - Standard Classification of Acoustical Ceiling Products.


   1. Section 808 – Acoustical Ceiling Systems.

1.3 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: Provide data on metal grid system components, acoustical units and trim.

C. Manufacturer’s Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

1.4 QUALITY ASSURANCE

A. Installer qualifications: Minimum five (5) years documented experience in work of this Section.
1.5 DELIVERY, STORAGE AND HANDLING – NOT USED.

1.6 PROJECT/SITE CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.7 SEQUENCING AND SCHEDULING

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
B. Install acoustical units after interior wet work is dry.

1.8 EXTENDED WARRANTY – NOT USED.

1.9 MAINTENANCE

A. Extra Materials:
   1. Furnish under provisions of Division 01.
   2. Provide four (4) unopened cartons of each type of tile used. (128 sf. min.).

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Suspension Grid System:
   3. Armstrong World Industries, Inc. (www.armstrong.com)
   4. CertainTeed Corporation (www.certainteed.com)
   5. Substitutions: Under provisions of Division 01.
B. Acoustical Tiles:
   1. Armstrong World Industries, Inc. (www.armstrong.com)
      a. Type ‘A’: Armstrong #1714 - 24 by 48 by 3/4 inch School Zone, fine fissured, square edge lay-in, with white finish.
   2. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Suspension Grid System:
   1. Non-fire Rated Grid: ASTM C635, intermediate duty; exposed T; components die cut and interlocking ends.
   2. Grid Materials: Commercial quality steel with galvanized coating.
   3. Exposed Grid Surface Width: 15/16 inch with perimeter reveal.
   5. Accessories: Stabilizer bars, clips, splices, edge moldings, outside and inside corners for edge moldings, and hold down clips required for suspended grid system.
   6. Support Channels and Hangers: Galvanized; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified. Minimum 12 gauge hanger wire.

2.3 MANUFACTURED UNITS – NOT USED.
2.4 EQUIPMENT – NOT USED.
2.5 COMPONENTS – NOT USED.

2.6 ACCESSORIES

A. Touch-up Paint: Type and color to match acoustical and grid units.
B. Support Channels:
   1. Galvanized steel; size and type to suit application.
C. Hanger Wire:
   1. ASTM A641, minimum 12 gage galvanized steel.
D. Impact Clips:
   1. Minimum 24 gage spring steel, Manufacturer's standard profile.

2.7 MIXES – NOT USED.
2.8 FABRICATION – NOT USED.
2.9 SOURCE QUALITY CONTROL – NOT USED.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that layout of hangers will not interfere with other work.

3.2 INSTALLATION

A. Suspension Grid System:
   1. Install ceilings in accordance with ASTM C636 and CISCA Handbook.
   2. Install suspension system in accordance with Manufacturer's instructions and as supplemented in this section.
   3. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.
   4. Locate system on room axis according to reflected plan.
   5. Install after major above ceiling work is complete.
   6. Coordinate the location of hanger wires with other work.
   7. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
   8. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
   9. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Use of ceiling support wire tails for fixture suspension is not allowed.
  10. Install support wires for electrical fixtures, fixture loads and seismic bracing; locate as required by building codes; attachment to fixtures by Division 26.
  11. Do not eccentrically load system, or produce rotation of runners. All runners to lay flat.
  12. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Provide factory manufactured trim pieces at all corners. Provide edge moldings at all junctions and/or with other interruptions.
  13. Adjust grid to insure grid and tile lay flat. Gaps are not acceptable.
B. Acoustical Tiles:
   1. Install ceilings in accordance with ASTM C636 and CISCA Handbook. Install
acoustical tiles in accordance with Manufacturer's instructions.
2. Fit acoustical tiles in place, free from damaged edges or other defects detrimental to appearance and function. Replace any dirty, damaged or chipped tiles.
3. Lay directional patterned tiles one way with pattern parallel to longest room axis. Fit border trim neatly against abutting surfaces.
4. Install tiles after above ceiling work is complete.
5. Install acoustical tiles level, in uniform plane, and free from twist, warp and dents.
6. Cut tile to fit irregular grid and perimeter edge trim.
7. Install hold-down clips to retain panels tight to grid system within 20 feet of an exterior door.

C. Erection Tolerances:
1. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

3.3 FIELD QUALITY CONTROL

A. The following information is a guide to the minimum installation provisions in the 2015 IBC standard for suspended ceiling systems. This information is limited to intermediate duty systems, either fire rated or non-rated and not used to brace partitions. Other methods for hanging and bracing suspended ceiling systems may be used when approved by the Building Division and the Architect:
1. All suspended ceiling systems regardless of area must be installed per 2015 IBC Section 16 and the ASCE 7 guidelines (or other approved design).
2. All light fixtures, HVAC devices, and similar items must be attached to the suspended ceiling system with devices having a capacity of 100 percent of the equipment weight acting in any direction.
3. Suspended ceiling systems that are part of a fire-rated assembly must comply with the conditions of the approved fire test in addition to the installation provisions in the IBC Section 803.

B. Damaged and/or defective ceiling tile and/or grid that have not been corrected prior to the punch list by the Architect shall be marked in a permanent, destructive manner to insure the tile and/or grid is replaced.

3.4 SCHEDULE

A. As indicated on Contract Documents.

END OF SECTION 09 51 23
PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Resilient vinyl sheet flooring.
   2. Edgings
   3. Cap strips

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.

B. ASTM International (ASTM):
   4. F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

C. Resilient Floor Covering Institute (RFCI) (www.rfci.com) - FloorScore Certification Program.


1.3 SUBMITTALS

A. Submittals for Review:
   1. Shop Drawings: Indicate room or space dimensions, flooring layout, and locations of seams.
   2. Product Data: Provide data on specified products, describing physical and performance characteristics.
   3. Samples:
      a. Flooring: 6 by 6 inch samples showing available colors.
      b. Edgings: 4 inch long samples showing available colors.
      c. Cap strips: 4 inch long samples showing available colors.

B. Quality Control Submittals:
   1. Certificates of Compliance: Certification from an independent testing laboratory that flooring meets fire hazard classification requirements.

1.4 QUALITY ASSURANCE
A. Installer Qualifications: Minimum five (5) years documented experience in work of this Section.
B. Fire Hazard Classification: Class I rated tested to ASTM E648.
C. Static Coefficient of Friction: Minimum 0.5, tested to ASTM D2047.

1.5 PROJECT CONDITIONS

A. Maintain temperature in spaces to receive flooring between 60 and 90 degrees F for 24 hours before, during, and for minimum 48 hours after installation.
B. Maintain minimum temperature of 60 degrees F after flooring is installed, except as otherwise specified.

1.6 MAINTENANCE

A. Extra Materials: 100 square feet of each color and pattern in full width rolls.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Contract Documents are based on Sheet Vinyl Flooring products by:
   1. Mannington Resilient Floors. (www.mannington.com)
   2. Product: Magna
B. Equivalent products by following Manufacturers are acceptable:
   1. Armstrong World Industries. (www.armstrong.com)
   2. Congoleum Corp. (www.congoleum.com)
   3. Forbo Flooring. (www.forboflooringna.com)
   4. Tarkett, Inc. (www.tarkett.com)
C. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Sheet Vinyl Flooring:
   1. Conform to ASTM F1913.
   2. Static load limit: Minimum 125 PSI, tested to ASTM F970.
   3. 0.08 inch thick minimum.

2.3 ACCESSORIES

A. Leveling Compound: White, premixed, latex based.
B. Adhesive: Water based, waterproof, recommended by flooring Manufacturer.
C. Edgings: Preformed rubber or approved substitute, profile required to suit conditions, color to be selected from Manufacturer's full color range.
D. Cap Strip: Preformed rubber or vinyl, fabricated specifically for capping resilient sheet flooring base, color to be selected from Manufacturer's full color range.
E. Reducer Strips: Preformed rubber tapered trim and reducers at floor transitions, color to be selected from Manufacturer's full color range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that concrete floors have cured a minimum 28 days and do not exhibit negative
alkalinity, carbonization, or dusting.

3.2 PREPARATION

A. Clean substrate to ASTM F710.
B. Clean substrate; remove loose and foreign matter that could impede adhesion or performance of flooring.
C. Fill cracks, voids, and depressions in substrate with leveling compound.
D. Grind off high spots and projections in substrate; leave smooth and level to 1/4 inch in 10 feet.
E. Test substrate for moisture content to ASTM F1869; do not install flooring until moisture emission level is acceptable to flooring manufacturer.

3.3 INSTALLATION

A. Install flooring in accordance with Manufacturer's instructions.
B. Lay out flooring to minimize seams, located as inconspicuously as possible.
C. Spread only enough adhesive to permit installation of materials before initial set.
D. Lay flooring with seams parallel to building lines.
E. Overlap and double cut seams using straight edge.
F. Continuously heat weld seams using color matched welding rods or chemically weld seams.
G. Roll flooring with floor roller to eliminate entrapped air and ensure bond with adhesive. Work toward edges of sheets. Hand roll seams on both sides, working toward seams.
H. Scribe flooring to walls, columns, cabinets, and other appurtenances to produce tight joints. Ensure that base, trim, plates, or escutcheons will completely cover cut edges.
I. Extend flooring into recesses and under equipment.
J. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar.
K. Install cove strip at juncture of flooring and partitions and fixed objects. Run flooring continuously up cove and onto wall 4inch height. Apply cap strip to top edge.

3.4 INSTALLATION OF EDGINGS AND TRANSITION STRIPS

A. Install strips where flooring abuts dissimilar flooring materials; secure to subfloor.
B. Center strips under doors where flooring terminates at door openings.
C. Install in longest practical lengths; butt ends tight.
D. Scribe to abutting surfaces.

3.5 PROTECTION

A. Do not allow traffic on flooring until adhesives have set. Cover areas subject to traffic with protective covering.

END OF SECTION 09 65 00
SECTION 09 65 13

RESILIENT BASE AND ACCESSORIES

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes
   1. Resilient Wall Base.
   2. Primers, Adhesives, and Accessories

B. Related Sections
   1. Division 01: Administrative, procedural, and temporary work requirements.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.
C. Resilient Floor Covering Institute (RFCI) (www.rfci.com) - FloorScore Certification Program.

1.3 SUBMITTALS

A. Submittals for Review:
   1. Samples: 4 inch long samples showing available colors.
   2. Provide product data on specified products, describing physical and performance characteristics, sizes, patterns and colors available.
   3. Submit Manufacturer’s installation instructions under provisions of Division 01.

1.4 MAINTENANCE

A. Extra Materials: Provide one unopened carton of each profile and color including end units and outside corners.

1.5 QUALITY ASSURANCE

A. Conform to 2015 IBC Chapter 8 and ASTM E84 for flame/smoke rating requirements.

1.6 PROJECT/SITE CONDITIONS

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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Allstate Rubber Corp. (www.allstaterubber.com).

B. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Resilient Base:
   1. Type: ASTM F1861, thermoset vulcanized rubber or thermoplastic rubber.
   2. Thickness: 1/8 inch.
   3. Profile: Coved.
   4. Height: 4 inches.
   5. Length: 120 foot rolls.
   6. End units and outside corners: Preformed; profile, size, and color to match base.
   7. Color: To be selected from Manufacturer’s full color range.

2.3 ACCESSORIES

A. Primer and Adhesive:
   1. Water based, waterproof type recommended in writing by base Manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare surfaces to receive base:
   1. Remove materials that could interfere with adhesion.
   2. Fill low spots with patching compound; finish flush with adjacent surface.
   3. Remove high spots, ridges and nibs.

3.2 INSTALLATION

A. Resilient Base:
   1. Apply adhesive continuously to back of base.
   2. Maintain top edge true to line and bottom edge in continuous contact with floor. Butt joints tight; butt base tight to adjacent construction.
   3. Miter and butt inside corners.
   4. At outside corners install preformed corner pieces.
   5. At exposed ends, install premolded units.
   6. Scribe to door frames and other interruptions.

3.3 SCHEDULE

A. Total of four (4) colors may be used.

END OF SECTION 09 65 13
PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Two (2) inch regular edge fabric finish flat wall panels
B. Accessories

1.2 RELATED DOCUMENTS

A. Division 01: Administrative, procedural, and temporary work requirements.

1.3 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.
B. ASTM International (ASTM) (www.astm.org):
   4. E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C
C. Environmental Protection Agency. (EPA).

1.4 SUBMITTALS

A. Submit under provisions of Division 01.
B. Product Data: Submit for each type of finish, panel edge, core material, and anchoring device indicated.
C. Shop Drawings: Submit for wall panels. Indicate mounting devices and details; details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge and core materials. Include elevations showing panel sizes and direction of fabric weave.
D. Samples: For each type of fabric facing from wall panel Manufacturer’s full range.
E. Fabric Facing: Submit full-width by approximately 12 inches long sample, but not smaller than required to show complete pattern repeat, from dye lot to be used for the Work, and with specified treatments applied. Mark top and face of fabric.
F. Panel Edge: 12-inch long sample(s) showing each edge profile, corner, and finish.
G. Core Material: 12-inch square sample at corner.
H. Mounting Devices: Full-size samples.
I. Assembled Panels: Approximately 12 by 12 inches, including joints and anchoring devices.
J. Maintenance Data: Indicate fabric Manufacturer’s written cleaning and stain removal recommendations.

K. Warranty: Submit sample indicating items covered and length of warranty.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Installers shall have demonstrated at least two (2) years experience in assembly and installation of products similar to those specified in this section.

B. Manufacturer Qualifications: Company specializing in manufacturing fabric-wrapped panels with ten (10) years minimum experience.

C. Source Limitations: Obtain acoustical treatments through one (1) source from a single manufacturer.

D. Fire-Test Response Characteristics: Provide wall panel cores with the following fire-test response characteristics as determined by testing per ASTM E136:
   1. Flame-Spread Rating: 0.
   2. Smoke-Developed Index: 0.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver wall panels in manufacturer’s original, unopened and labeled packages.

B. Store and handle in strict compliance with manufacturer’s written instructions and recommendations.

C. Protect from damage due to weather, excessive temperature, and construction operations.

1.7 WARRANTY

A. Manufacturer’s standard form in which Manufacturer warrants against any defects in workmanship or breakdown of the core material for two (2) years from substantial completion.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not begin installation of acoustic panels until building has been enclosed and environmental conditions approximate interior conditions that will prevail when building is occupied.

PART 2 - PRODUCTS

2.1 ACOUSTIC PANEL MANUFACTURERS

A. Design Basis: Contract Documents are based on products by:
   2. Product: Two (2) Inch Regular Edge Fabric-Finish Flat Panels.

B. Equivalent products by following manufacturers are acceptable:
   1. ATS Acoustics. (www.atsacoustics.com).
   3. Or equal substitution under provisions of Division 01.

2.2 ACOUSTIC PANELS

A. Two (2) Inch Regular Edge Fabric-Finish Flat Panels: Mineral wool core with fiberglass mat
front and back; square edges.

1. **Core Properties:** Flame spread of zero (0), smoke developed rating of zero (0); minimum tensile strength of 2631 lbs/sq ft breaking load, and compressive resistance of 480 lbs/sq ft at 10 percent compression, and horizontal sag of not more than 1/2-inch in four (4) ft.

2. **Fabric Facing:** Selected from manufacturer’s standard fabric. Bond fabric to face and edges and return at edges a minimum of two (2) inches on back of panels. Provide panels with flat, wrinkle-free surface and tailored corners.

3. **Rating:** Rating of fabric used determines rating of panel as a unit.

4. **Recycled Content:** Provide fabric with post-consumer recycled content.

5. **Acoustical Properties:** NRC numbers in accordance with ASTM C423 for Type A mounting. Certifiable acoustical data must be provided by an NVLAP-approved, independent testing laboratory.

6. **Sound Absorption Coefficients (Regular Edge Fabric Finish – Abutted):**

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<th>Frequency (Hz)</th>
<th>Coefficient</th>
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<tbody>
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<td>.98</td>
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<tr>
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<td>.95</td>
</tr>
</tbody>
</table>

### 2.3 ACCESSORIES

A. **Fastening Devices:** Manufacturer’s standard “Concealed Multiple-Perforation Fastening Devices” (EZ-Clips). Provide in the following quantities:

1. Four (4) per 4 x 4 ft panel.
2. Six (6) per 4 x 6 ft panel.
3. Eight (8) per 4 x 8 ft panel.
4. In strict accordance with Manufacturer’s published instructions per custom size panel.

B. **Adhesives:** As recommended by manufacturer with a VOC content of 70 g/L or less when calculated in accordance with 40 CFR 59, Subpart D (EPA Method 24).

C. **Ceiling Hangers:** 14-gage stainless steel aircraft cable.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements that affect installation and with requirements for installation tolerances. Notify the Architect in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

A. Measure areas to receive flat panels and establish layout to balance border widths at opposite edges of each area. Avoid using less-than-half-width panels at borders, and comply with layout shown on wall elevations.

B. Coordinate work that penetrates the walls. Provide cutouts for wall-mounted items and penetrations accurately and cleanly.

#### 3.3 ACOUSTIC PANEL INSTALLATION
A. Install in strict accordance with Manufacturer's written installation instructions and recommendations and approved shop drawings. Coordinate installation with adjacent work to ensure proper clearances.

B. Install each EZ-Clip on the wall, with attachment screws appropriate to the substrate, so that it will impale the panel approximately 6 inches in from each corner and approximately 6 inches in from each side on longer panels.

C. Apply paneling adhesive in a 3/8-inch bead on fabric 1-1/2 inches in from edge before impaling panel on EZ-Clips.

D. Hang ceiling baffles from grommets with 14-gage stainless steel aircraft cable to exposed structure.

E. Make all required field alterations in accordance with manufacturer’s written instructions.

3.4 CLEANING AND PROTECTION

A. Clean exposed surfaces of flat panels in accordance with Manufacturer’s recommendations.

B. Protect installed products from damage or soiling until completion of project.

C. Remove and replace flat panels that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 84 00
PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
1. Surface preparation and field application of paints.
2. Painting of all exterior and interior surfaces indicated on drawings, door and finish schedules, as referenced in this section, and other specification sections to receive painted finish.
3. Paint all fabricated metal assemblies, brackets, rails, gratings and framing members exposed to view.
4. Reference finish schedule, interior elevation, and building sections for additional accent painting.
5. Prime and paint all steel bollards and other site furnishings that are not factory finished as identified on civil/landscape drawings. Color as directed by Construction Manager.
6. Apply a primer-sealer coat to all gypsum board prior to texture being applied. Coordinate with gypsum board contractor.
7. Prime and Paint all 8 foot steel downspout sections and mounting brackets.
8. Prime and Paint all fabricated steel trash enclosure gate assembly components.
9. Acrylic Dryfall to be applied on exposed overhead structural elements and deck where open-to-structure ceilings are indicated.

B. Related Sections:
1. Division 01: Administrative, procedural, and temporary work requirements.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.
B. ASTM International (ASTM):
1. D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications
C. Green Seal, Inc. (GS) (www.greenseal.org) 11 - Standard for Paints and Coatings.

1.3 SUBMITTALS

A. Submit product data under provisions of Division 01.
B. Provide product data on all finishing products.
C. Product Data: Manufacturer's data on materials proposed for use including:
1. Product designation and grade.
2. Product analysis and performance characteristics.
4. Material content.
5. Mixing and application procedures.

D. Samples:
   1. 3 by 6 inch samples of each coating system on representative substrate. Step back successive coats so that all coats remain exposed. Indicate type of material used for each coat.
   2. Paint Schedule: Indicate types and locations of each surface, paint materials, and number of coats to be applied.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Product Manufacturer: Company specializing in manufacturing quality paint and finish products with ten (10) years experience.
   2. Applicator: Company specializing in commercial painting and finishing approved by product manufacturer with five (5) years minimum experience.

B. Field Samples:
   1. Provide samples under provisions of Division 01.
   2. Provide field sample panel, on at least 100 sq. ft. of surface until required sheen, color and texture are achieved.
   3. Once each scheme has written approval of the Architect and the Owner, sample may remain as part of the Work.

C. Regulatory Requirements:

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 01.
B. Store and protect products under provisions of Division 01.
C. Deliver products to site in sealed and labeled containers; inspect to verify acceptance.
D. Container labeling to include Manufacturer’s name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing.
E. Store paint materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in well ventilated area, unless required otherwise by Manufacturer’s instructions.
F. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.6 PROJECT/SITE CONDITIONS

A. Owner will provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 50 degrees for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer’s instructions.
B. Do not apply exterior coatings during rain or snow, or when relative humidity is above 85 percent unless required otherwise by manufacturer’s instructions.
C. Minimum Application Temperatures for Latex Paints: 50 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer’s instructions.
D. Minimum Application Temperature for Varnish Finishes: 65 degrees F, unless required otherwise by manufacturer’s instructions.
E. Provide a minimum lighting level of 80 ft candles measured mid-height at substrate surface
while all work under this Section is being performed.

1.7 SEQUENCING AND SCHEDULING – NOT USED.

1.8 EXTENDED WARRANTY
   A. Under provisions of Division 01.
   B. Provide Manufacturer’s Standard Material Warranty.

1.9 MAINTENANCE
   A. Extra Stock: provide two (2) gallons of each type and color of paint used. Containers are to be sealed and properly identified.

PART 2 – PRODUCTS

2.1 MANUFACTURERS - PAINTS, STAINS, URETHANES, PRIMERS AND SEALERS
   A. Contract Documents are based on Painting products by:
   B. Equivalent products by following Manufacturers are acceptable:
      1. Benjamin Moore and Co. (www.benjaminmoore.com)
      2. Devoe Paint Co. (www.devoepaint.com)
      5. PPG Architectural Finishes, Inc. (www.pittsburghpaints.com)
   C. Substitutions: Under provisions of Division 01.

2.3 MATERIALS
   A. Manufacturer’s First Line, Superior Quality paint, stain and primer products are to be used throughout project for all applications. Coatings: Ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
   B. Coatings: Good flow and brushing properties; capable of drying or curing free of streaks or sags.
   C. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.
   D. Gypsum board primer to be S-W PrepRite High Build Latex Primer Surfacer B28W601, USG ‘First-Coat’ or Hamilton’s ‘Prep-cote’ or approved equal.
   E. Floor paint to be S-W Armorseal Tread-Plex 100% Acrylic Water Based Floor Coating B90 Series, Valspar ‘Ultra Premium Latex Porch & Floor Paint’ # 65735 Series or approved equal.
   F. Refer to schedule at end of Section and Contract Documents for surface finishes.

2.4 MANUFACTURED UNITS – NOT USED.
2.5 EQUIPMENT – NOT USED.
2.6 COMPONENTS – NOT USED.
2.7 ACCESSORIES – NOT USED.
2.8 MIXES – NOT USED.
2.9 FABRICATION – NOT USED.
2.10 SOURCE QUALITY CONTROL – NOT USED.
PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that substrate is ready to receive work as instructed by the product Manufacturer.
B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
   3. Interior Located Wood: 15 percent.
   4. Concrete Floors: 12 percent.
D. Beginning of installation means acceptance of substrate.

3.2 PREPARATION

A. Remove electrical plates, hardware, light fixture trim, and fittings prior to preparing surfaces or finishing.
B. Correct minor defects and clean surfaces which affect work of this Section.
C. Shellac and seal marks which may bleed through surface finishes.
D. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
E. Concrete Floors: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
F. Gypsum Board Surfaces: Latex fill minor defects. Spot prime defects after repair. Contractor is to apply a sealer-primer coat to all gyp board surfaces prior to texture being applied.
G. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
H. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish or clear sealer 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.
J. Interior Wood Items: 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.
K. Metal Doors: Seal top and bottom edges with primer.
L. Exterior mineral fiber cement siding and trim: Spot prime defects and remove dirt and other foreign matter prior to application of finish coatings. Review siding and trim manufacturers finishing preparation and application instructions.

3.3 APPLICATION

A. Apply products in accordance with Manufacturer's instructions.
B. Do not apply finishes to surfaces that are not dry.
C. Apply a coat of primer to all gyp board surfaces prior to texture being applied. Coordinate with gyp board contractor.
D. Apply each coat to uniform finish, without streaking, telegraphing of drywall joints or brush marks.
E. Apply each coat of paint slightly darker than preceding coat.
F. Sand lightly between coats to achieve required finish.
G. Allow applied coat to dry before next coat is applied.
H. Prime back surfaces of interior and exterior woodwork with primer paint.
I. Seal concrete floors with polyurethane sealer where Sealed Wear Surface is scheduled.
J. Mechanical and Electrical Equipment
1. Paint exposed electrical wire mold occurring in finished areas.
2. Replace electrical plates, hardware, light fixture trim, and fittings removed prior to finishing.
K. Paint all surfaces of girders, joists, ducts, catwalks steel framing and decking, etc. in exposed ceiling areas.
L. Paint all plumbing piping, fire sprinkler piping and conduit runs exposed in finished spaces.
M. Paint all access doors provided by Section 08 31 13 – Access Doors and Frames in finished spaces.
N. Paint all site steel items including but not limited to bollards and downspout extensions.
O. Paint all ladders, guardrail assemblies and handrails.
P. Paint all exposed interior and exterior structural steel including but not limited to steel lintels at masonry openings.
Q. Exterior items to be painted shall include, but not be limited to, steel lintels, vents, flues, pipes, conduits, steel bollards, roof hatches, grated rails, mineral fiber cement siding and trim, concrete masonry units and any other items not factory finished.
R. Apply clear masonry sealer to exterior integral colored concrete masonry and cast stone units. Apply clear masonry sealer to the back side of all masonry parapet walls not covered with membrane roofing materials.

3.4 CLEANING
A. As Work proceeds, promptly remove paint where spilled, splashed, or spattered.
B. During progress of Work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.
C. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

3.5 DEMONSTRATION – NOT USED.

3.6 PROTECTION
A. Protect elements surrounding the work of this Section from damage or disfiguration.
B. Repair damage to other surfaces caused by work of this Section.
C. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.
D. Remove empty paint containers from site.

3.7 SCHEDULES
A. Shop-Primed Items for Site Finishing.
   1. Section 08 11 13 - Hollow Metal Doors and Frames: All exposed surfaces, tops and bottoms of doors.
B. Exterior Surfaces.
   1. Steel Shop Primed:
      a. Touch up with: S-W Kem Kromik Universal Metal Primer - Off White B50WZ1
      b. Two Coats alkyd enamel: S-W Industrial Enamel Pure White B54W101
2. **Steel - Galvanized:**

C. **Interior Surfaces**

1. **Steel - Primed:**
   a. Touch-up with original primer: S-W Pro-Cryl Universal Primer B66W00310 (99 g/L VOC).
   b. Two coats Acrylic enamel, semi-gloss: S-W Pro Industrial High Performance Acrylic Semi-Gloss, B66 Series. (<50 g/L VOC)

2. **Gypsum Board, standard classrooms, hallways and similar areas:**
   a. One coat acrylic latex drywall primer-sealer. S-W Contractors 152 Pro Primer, B28WFO152 (<50 g/L VOC).
   b. Two coats acrylic latex enamel, satin: S-W ProMar 400 Latex Low Sheen ES, B20 Series (<50 g/L VOC)

3. **Gypsum Board at toilet rooms and wet areas:**
   a. One coat acrylic latex drywall primer-sealer: S-W Contractors 152 Pro Primer, B28WFO152 (<50 g/L VOC).
   b. Two coats epoxy enamel, semi-gloss: S-W Water Based Catalyzed Epoxy, Extra White, B70W211. (<150 g/L VOC).

4. **Steel - Galvanized:**
   a. One coat: S-W Pro-Cryl Universal Primer B66W00310 (99 g/L VOC).

5. **Clear Finished Hardwood millwork and trim:**
   b. Two coats urethane/polyurethane satin: S-W Minwax, Polycrylic Protective Finish Satin, 3333 (275 g/L VOC).

6. **Concrete Floors: (Sealed Wear Surface)**
   a. Two coats: BASF (Sonneborn) “Kure-n-Seal W” water based transparent clear curing/sealing compound with 20% solids.

7. **Wood Trim to be Painted:**
   a. One coat primer: S-W Multi-Purpose Int/Ext Latex Primer Sealer B51 Series, (<50 g/L VOC).

8. **Gypsum wall board as preparation for vinyl wall covering and protective wall covering:**
   a. One coat back-rolled acrylic latex drywall primer-sealer: S-W Contractors 152 Pro Primer, B28WFO152 (<50 g/L VOC).

9. **Steel structural members, Joists, Deck and Ductwork Dryfall where indicated:**
   a. Dry fall paint to be utilized. S-W Low VOC Waterborne Dryfall, B42 Series (<50 g/L VOC). Four colors required.
   b. 2 coat applications at manufacturers written recommended DFT per coat.

10. **Plywood panel storage cubbies and utility counter tops – If required for this requested:**
    a. Three coats low sheen acrylic latex floor enamel: S-W ArmorSeal Tread-Plex 100% Acrylic Floor Coating B90W00111 (<50 g/L VOC), prime coat thinned 10% for maximum penetration.

D. **Colors:**

1. The Architect may select from the following number of interior paint colors:
   a. Hallways and Corridors 2 base colors
   b. Classrooms 2 base colors
c. Gymnasium 2 base color and 4 accent colors
d. OTS Deck and Joists 2 colors
e. Ductwork 2 colors
f. Offices 2 base colors and 1 accent color

E. Finish Schedule
1. Review finish schedule general notes for additional requirements.

END OF SECTION 09 91 00
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SECTION 10 11 16

MARKERBOARDS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Porcelain Enamel Steel Surfaced Magnetic Markerboards.
   2. Trim, marker tray/chalk trough, and accessories.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.

B. American National Standards Institute (ANSI):
   1. A135.4 - Basic Hardboard.
   2. A208.1 - Particleboard.

C. ASTM International (ASTM):
   2. A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.


1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Indicate on shop drawings, wall elevations, dimensions, joint locations, special anchor details.

C. Submit product data under the provisions of Division 01.

D. Samples: Submit two samples illustrating materials and finish, color, and texture of markerboards.

E. Submit Manufacturer's installation instructions under provisions of Division 01.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Manufacturer shall be a firm engaged in the Manufacture of visual display boards in the United States.
   2. Manufacturer shall have a minimum of five (5) years experience in the manufacture of visual display boards.

B. Regulatory Requirements: Conforms to applicable code for flame/smoke rating in
tackboards in accordance with ASTM E84.

C. Product Certifications: Provide GREENGUARD Indoor Air Quality Certified® and GREENGUARD Children and Schools certificates for markerboards, as applicable.

D. Operation and Maintenance: Include data on regular cleaning, stain removal, and precautions.

1.5 DELIVERY, STORAGE AND HANDLING – NOT USED.

1.6 PROJECT/SITE CONDITIONS

A. Field measure prior to preparation of shop drawings and fabrication to ensure proper fit.

B. Comply with Manufacturer’s recommendations for acclimating area for interior moisture and temperature to approximate normal occupied conditions.

1.7 SEQUENCING AND SCHEDULING – NOT USED.

1.8 EXTENDED WARRANTY

A. Provide Manufacturer’s ten (10) year warranty under provisions of Division 01.

B. Warranty: Include coverage of marker surface from discoloration due to cleaning, crazing, cracking, or staining.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Equivalent products by following Manufacturers are acceptable:
   1. AJW Visual Display Surfaces. (www.ajw.com)
   2. Aywon Chalkboard and Corkboard, Inc. (www.aywon.com)
   4. Claridge, Inc. (www.claridgeproducts.com)
   6. WIUSA. (www.wiusa.com).

B. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Writing Surface Face Sheet:
   1. Manufactured in accordance with Porcelain Enamel Institute's specification.
   2. Shall be enameling grade cold rolled steel manufactured from a minimum of 30 percent post-consumer and post-industrial waste.
   3. Enameling grade steel shall be coated with LCS-11 Porcelain Enamel by Claridge Products and Equipment.
   4. 3-Coat process shall include:
      a. Bottom Ground Coat - 1.5 to 2.2 mils
      b. Top Ground Coat - 2.0 to 2.8 mils
      c. Top Cover (Color) Coat - 3.0 to 4.0 mils
   5. Firing Temperature: Enamel shall be fired at lowest possible temperatures to reduce steel and porcelain stresses and achieve superior enamel and hardness.

B. Steel Sheet: ASTM A424, Type I, commercial quality, 28 gauge minimum.

C. Aluminum Extrusions: ASTM B221, 6061 alloy, temper.

D. Plywood: APA Structural I, Grade C-D, fir species.
E. Hardboard: ANSI A135.4; tempered.
F. Foil Backing: Aluminum foil sheet, minimum 0.005 inches thick.
G. Adhesives: Type recommended by Manufacturer. Waterproof type.
H. Plastic Laminate: Manufacturer standard.

2.3 MANUFACTURED UNITS – NOT USED.
2.4 EQUIPMENT – NOT USED.
2.5 COMPONENTS – NOT USED

2.6 ACCESSORIES

A. Maprail: Full length of board, extruded aluminum, with cork inserts.
B. Map Supports: Formed aluminum hooks, sliding type to fit map rail, 1 per each 2 foot of board.
C. Flag holder: One (1) per classroom.
D. Marker Tray/Chalk trough: Standard continuous, solid, blade-type aluminum tray with ribbed section and injection molded end closures at bottom of each markerboard.
E. Omit marker tray at marker boards in Gymnasium 142A and Commons 101 and Hallway 119.
F. Screen Print: Manufacturers fabricated permanent imprinted lines that are UV-resistant, scratch resistant and permanently fused to the porcelain enamel writing surface where indicated in the Contract Documents.

2.7 MIXES – NOT USED.

2.8 FABRICATION

A. Magnetic marker boards:
   1. Outer Face Sheet: Steel, 28 gauge thick.
   2. Core: Plywood or Hardboard; 1/2 inch thick, sealed both sides.
B. Frame and Trim:
   1. Frame: Extruded aluminum, of standard profile; concealed fasteners; map rail with cork insert over chalkboard surfaces.
   2. Marker Tray/Chalk trough: Extruded aluminum, of standard profile; one piece, full length of markerboard with concealed fasteners.
C. Finishes:
   1. Marker Board Surface: Porcelain Magnetic Finish. Provide special writing surface intended also for projection. Dry erase markers, permanent markers, pencils and pens must be erased using a damp cloth.

2.9 SOURCE QUALITY CONTROL – NOT USED.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and internal wall blocking are ready to receive work.
B. Beginning of installation means acceptance of existing substrate construction.

3.2 PREPARATION – NOT USED.
3.3 INSTALLATION
   A. Install markerboards in strict accordance with Manufacturer’s instructions.
   B. Secure units level and plumb.

3.4 FIELD QUALITY CONTROL – NOT USED.
3.5 ADJUSTING – NOT USED.

3.6 CLEANING
   A. Clean markerboard surfaces in accordance with Manufacturer’s instructions.
   B. Cover markerboard surfaces with protective cover, taped to frame.
   C. Remove protective cover at Date of Substantial Completion.

3.7 DEMONSTRATION – NOT USED.
3.8 PROTECTION – NOT USED.

3.9 SCHEDULE
   A. Provide Markerboards as indicated on Contract Documents for all Classrooms and other rooms where indicated.

END OF SECTION 10 11 16
PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes
   1. Tack boards.
   2. Trim and accessories.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.


C. American National Standards Institute (ANSI):
   1. A135.4 - Basic Hardboard.
   2. A208.1 - Particleboard.

   1. 265 - Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls.


1.3 SUBMITTALS

A. Submit product data and installation instructions under provisions of Division 01.

B. Samples and color charts: Provide Manufacturer's color charts and composition samples of face, core, backing and trim to illustrate finish, color and texture. Provide Manufacturer's maintenance data as per provisions of Division 01.

1.4 QUALITY ASSURANCE – NOT USED.

1.5 DELIVERY, STORAGE AND HANDLING

A. Schedule delivery of tack boards with spaces sufficiently complete so that tack boards can be installed upon delivery.

1.6 PROJECT/SITE CONDITIONS – NOT USED.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate work with other finish trades.

B. Sequence installation after all other finish work is completed in each room to receive panels.
1.8 EXTENDED WARRANTY – NOT USED.

1.9 MAINTENANCE

A. Provide Four (4) additional panels (of each size used on project) as extra stock, properly wrapped and identified.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. InWest Manufacturing. (www.inwestmfg.com).
B. Lamvin. (www.lamvin.com).
D. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Tackboard:
   1. Core: 1/2 inch Micore Fiberboard as manufactured by USG.
   2. Outer facing: Vinyl covering.
   3. Frame: Extruded aluminum, of standard profile and concealed fasteners.
   4. Flame Spread – Class A
   5. 100% polyester vinyl (type II)
      a. Koroseal
      b. Product: Harbor Weave
   7. Adhesive: Type recommended by panel manufacturer for application. Utilize low VOC type where available.

2.3 MANUFACTURED UNITS – NOT USED.

2.4 COMPONENTS – NOT USED.

2.5 ACCESSORIES – NOT USED.

2.6 MIXES – NOT USED.

2.7 FABRICATION - NOT USED.

2.8 SOURCE – NOT USED.

2.9 QUALITY CONTROL – NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that substrate, adjacent materials and panels are dry and ready for installation.

3.2 PREPARATION – NOT USED.

3.3 EXECUTION

A. Adhere panels to walls in a true and level manner. Place panels in a method to maximize contact bedding. Butt ends tight to adjacent panels.
B. Joints for all materials shall not exceed 1/16 inch space, including all miter joints or the material shall be replaced.
3.4 FIELD QUALITY CONTROL – NOT USED.
3.5 ADJUSTING – NOT USED.

3.6 CLEANING
   A. Clean in accordance with Manufacturer's instructions.

3.7 DEMONSTRATION – NOT USED.

3.8 PROTECTION OF FINISHED WORK
   A. Protect work under provisions of Division 01.

3.9 SCHEDULES – NOT USED.

END OF SECTION 10 11 23
SECTION 10 14 00
SIGNAGE

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes
   1. Melamine Plastic interior panel signs.
B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.
B. American Architectural Manufacturers Association (AAMA):
   1. 611 - Voluntary Specification for Anodized Architectural Aluminum.
C. ASTM International (ASTM):
   1. A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
   1. A117.1 – Accessible and Usable Buildings & Facilities
E. United States Department of Justice (USDOJ) (www.ada.gov) - ADA Standards for Accessible Design (SAD).

1.3 SUBMITTALS

A. Submit shop drawings under provisions of Division 01.
B. Submit Manufacturer’s installation instructions under provisions of Division 01.
C. Submit color sample to Architect under provisions of Division 01.
D. Submit shop drawings listing attachment devices, sign styles, lettering and locations of each sign.
E. Mockup: One full-size melamine plastic interior panel sign.

1.4 QUALITY ASSURANCE

A. Obtain written approval of local Fire Marshal for mounting location of address numbers as per requirements of International Fire Code.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site, store, and protect products under provisions of Division 01.
B. Store adhesive tape at ambient room temperatures.
1.6 PROJECT/SITE CONDITIONS

A. Do not install plastic signs when ambient temperature is below 70 degrees F. Maintain this minimum during and after installation.

1.7 SEQUENCING AND SCHEDULING – NOT USED.
1.8 EXTENDED WARRANTY – NOT USED.
1.9 MAINTENANCE – NOT USED.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Melamine Plastic Signs:
   2. Best Manufacturing Inc. (www.bestmanufacturinginc.com)

B. Substitutions: Under provisions of Division 01.

2.2 MATERIALS – NOT USED.

2.3 MANUFACTURED UNITS

A. Room Signs: Provide 6 by 6 by 1/4 inch melamine plastic signs with frames at 60 inch A.F.F. to center of sign at latch side of all interior door jambs as indicated. Room sign letters and/or numerals shall be raised 1/32 inch upper case, Futura letter style. Changeable inserts shall be clear melamine plastic for paper inserts. Braille inserts shall be Grade 2 Braille with the room description as indicated on the Signage drawings in the construction documents. Pictograms shall be accompanied by the equivalent verbal description placed directly below the pictogram. The border dimension of the pictogram shall be 6-1/2 inch minimum in height. Characters and symbols shall contrast with their background. Sign colors shall be selected by the Architect. Mounting to be with adhesive and screws to wall surface on latch side of door where feasible.

B. Occupancy Signs: Provide Code compliant plastic sign similar to those described in Paragraph 2.3.A (above). Provide text to read “Maximum Occupancy shall not exceed 782”.

2.4 EQUIPMENT – NOT USED.

2.5 COMPONENTS – NOT USED.

2.6 ACCESSORIES

A. Provide mounting hardware for concealed flush mounting.

2.7 MIXES – NOT USED.

2.8 FABRICATION

A. Melamine Plastic Signs:
   1. Material: Engraved Melamine, equal to Best Graphic Blast MP, ASE Blast-Etched BE100.

2.9 SOURCE QUALITY CONTROL – NOT USED.

PART 3 - EXECUTION
3.1 EXAMINATION
A. Verify that surface is ready to receive work.
B. Beginning of installation is acceptance of substrate construction.

3.2 PREPARATION
A. Exact text is to be provided during shop drawing review.
B. Contractor to compile a complete list of signs and content copy with Owner and Architect & obtain Owner’s signature of approval prior to sign production. The Architect is not responsible for content of sign copy.

3.3 INSTALLATION
A. Install in accordance with manufacturer's instructions.
B. Install units level and plumb.

3.4 FIELD QUALITY CONTROL – NOT USED.

3.5 CLEANING
A. Under provisions of Division 01.
B. Clean in accordance with Manufacturer’s instructions.
C. Protect from damage by other trades.

3.6 ADJUSTING – NOT USED.
3.7 DEMONSTRATION – NOT USED.

3.8 PROTECTION
A. Protect until Substantial Completion.

3.9 SCHEDULES – MELAMINE PLASTIC SIGNS / CAST LETTERS / CAST PLAQUE
A. Style A - Changeable Insert Room Sign: Provide where indicated on Floor Finish Plans
B. Style B - Message Sign: Provide where indicated on Floor Finish Plans
C. Style C - Word and Picture Sign: Men’s: Provide where indicated on Floor Finish Plans
D. Style Cb - Word and Picture Sign: Boy’s: Provide where indicated on Floor Finish Plans
E. Style D - Word and Picture Sign: Women’s: Provide where indicated on Floor Finish Plans
F. Style Dg - Word and Picture Sign: Girl’s: Provide where indicated on Floor Finish Plans
G. Style F - Maximum Occupancy Sign: Provide two (2) - 782
SIGNAGE KEYING LEGEND

SIGN A
101
CHANGEABLE INSERT SIGN
(6"x6")

SIGN B
109
MESSAGE SIGN
(6"x4")

SIGN C, Cb
WORD & PICTURE SIGN
MEN'S (6"x7 3/4") - TO READ
"BOYS" @ TYPE Cb

SIGN D, Dg
WORD & PICTURE SIGN
WOMEN'S (6"x7 3/4") - TO READ
"GIRLS" @ TYPE Dg

SIGN F
MAXIMUM OCCUPANCY
100
MAX. OCCUP. SIGN

END OF SECTION 10 14 00
SECTION 10 21 13

HIGH DENSITY POLYETHYLENE TOILET COMPARTMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Solid plastic toilet compartments; floor anchored pilaster, overhead braced.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.

B. American National Standards Institute. (ANSI)

C. ASTM International (ASTM) (www.astm.org):


1.3 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall, floor, and ceiling supports, door swings.

C. Product Data: Provide data on panel construction, hardware, accessories, and colors.

D. Samples: 3 by 3 inch samples showing available colors.

E. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Conform to ANSI A117.1 for access for the handicapped.
   2. Interior finishes using polypropylene (PP) and high density polyethylene (HDPE) must be tested in accordance with NFPA 286.

B. Manufacturer Qualifications: Minimum five (5) years experience in manufacture of solid plastic toilet compartments with products in satisfactory use under similar service conditions.

C. Installer Qualifications: Minimum five (5) years experience in work of this Section.

1.5 DELIVERY, STORAGE AND HANDLING – NOT USED.

1.6 PROJECT/SITE CONDITIONS
A. Verify that field measurements are as indicated on shop drawings.

1.7 SEQUENCING AND SCHEDULING
A. Coordinate work under provisions of Division 01.
B. Coordinate the work with placement of support framing and anchors in wall and ceiling.

1.8 EXTENDED WARRANTY
A. Provide Manufacturer’s 25 year warranty against breakage, corrosion, and delamination under normal conditions.
B. Include coverage of partitions/trim from discoloration from cleaning, staining, and rusting.

1.9 MAINTENANCE – NOT USED.

PART 2 – PRODUCTS

2.1 MANUFACTURERS
A. Accurate Partitions Corp. (www.accuratepartitions.com)
B. Bobrick. (www.bobrick.com).
C. Global Partitions. (www.globalpartitions.com)
D. Substitutions: Under provisions of Division 01.

2.2 MATERIALS
A. Doors, Panels and Pilasters:
   1. High density polyethylene (HDPE), fabricated from polymer resins compounded under high pressure, forming single thickness panel.
   2. Waterproof and nonabsorbent, with self-lubricating surface, resistant to marks by pens, pencils, markers, and other writing instruments.
   3. 1 inch thick with edges rounded to 1/4 inch radius.
   4. Color: To be selected from Manufacturer’s full color range.
B. Aluminium Extrusions: ASTM B221, 6463-T5 alloy and temper.
C. Stainless Steel: ASTM A167, Type 304.

2.3 MANUFACTURED UNITS – NOT USED.
2.4 EQUIPMENT – NOT USED.
2.5 COMPONENTS – NOT USED.

2.6 ACCESSORIES
A. Pilaster Shoe: Formed ASTM A167 type 304 stainless steel with No. 4 finish, 3 inch high, with adjustable screw jack.
B. Attachments, Screws, and Bolts: Stainless steel and tamperproof type.
C. Through Bolts and Nuts: Stainless steel with tamperproof heads.
D. Hardware; Stainless steel:
   1. Continuous hinge, spring loaded, through bolted.
   2. Slide door latch with exterior emergency access feature. Accessible to persons with fine motor disabilities.
   3. Door strike and keeper with rubber bumper or vinyl door stops.
   4. Coat hook with rubber bumper.
5. Door pull for out swinging doors.
E. Wall bracket is to be cut at top of tile to provide flush mounting to varying wall conditions.
F. All exposed screws to be tamper proof.
G. All doors to have stainless steel “anti-lock out” device on exterior of ADA compliant doors, no exceptions.

2.7 MIXES – NOT USED.

2.8 FABRICATION

A. Fabricate partitions by forming solid plastic with finished faces and edges. Finish edges convex.
B. Bevel corners and edges of cut-outs.
C. Doors and Stiles:
1. Thickness: 1 inch
2. Door Width: 24 inch
3. Door Width for Handicapped Use: 36 inch, out-swinging.
4. Height: 55 inches
D. Panels:
1. Thickness: 1- inch
E. Finishes:
1. Solid Plastic material: Color to be selected from Manufacturer's standards.
2. Stainless Steel Surfaces: No. 4 finish.
F. Wall Brackets:
1. Use plastic type. Color to be selected by Architect to match or compliment wall panel.

2.9 SOURCE QUALITY CONTROL – NOT USED.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Division 01.
B. Verify correct spacing of and between plumbing fixtures.
C. Verify correct location of built-in framing, anchorage, and bracing.

3.2 PREPARATION – NOT USED.

3.3 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with Manufacturer's instructions.
B. Maintain 3/8 to 1/2 inch space between wall and panels and between wall and end pilasters.
C. Attached panel brackets securely to walls using anchor devices.
D. Attach panels and pilasters to brackets, tamperproof through bolts and nuts.
E. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster. Conceal floor fastenings with pilaster shoes.
F. Support overhead brace by adequately attaching to wall.
G. Equip each door with continuous spring loaded hinge, one door latch, one coat hook and bumper; out swinging door with pull.
H. Install door strike and keeper with door bumper on each pilaster in alignment with door latch.
I. Field touch-up of scratches or damaged finish will be permitted, subject to Architect’s approval.
J. Replace damaged or scratched materials with new materials if repair is not acceptable to Architect.
K. Tolerances
   1. Maximum Variation From True Position: 1/4 inch.
M. Remove all sharp edges and corners on aluminum end caps.

3.4 FIELD QUALITY CONTROL – NOT USED.

3.5 ADJUSTING

A. Adjust work under provisions of Division 01.
B. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.
C. Adjust hinges to position doors in full closed position when unlatched. Return out swinging doors to closed position.
D. Adjust adjacent components for consistency of line or plane.

3.6 CLEANING – NOT USED.
3.7 DEMONSTRATION

A. Demonstrate panel repair (scratch) to Owner staff.

3.8 PROTECTION – NOT USED.
3.9 SCHEDULES – NOT USED.

END OF SECTION 10 21 13
PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes
   1. Stainless Steel Corner Guards.
   2. Stainless Steel End Wall Guards.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.
B. ASTM International (ASTM)
   1. A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
C. American National Standards Institute. (ANSI)
D. National Fire Protection Agency. (NFPA)
   1. 286 -Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth

1.3 SUBMITTALS

A. Submit under provisions of Division 01.
B. Provide product data on corner guards and fasteners.
C. Submit sample under provisions of Division 01.
D. Submit Manufacturer's installation instructions under provisions of Division 01.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Company specializing in manufacturing corner guards with three (3) years documented experience.
   2. Applicator: Company specializing in installing corner guards with three (3) years documented experience.
B. Regulatory Requirements:
   1. Perform work in accordance with ANSI A117.1.
   2. Work shall have a Class I rating when tested in accordance to 2015 IBC Section 803 and NFPA 286.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Division 01.
B. Store and protect products under provisions of Division 01.
C. Inspect materials on site to verify acceptance.

1.6 PROJECT/SITE CONDITIONS

A. Provide continuous ventilation and heating facilities to maintain substrate surface and ambient temperatures above 60 degrees F, unless required otherwise by Manufacturer's instructions.
B. Maintain these conditions 24 hours before, during and after installation of corner guards.
C. Do not install guards until after painting and finishing work is completed.

1.7 SEQUENCING AND SCHEDULING – NOT USED.

1.8 WARRANTY

A. Under provisions of Division 01.
B. Manufacturer's Standard Five (5) Year Warranty on material under provisions of Division 01.

1.9 MAINTENANCE

A. Extra Stock:
   1. Provide 6 lengths of each type of corner guard under provisions of Division 01.
   2. Package and store where directed by Owner.

PART 2– PRODUCTS

2.1 MANUFACTURERS

A. Afco. (www.afco-usa.com).
B. Construction Specialties, Inc. (www.c-sgroup.com)
C. Inpro Corporation. (www.inprocorp.com)
D. Lasasco, Inc. (www.lasascoinc.com).
E. Pawling Corp. (www.pawling.com)
F. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Brushed stainless steel:
   1. ASTM A666, Type 304, No. 4 satin finish, 16 gauge.
   2. Corner Guards to match kick plates on doors.

2.3 MANUFACTURED UNITS – NOT USED.

2.4 EQUIPMENT – NOT USED.

2.5 COMPONENTS:

A. Corner Guards to be of “Stainless Steel” material, minimum of 48 inches high (Contractor to verify and cut to fit when necessary), with 2 inch returns on each side of face, mounted above the rubber base. (no visible attachment). See interior elevations and corner guard details for heights at different conditions.
B. End Wall Protection to be of “Stainless Steel” material, minimum of 48 inches high, (contractor to verify and cut to fit when necessary), surface mount with continuous coverage at end of wall and 2 inch returns on each side of end face, mounted above the rubber base. (no visible attachment). See interior elevations and corner guard details for
heights at different conditions.
C. Fastener: Clear silicone adhesive to be of low VOC type or as recommended by Manufacturer to suit application to substrate.

2.6 ACCESSORIES – NOT USED.
2.7 MIXES – NOT USED.
2.8 FABRICATION – NOT USED.
2.9 SOURCE QUALITY CONTROL – NOT USED.

PART 3 – EXECUTION

3.1 EXAMINATION
A. Verify that surfaces are ready to receive work.
B. Beginning of installation means acceptance of existing substrate and conditions.

3.2 PREPARATION – NOT USED.

3.3 INSTALLATION
A. Install components in accordance with Manufacturer's instructions, level and plumb.
B. Position corner guard at top of rubber base where applicable.
C. Install corner guards at locations indicated on Contract Documents and per schedule herein.

3.4 FIELD QUALITY CONTROL – NOT USED.
3.5 ADJUSTING – NOT USED.

3.6 CLEANING
A. Clean corner guards of excess dust, dirt and other contaminants.
B. Protect finished installation under provisions of Division 01.

3.7 DEMONSTRATION – NOT USED.
3.8 PROTECTION – NOT USED.

3.9 SCHEDULE
A. Provide Corner Guards at all outside gypsum board corners and endwalls throughout the building.

END OF SECTION 10 26 13
SECTION 10 26 23

PROTECTIVE WALL COVERING

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes
   1. Rigid Sheet Wall Covering
   2. Accessories
   3. Surface Preparation

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.
B. ASTM International (ASTM) (www.astm.org):

1.3 SUBMITTALS

A. Submit product data under provisions of Division 01.
B. Provide product data on High Impact Panels, adhesive sealant and trim moldings.
C. Submit samples under provision of Division 01.
D. Submit Manufacturer’s installation instructions under provisions of Division 01.
E. Submit 3 by 3 inch samples of panels illustrating color finish and texture.
F. Provide color samples for Architect’s selection.

1.4 QUALITY ASSURANCE

A. Installer qualifications: Engage an installer who has no less than three (3) years experience in installation of systems similar in complexity to those required for this project.
B. Manufacturer’s qualifications: Not less than five (5) years experience in the production of specified products and a record of successful in-service performance.
C. Code compliance: Assemblies should conform to all applicable codes including UBC, SBCCI, BOCA, and 2015 IBC.
D. Fire performance characteristics: Provide engineered high impact panel protection system components with UL label indicating that they are identical to those tested in accordance with ASTM E84 for Class 1 characteristics listed below:
   1. Flame spread: 25 or less
   2. Smoke developed: 450 or less
E. Impact Strength: Provide assembled wall protection units that have been tested in accordance with the applicable provisions of ASTM F476.
F. Chemical and stain resistance: Provide wall protection system components with chemical and stain resistance in accordance with ASTM D543.
G. Color match: Provide wall protection components that are color matched in accordance with the following:
   1. Delta Ecmc of no greater than 1.0 using CIELab color space.

H. Single source responsibility: Provide all components of the wall protection system manufactured by the same company to ensure compatibility of color, texture and physical properties.


1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Instructions to Bidders and Division 01.
B. Store and protect products under provisions of Instructions to Bidders and Division 01.
C. Inspect materials on site for damage.
D. Protect packaged adhesive and sealant from temperature cycling and cold temperatures.

1.6 PROJECT/SITE CONDITIONS

A. Provide continuous ventilation and heating facilities to maintain substrate surface and ambient temperature above 60 degrees F, unless required otherwise by manufacturer’s instructions.
B. Do not apply adhesive when substrate surface temperature or ambient temperature is below 60 degrees F or relative humidity is above 50 percent.
C. Maintain these conditions 24 hours before, during and after installation of Rigid Sheet Wall Covering.
D. Provide lighting level of 80 ft candles measured mid-height at substrate surfaces, during installation.

1.7 SEQUENCING AND SCHEDULING – NOT USED.

1.8 EXTENDED WARRANTY – NOT USED.

1.9 MAINTENANCE

A. Extra Stock:
   1. Provide four (4) full size sheets of each color of wall panel under provisions of Division 01.
   2. Package and store where directed by Owner.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

   1. C/S Acrovyn Interiors Fiber-Backed Wall Covering System, as manufactured by Construction Specialties, Inc., Mincy, PA; San Marcos, CA; Mississauga, Ontario.
   2. Substitutions: Under provisions of Division 01.

B. Rigid Sheet Wall Covering 01:
   1. Engineered PETG: Rigid sheet should be high impact Acrovyn 4000 with nominal .060” (1.52mm) thickness and supplied in 4 by 8 or 10 foot sheet sizes in Suede texture.
   2. Available in (60) Acrovyn solid colors. Color-matched caulk, plastic, or metal trim as needed for joints/transitions.

2.2 MATERIALS – NOT USED.
2.3 MANUFACTURED UNITS – NOT USED.
2.4 EQUIPMENT – NOT USED.

2.5 COMPONENTS

A. Adhesive: Type provided by Manufacturer to suit applications to substrate.
B. Substrate Filler: As recommended by adhesive and Rigid Sheet Wall Covering Manufacturer; compatible with substrate.
C. Sealant: Type provided by Manufacturer.
   1. See Section 07 92 00 – Joint Sealants.
   2. Color: Clear.

2.6 ACCESSORIES

A. Moldings and Trims: Type recommended by Manufacturer for conditions encountered at all panel edges including, but not limited to, inside and outside corners, edge and cap moldings.
   1. Aluminum.

2.7 MIXES – NOT USED.
2.8 FABRICATION – NOT USED.
2.9 SOURCE QUALITY CONTROL – NOT USED.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work and conform to requirements of the Rigid Sheet Wall Covering Manufacturer.
B. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch per foot.

3.2 PREPARATION

A. Fill cracks and smooth irregularities with filler; sand smooth.
B. Remove electrical, telephone, and wall plates and covers.
C. Vacuum clean surfaces free of loose particles.

3.3 INSTALLATION

A. Apply adhesive and Rigid Sheet Wall Covering in accordance with Manufacturer’s instruction.
B. Install panels horizontally in one piece from floor to 51 inches A.F.F. Horizontal joints are not acceptable.
C. Razor trim edges on flat worktable. Do not cut on gypsum board surfaces.
D. Install inside and outside corner and cap moldings at all corner and edge locations.
E. Panels are to be installed with adhesive. Visible mechanical fasteners are not acceptable.
F. Apply specified sealant at all terminations and joints.
G. Install wall covering before installation of bases, hardware, or items attached to or spaced slightly from wall surface.
H. Install vertical joint trim, exterior and interior corner molding to top of base, or trim to provide “flat” base installation.

3.4 FIELD QUALITY CONTROL – NOT USED.
3.5 ADJUSTING – NOT USED.

3.6 CLEANING

A. Clean wall panels of excess adhesive, dust, dirt and other contaminants.

3.7 DEMONSTRATION – NOT USED.

3.8 PROTECTION

A. Provide finished installation under provisions of Instructions to Bidders.
B. Do not permit work at or near finished wall covered areas.

3.9 SCHEDULES

A. See Contract Documents.

END OF SECTION 10 26 23
SECTION 10 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Toilet, Bath, and Custodial Accessories.
   2. Hand Dryers.
   3. Framed Mirrors.
   5. Attachment hardware
   6. Installation of Owner Furnished Items

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.

1.2 REFERENCES

A. ASTM International (ASTM):
   3. A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   4. A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

B. American National Standards Institute. (ANSI)


1.3 SUBMITTALS

A. Submit under provisions of Division 01.
B. Provide product data on accessories describing size, finish, details of function, attachment methods.
C. Samples: One of each accessory, if requested.
D. Warranty: Sample warranty form.

1.4 QUALITY ASSURANCE

A. Conform to applicable accessibility code for locating accessories.
B. Hand Dryers: Tested and certified by UL and bear UL Listing Mark.

1.5 DELIVERY, STORAGE AND HANDLING
A. Deliver, store, protect, and handle products to site under provisions of Division 01

1.6 WARRANTIES
A. Furnish Manufactures Warranty on all products.

1.7 PROJECT/SITE CONDITIONS – NOT USED.
1.8 SEQUENCING AND SCHEDULING – NOT USED.
1.9 EXTENDED WARRANTY – NOT USED.
1.10 MAINTENANCE – NOT USED.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. A and J Washroom Accessories. (www.ajwashroom.com)
B. American Specialties, Inc. (www.americanspecialties.com)
C. Bobrick Washroom Equipment, Inc. (www.bobrick.com)
D. Bradley Corp. (www.bradleycorp.com)
E. Excel Dryer Co. (www.exceldryer.com)
F. Foundations. (www.foundations.com)
G. GAMCO. (www.gamcousa.com)
H. Imperial Fastener Company. (www.imperialfastener.com)
I. IronWood Manufacturing. (www.ironwoodmfg.com)
J. Koala Corporation. (www.koalakare.com)
K. World Dryer Corp. (www.worlddryer.com)
L. Substitutions: Under provisions of Division 01.

2.2 MATERIALS
A. Stainless Steel Sheet: ASTM A666, Type 304, 16 gauge.
B. High impact polyethylene.
C. Stainless Steel Tubing: ASTM A269.
D. Fasteners, Screws, and Bolts: Tamperproof.
E. Galvanized Steel: ASTM A1008.
F. Mirror Glass: ASTM C1036, Type I, Class 1, Quality q1, 1/4 inch thick.

2.3 MANUFACTURED UNITS- NOT USED
2.4 EQUIPMENT – NOT USED
2.5 COMPONENTS – NOT USED
2.6 ACCESSORIES – NOT USED
2.7 MIXES – NOT USED

2.8 FABRICATION
A. Weld and grind smooth joints of fabricated components.
B. Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.
C. Provide steel anchor plates, adapters, hangers, anchor components and cover plates for installation.
D. Factory Finish: Stainless Steel No. 4 satin luster finish.
E. Use stainless steel for exposed surfaces; galvanized steel may be used in concealed locations.
F. Form exposed surfaces from single sheet of stock, free from joints, and flat, without distortion.
G. Weld joints of fabricated components and grind smooth.
H. Fabricate grab bars of tubing, free of visible joints, return to wall with end attachment flanges.
I. Provide hangers, adapters, anchor plates, and accessories required for installation.
J. Key locks alike; furnish six keys.
K. Mirror Frame: One piece, roll formed stainless steel channel, 1/2 by 1/2 inch, with corners mitered and welded.
L. Mirror: Apply one coat of silver, one coat of electroplated copper, and one coat of organic mirror backing compound to back surface of glass. Galvanized steel sheet backing. Isolate glass from frame and backing with resilient, waterproof padding.

2.9 SOURCE QUALITY CONTROL – NOT USED.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that site conditions are ready to receive work.
B. Beginning of installation means acceptance of existing substrate.

3.2 PREPARATION

A. Verify exact location of accessories for installation with Owner and Architect.

3.3 INSTALLATION

A. Install fixtures, accessories and items in accordance with Manufacturer’s instructions.
B. Install plumb and level, securely and rigidly anchored to substrate.
C. Install Owner Furnished items, including but not limited to:
   1. Toilet paper dispensers
   2. Paper towel dispensers
   3. Soap dispensers
D. Coordinate exact locations with Owner and Architect prior to installation.
E. Comply with Accessibility Code requirements.

3.4 FIELD QUALITY CONTROL – NOT USED.
3.5 DEMONSTRATION – NOT USED.
3.6 PROTECTION – NOT USED.

3.7 SCHEDULE

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MFR NO.</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Mirror:</td>
<td>Bobrick B-290-1830</td>
<td>Where indicated on drawings.</td>
</tr>
<tr>
<td>Tilt Mirror:</td>
<td>Bobrick B-293-1830</td>
<td>Where indicated on drawings.</td>
</tr>
<tr>
<td>Long Mirror:</td>
<td>Bobrick B-290-2472</td>
<td>Where indicated on drawings.</td>
</tr>
<tr>
<td>Mop and Broom Holder:</td>
<td>Bradley 9955</td>
<td>One at service sink in Custodian 105.</td>
</tr>
<tr>
<td>Waste Receptacle:</td>
<td>Bobrick B-3644</td>
<td>One at each wash fountain.</td>
</tr>
<tr>
<td>Item</td>
<td>Brand/Type</td>
<td>Specifications</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Towel Dispenser:</td>
<td>O.F.C.I.</td>
<td>One at each sink. Excluding washfountains.</td>
</tr>
<tr>
<td>Soap Dispenser:</td>
<td>O.F.C.I.</td>
<td>One at each sink or lavatory. Two at each wash fountain.</td>
</tr>
<tr>
<td>Sanitary Napkin Receptacle:</td>
<td>O.F.C.I.</td>
<td>One at each stall in Restroom 138 and one each at Toilet 108 and Toilet 117.</td>
</tr>
<tr>
<td>Grab Bars:</td>
<td>Bradley</td>
<td>Concealed mounted, safety grip, 1-1/2: diameter, configuration as shown for ADA accessible Toilet rooms and stalls as indicated on Drawings.</td>
</tr>
</tbody>
</table>
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fire Extinguishers.
   2. Cabinets and Wall Brackets.
   3. Accessories.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.

B. ASTM International (ASTM) (www.astm.org)

C. National Fire Protection Association (NFPA) (www.nfpa.org)
   1. 10 - Standard for Portable Fire Extinguishers.

D. Underwriters Laboratories (UL) (www.ul.com):
   1. 154 - Carbon-Dioxide Fire Extinguishers.
   2. 299 - Dry Chemical Fire Extinguishers.
   3. 626 - Water Fire Extinguishers.
   5. 2129 - Halocarbon Clean Agent Fire Extinguishers.


F. American National Standards Institute. (ANSI)


1.3 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings: Indicate cabinet physical dimensions, rough-in measurements for recessed cabinets, and wall bracket mounted measurements.

C. Product Data: Provide extinguisher operational features, color and finish, and anchorage details.

1.4 QUALITY ASSURANCE

A. Work shall conform to requirements of IFC Standards, UL 711, and NFPA 10.

B. Mount extinguishers and cabinets as required by ANSI A 117.1.

C. Conform to applicable accessibility code for locating extinguishers.

1.5 DELIVERY, STORAGE AND HANDLING – NOT USED.

1.6 PROJECT/SITE CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher
ingredients.
B. Do not install fire extinguishers until Substantial Completion.

1.7 SEQUENCING AND SCHEDULING – NOT USED.
1.8 EXTENDED WARRANTY – NOT USED.
1.9 MAINTENANCE – NOT USED.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Ansul Incorporated. (www.ansul.com)
B. JL Industries. (www.jlindustries.com)
D. Potter Roemer. (www.potterroemer.com)
E. Fire Engineering Co. (www.fireengineeringco.com)
F. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Cabinets:
   1. Metal: Formed sheet steel; 18 gauge thick base metal.
   2. Configuration: Rolled edge, semi-recessed type, sized to accommodate accessories.
   3. Trim Type: Returned to wall surface, with 2-1/2 inch projection.
   4. Door: 18 gauges thick, reinforced for flatness and rigidity.
   5. Door Glazing: Glass, clear, 1/8 inch thick float strengthened
   6. Cabinet Mounting Hardware: Appropriate to cabinet.
B. Extinguishers:
   1. Metal: Cast steel tank.
C. Brackets:
   1. Metal: Formed steel, sized to accommodate extinguisher.

2.3 MANUFACTURED UNITS – NOT USED.
2.4 EQUIPMENT – NOT USED.
2.5 COMPONENTS – NOT USED.

2.6 ACCESSORIES

A. Cabinet Signage: "FIRE EXTINGUISHER, PULL TO OPEN" silk screened on door.
B. Wall mounted extinguisher brackets.
C. Signage: “Fire Extinguisher” decal at wall hung locations.

2.7 MIXES – NOT USED.
2.8 FABRICATION

A. Form cabinet enclosure with right angle inside corners and seams. Form perimeter trims and door stiles.
B. Pre-drill for anchors.
C. Hinge doors for 180 degree opening with continuous piano hinge. Provide nylon roller type catch.
D. Weld, fill, and grind components smooth.
E. Finishes:
1. Extinguisher: Baked enamel, and color to be red.
2. Cabinet Exterior Trim and Door: All cabinets to be clear anodized aluminum
3. Cabinet Interior: Color as selected by Architect.
4. Cabinet door to be type to “pull” to open and NOT break glass type.

2.9 QUALITY CONTROL – NOT USED.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify wall openings under provisions of Division 01.
B. Verify rough openings for cabinet are correctly sized and located.

3.2 PREPARATION – NOT USED.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Install cabinets plumb and level in wall openings, height from finished floor as directed.
C. Secure rigidly in place.
D. Place extinguishers and accessories in cabinets or on wall brackets.

3.4 FIELD QUALITY CONTROL – NOT USED.
3.5 ADJUSTING – NOT USED.
3.6 CLEANING – NOT USED.
3.7 DEMONSTRATION – NOT USED.
3.8 PROTECTION – NOT USED.

3.9 SCHEDULES

A. Cabinets:
   1. Extinguisher Cabinet Type I - Equal to Larsen Model No. AL2409-6R, full glass door.
   2. Extinguisher Cabinet Type II - Equal to Larsen Model No. AL2409-6R, solid door in Gymnasium.
B. Extinguishers:
   1. 4A-60B: C, 10 lbs unless otherwise noted.
C. See Contract Documents for locations.
D. In addition, provide extinguishers at the following locations:
   1. Provide two (3) - 5-pound ABC fire extinguishers with wall hung brackets in locations as directed by Architect.
   2. Current service tags shall be affixed to all extinguishers.

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PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
   1. Wall mount stationary basketball structure.
   2. Backboard, height adjuster, goal, padding, net, and accessories.
   3. Wall mount safety pads.

B. Related Sections
   1. Division 01: Administrative, procedural, and temporary work requirements.
   2. Section 09 65 00 - Resilient Flooring

1.2 REFERENCES

A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.

B. ASTM International (ASTM) (www.astm.org):
   1. A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

   1. A208 - Particleboard, Mat-Formed Wood.

D. National Collegiate Athletic Association (NCAA).

E. National Federation of State High School Associations (NFHS).


1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Shop drawings showing layout, elevations, dimensions, fabrication details, method of attachment, requirements for supplemental bracing or structural support members and necessary electrical wiring diagrams.

C. Calculations for actual vertical and horizontal loads to be transmitted to structural framing supporting backstop assemblies.

D. Operations and Maintenance Submittals provided as per the provisions of Division 01.

1.4 QUALITY ASSURANCE

A. All components including framing, backboard, goals, winches, and accessories for basketball backstop assemblies as well as all other related gymnasium equipment products shall be products of a single Manufacturer.

B. Backstops shall be designed, fabricated, and installed to comply with National Collegiate Athletic Association (NCAA) and National Federation of State High School Associations (NFHS) regulations.
C. Verify that all field conditions are as indicated on Shop Drawings.

1.5 DELIVERY, STORAGE AND HANDLING – NOT USED.

1.6 PROJECT/SITE CONDITIONS – NOT USED.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate work to insure installation occurs prior finish floor installation.

1.8 WARRANTY

A. 25 years warranty for basketball backstop structure.
B. Lifetime warranty against breakage for backboards installed with goal brace.
C. Eight (8) years warranty for bolt-on safety edge padding.

1.9 MAINTENANCE – NOT USED.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Backstops, Backboards and Goals.
   2. ADP Lemco. (www.adplemco.com).
   7. Substitutions: Under provisions of Division 01.

B. Safety Pads
   1. ADP Lemco. (www.adplemco.com).
   5. Substitutions: Under provisions of Division 01.

C. Volleyball Floor Plate and Sleeves (2-each):
   1. Model No. 6405 volleyball floor sleeves with Model 6430 cover plates.
   2. Cover plate shall be 6-1/4 inch diameter by 9/16 inch thick brass alloy with attached hinged cover. Diameter of opening shall be five (5) inches. Hinge and four holes in ring (for screwing into floor) shall be completely concealed under cover when in closed position, allowing for a completely flat surface. When installed in “floating” wood floors, floor plate is connected to floor only, allowing it to move with expansion and contraction of floor.
   3. Sleeve shall be 3 1/2 inch I.D. steel measuring 12-11/16 inch long. Steel sleeve eliminates possibility of electrolysis between concrete and sleeve that occurs with aluminum sleeves. Sleeves made of aluminum shall not be considered as equal. Cover plate the sleeve are furnished as separate units to allow for any “floating” of playing surface.

D. Volleyball Standards (1-set):
   1. Model No. 6000 Collegiate standards. Refer to drawings for configuration of court layout.
   2. Standards are 3.5” O.D. high strength, lightweight extruded aluminum. Uprights shall be removable type designed for use with below floor sleeves or above floor
tee-bases. Uprights shall be provided with adjustable high impact rubber foot to protect finished floors and to allow for precise net height adjustment. The upright post shall have infinite height adjustment for Men’s, Women’s, Tennis, and Badminton. Standards shall meet NCAA, NFSHSA and USVBA specifications. The net tensioner shall incorporate a heavy duty, self-locking ratchet mechanism with a compression clutch brake release. A high tensile nylon strap will be used with the winch to achieve required net tension.

E. Standard Protective Pads (1-set):
   1. Model No. 6010 volleyball standard protective pads.
   2. Pads shall be 72 inches high and fabricated from 1-1/4 inch thick polyurethane foam covered with 14 oz. vinyl coated nylon on the outside and jersey inner liner. Each pad shall be tailored to easily fold around upright and fastened by Velcro flaps, covering winch and net tensioning hardware. Front side of pad shall be furnished with an opening for attaching and tensioning bottom strap from net. Available in sixteen (16) standard colors (color to be determined by Architect). Standard pads to meet NCAA, NFSHSA and USVBA specifications.

F. Volleyball Net. (1 each):
   1. Model No. 7602 Collegiate volleyball net.
   2. Net shall be 32 feet L x 39 inch H with #48 black nylon mesh measuring approximately 4 by 4 inch square. The net shall have a 2 inch white double thickness binding on all 4 sides. The end sleeves shall feature a 1 foot diameter wood dowel. The net must meet NCAA, NFSHSA and USVBA specifications.

G. Net Antenna. (1-set):
   1. Model No. 6412 antenna.
   2. Antenna is secured firmly to the net by insertion in the full length pockets in the sidelines markers fully eliminating the possibility of the antennae dislodging from the net.

2.2 MATERIALS

A. Suspension System:
   1. Front Braced Forward Folding Backstop. Two (2) each. (Model 1325, ADP).
   2. Manual Height Adjuster. Two (2) each. (Model 125M).
   3. System to have primer and two (2) coats of finish paint, or Manufacturer’s standard black finish or powder coat finish.

B. Suspension System:
   1. 3/4 Horsepower, 220-115 Volt, 60 Hz single phase. (Model 503285). Two (2) each.
   2. Winch to hold the backstop at any position when raising or lowering the backstop.
   3. Equipped with pressure roller and torsion spring tensioning.
   5. Three (3) position momentary key switch and coverplate.

C. Banks:
   1. Rectangular Glass Backboard. (Model 64, ADP).
      a. Backboards shall be 42 inches high by 72 inches wide.
      b. Backboard shall be manufactured from 1/2 inch tempered glass set in heavy extruded aluminum framing and cushioned by shock absorbing vinyl. Official border and target area permanently fired into glass.
      c. Goal mounting structure shall be a heavy welded formed steel assembly, and directly attached to lower horizontal frame member to minimize stress on glass.
   2. Bolt on backboard protective edge (Model 105, ADP).
      a. The backboard padding is 1 1/8 inch thick, urethane foam.
      b. Each half is 36 inches long and allows for 12 inches to run up the side of the
rectangular backboard.

D. Goal:
   1. Heavy duty break-away. (Model 25, ADP)
   2. Bright orange enamel.
   3. Goal shall have official size 18 inch ring of 5/8 inch diameter steel with continuous
      no-tie net attachment, full wing brace design, and a durable orange powder coated
      finish.
   4. Goal shall meet NCAA and high school specifications.

E. Net:
   1. Recreational Basketball Net. (Model GGN, ADP).
   2. Net to be 120 thread white net 18 inches long.
   3. Constructed of durable braided polyester with a
   4. 12-loop, hourglass design, and has been tested to withstand approximately 150 lbs.
      of tensile strength.

F. Wall Padding:
   1. Wall padding. (Model 2025, ADP).
   2. Standard size shall be 6 by 2 feet with 1 inch nailing margin on top and bottom of
      each panel.
   3. Pads shall be constructed using bonded polyurethane foam over oriented strand
      board.
   4. 2 inch thick 6 lbs. density bonded polyurethane foam.
   5. Cover material shall be 14-ounce polyester laminated vinyl stapled to backing every
      two inches. Vinyl to be flame retardant material, which meets NFPA 701, and ASTM
      E84.
   6. Color selected from Manufacturers standard colors.

G. ACCESSORIES
   1. Fasteners, wall attachment, trims, and hardware.

2.1 MANUFACTURED UNITS – NOT USED.
2.2 EQUIPMENT – NOT USED.
2.3 COMPONENTS – NOT USED.

2.4 ACCESSORIES
   A. Provide all anchorage devices and materials required for a complete installation of the
      backstop assembly to the building structure including intermediate structural elements
      required for attachment to trusses.

2.5 MIXES – NOT USED.
2.6 FABRICATION – NOT USED.
2.7 SOURCE QUALITY CONTROL – NOT USED.

PART 3 - EXECUTION

3.1 EXAMINATION – NOT USED.
3.2 PREPARATION – NOT USED.

3.3 INSTALLATION
   A. Install supports, backstops and safety pads at locations shown and in accordance with
      Manufacturer’s instructions.
   B. Install level, plumb, secure and at proper heights. Provide all framing members and
      accessories required to attach to roof girders, joists or walls. Coordinate installation with
C. Install volleyball floor sleeves and cover plates in locations shown and in accordance with Manufacturer’s instructions.

3.4 FIELD QUALITY CONTROL – NOT USED.

3.5 ADJUSTING

A. Make necessary adjustments for safe, efficient and smooth operation.

3.6 CLEANING

A. Clean all surfaces, banks, and restore marred surfaces after installation of finish floor.

3.7 DEMONSTRATION

A. Demonstrate operation of backstops to Owner's designated personnel prior to Substantial Completion.

3.8 PROTECTION

A. Protect until final acceptance by Owner.

3.9 SCHEDULE – NOT USED.

END OF SECTION 11 66 23
SECTION 11 68 00

PLAYGROUND EQUIPMENT AND STRUCTURES

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes all playground equipment Associated with this project, including but not limited to:
   1. Relocated Play Structures & Equipment
   2. Basketball Standards
   3. Tether Ball Poles

B. Related Sections include the following:
   1. Division 01 Sections.
   2. Division 31 Section “Earthmoving” for filling and grading work.
   3. Division 32 Section “Concrete Paving” for concrete footings and surface mounting.
   4. Division 32 Section “Playground Protective Surfacing”.

1.2 REFERENCES

D. ASTM A 325M - Standard Specification for High-Strength Bolts for Structural Steel Joints (Metric); 2000.

1.3 SUBMITTALS

A. See Division 1 for submittal procedures.
B. Product Data: Provide data on all equipment, accessories and configurations.
C. Provide manufacturer’s standard color charts for selection.
D. Provide manufacturer’s warranty information.
E. Operations & Maintenance Data: Submit manufacturer’s written Operations & Maintenance data for all equipment & accessories.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer of playground equipment. Installer must be licensed in the State of this project and shall be NPSI certified.
B. Manufacturer Qualifications: A firm whose playground equipment components have been certified by IPEMA’s “3rd Party Certification” service.
   1. Provide only playground equipment and play structure components bearing the IPEMA Certification Seal.
   2. Compliance to ASTM standards and CPSC guidelines shall be independently certified by the International Play Equipment Manufacturers Association (IPEMA). Bidders shall supply a list of all individual play components included in the
proposed bid structure with each IPEMA certified component identified on the list. This certifications page must accompany all component drawings.

3. Provide playground equipment specified on drawings, or approved equal.

4. Substitutions must be made in accordance with Division 1 specifications and per the drawings.

5. All equipment shall meet all standards as specified in ASTM F 1487.

C. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

D. Standards and Guidelines: Provide playground equipment complying with or exceeding requirements in the following:

1. ASTM F 1487.


3. Label play structures with warning label and manufacturer’s identification per ASTM F 1487.

E. Furnish paint for touch-up as required.

1.5 COORDINATION

A. Coordinate construction of equipment use zones and fall heights during installation of playground equipment with installation of protective surfacing specified on the Drawings. Sequence work so protective surfacing can be installed immediately after play equipment has been set.

1.6 WARRANTY

A. Contractor shall warrant work as provided by the General and Supplementary Conditions and Division 01 Specifications.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Substitutions or equivalent products shall be in accordance with Division 01 Specifications.

2.2 PLAY EQUIPMENT

A. Existing equipment and structures as indicated on the drawings. Reinstalled equipment shall meet all applicable Federal ADA requirements.

B. Tetherball Pole


2. In-ground mount with concrete footing per manufacturer’s written details and specifications at location shown on the drawings. Pole shall stand 10’ above ground with 2-foot embedment. Coordinate footing with asphalt paving.

3. Manufacturer’s Finish: Galvanized.

4. Installation per manufacturer’s written installation procedures and details.


C. 2.3 PLAY STRUCTURES AND EQUIPMENT
A. General:
1. Existing Playground equipment shall be relocated and installed by the contractor.
2. Playground equipment shall meet all applicable Federal ADA requirements.

B. Existing Structure as noted on drawings.

2.4 CAST-IN-PLACE CONCRETE

A. Concrete Materials and Properties: Comply with requirements in Division 32 Section Concrete Paving to produce normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi, 3-inch slump, and 3/4-inch maximum size aggregate.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, site surface and subgrade drainage, and other conditions affecting performance.
1. Do not begin installation before final grading required for placing protective surfacing is completed, unless otherwise permitted by Architect.
2. Elevation of equipment shall be based on finish grade of protective surfacing, and per manufacturer’s recommendations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Verify locations of adjacent improvements. Verify that playground layout and equipment locations comply with requirements for each type and component of equipment.

3.3 INSTALLATION

A. General: Comply with manufacturer’s written installation instructions, unless more stringent requirements are indicated. Anchor playground equipment securely, positioned at locations and elevations indicated on the Drawings.
1. Maximum Equipment Height: Coordinate installed heights of equipment and components with installation of protective surfacing. Set equipment so fall heights and elevation requirements for age group use and accessibility are within required limits. Verify that playground equipment elevations comply with requirements for each type and component of equipment.

B. Relocation of Existing Equipment:
1. Disassemble structure into separate components for ease of relocation.
2. Contractor shall take photographs and measurements necessary for the proper re-assembly of the structure.
3. Provide photographs and measurements to the Architect prior to removal of structure.
4. Transport disassembled structures to new location.
5. Re-install structures at location indicated. Coordinate installation with safety surfacing elevation and area limits.
6. Re-assemble structure to pre-construction condition, provide touch up paint and repair as needed. Play structures shall be in-ground mount to match pre-construction condition. Footings, mounting bolts, sleeves, etc. shall be provided as required for proper permanent installation.
C. Post and Footing Excavation: Hand-excavate holes for posts and footings to dimensions, profile, spacing, and in locations indicated on Drawings or Manufacturer’s Drawings, in firm, undisturbed or compacted subgrade soil. Level bearing surfaces with drainage fill to required elevation.

D. Post Setting: Set main-frame equipment posts in concrete footing. Protect portion of posts above footing from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Verify that posts are set plumb or at the correct angle and are aligned and at the correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
   1. Concrete Footings: Smooth top, and shape to shed water.
   2. Depth of footing shall be per manufacturer’s recommendations.

E. Correct, as necessary, all blemishes incurred during shipping or assembly and installation, color as designated, to manufacturer’s standards.

F. Basketball Nets: Secure nets to goals with screw links.

3.4 ADJUSTING

A. Adjust movable playground equipment components to operate smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range.

3.5 PROTECTION

A. Protect installed products until completion of project. Touch-up, repair or replace any damage to products occurring prior to Substantial Completion.

3.6 CLEANING

A. After completing playground equipment installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component. Provide touchup paint as required.

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DIVISION 12 - FURNISHINGS

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SECTION 12 21 13
HORIZONTAL LOUVER BLINDS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Horizontal slat louver blinds.
   2. Operating hardware.

B. System Description:
   1. Horizontal metal slat louver blinds installed at scheduled window openings, manual control of raising and lowering by cord; blade angle adjustable by control wand.

C. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements

1.2 REFERENCES – NOT USED.

1.3 SUBMITTALS

A. Submit shop drawings under provisions of Division 01.
B. Submit shop drawings indicating opening sizes, tolerances required, and installation of blind at window opening, method of attachment, clearances, and operation.
C. Submit product data under provisions of Division 01.
D. Submit color selection samples.
E. Submit Manufacturer's installation instructions under provisions of Division 01.

1.4 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with three (3) years documented experience.
B. Installer: Three (3) years minimum experience.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Division 01.
B. Deliver blinds wrapped and crated in a manner to prevent damage to components or marring of surfaces.
C. Store and protect products under provisions of Division 01.
D. Store in a clean, dry area, laid flat and blocked off ground to prevent sagging, twisting or warping.

1.6 PROJECT/SITE CONDITIONS

A. Verify that field dimensions are as indicated on Shop Drawings.
B. Do not install blinds until painting and finishing work is complete.

1.7 SEQUENCING AND SCHEDULING – NOT USED.

1.8 EXTENDED WARRANTY
A. Under provisions of Division 01.  
B. Provide Manufacturer’s Limited Lifetime Warranty.  

1.9 MAINTENANCE – NOT USED.  

PART 2 - PRODUCTS  

2.1 MANUFACTURERS  

A. Window Blinds Manufacturer:  
      Product: Classics  
      Product: LightLines  
      Product: Mark I LightMaster  
      Product: Equal to LightLines.  
B. Substitutions: Under provisions of Division 01.  

2.2 MATERIALS  

A. Louver Slats: One inch wide; 0.006 inch thick spring tempered pre-finished aluminum horizontal slats, with manufacturing burrs removed; radiused slat corners.  
B. Slat Support: Woven polypropylene, ladder configuration.  
C. Head Rail Housing: Prefinished, formed box internally fitted with hardware, pulleys and bearings for blind operation.  
D. Bottom Rail: 024 Electro-Galvanized Steel.  
E. Cord: Braided nylon, continuous loop, free end.  
F. Control Wand: Extruded hollow plastic, round shape, removable type, and length of window opening height less 12 inches.  
G. Head Support: Overhead head rail housing attachment, provide as required for installation.  
H. Valance: One Piece Valance including continuous corners for outside mount returns.  
I. Tilter: Self-lubricating Clutch mechanism. Precision worm and gear encased in 0.08 high impact.  
J. Cordlock: Crushproof, 0.036 Electro Plated Steel, Rolling Pawl type with 7/16 inch diameter Celcon Main roller.  
K. Center Support Brackets: For blinds over 60 inches wide. If two or more are required they should be spaced evenly, no more than 36 inches apart.  
L. Accessory Hardware: Type recommended by blind Manufacturer.  

2.3 MANUFACTURED UNITS – NOT USED.  

2.4 EQUIPMENT – NOT USED.  

2.5 COMPONENTS – NOT USED.  

2.6 ACCESSORIES – NOT USED.  

2.7 MIXES – NOT USED.  

2.8 FABRICATION  

A. Factory Finishes:  
   1. Blind Slat and Head Rail Housing: Color as selected by Architect.  
   2. Control Wand: Color as selected by Architect.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and openings are ready to receive the work.
B. Do not commence fabrication until field measurements are confirmed.
C. Beginning of installation means installer accepts existing substrate.
D. Verify that window operating hardware will not interfere with the operation of the blinds.

3.3 INSTALLATION

A. Install blinds in accordance with manufacturer's instructions just prior to Substantial Completion.
B. Set blinds out from windows to avoid window operating hardware.
C. Provide individual units for upper and lower operable sections.
D. Secure in place with concealed fasteners.
E. Tolerances.
E. Coordinate control devices with window operating devices per the direction of the Architect.

3.9 SCHEDULE

A. Location of blinds:
   1. Provide blinds for the following exterior window type opening: “02”
   2. Provide blinds for all half glass door types GW and GM in building.
   3. Nominal opening sizes, field measure and verify all openings and mounting conditions.
   4. Color as selected by Architect.

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DIVISION 21 - FIRE SUPPRESSION

Section 21 00 00  Fire Suppression ................................................................. 4
PART 1 – GENERAL

1.1 SCOPE

A. General:

1. Specification Section 22 00 00, Plumbing General Requirements, is to be included as part of this Section of the specification.

B. Work Included:

1. This section covers the work necessary to design and install a complete, satisfactory, and ready to operate wet pipe fire protection system for heated areas and dry pipe fire protection system for non-heated areas (areas subject to freezing). Hazard classification shall be as required by the State Fire Marshal, local City, IBC, IFC, and applicable NFPA Standards.

C. Qualifications of Installer:

1. All work shall be performed by a qualified, competent, licensed Fire Sprinkler Contractor who can furnish a verified list of satisfactory installations of this type and size, for a period of 5 years or more. Fire sprinkler contractor shall be licensed by the Idaho State Fire Marshal, and shall have in his employ an Engineering Technician (Level III), certified by NICET (National Institute for Certification in Engineering Technologies).

D. System Responsibility:

1. All work required for the fire protection system, including design and installation, shall be the responsibility of the Fire Sprinkler Contractor. Coordination with other trades is critical. Contractor shall coordinate his work with all ductwork, piping, electrical, etc., to ensure that all systems can be installed with a minimum of interference. Sprinkler heads should be located in the center of ceiling tiles wherever and whenever possible. All piping penetrations through finished walls shall be provided with chrome escutcheons. Submittals which are required are only for the purpose of general coordination. Architect/Engineer assumes no responsibility or liability for the design of the system.

2. All monitoring of valves not shown on the electrical drawings shall be within the scope of work for the fire sprinkler contractor. This shall include, but not be limited to, the following: All conduit and wiring as required to monitor post indicator valves, tamper switches, and any other devices required to be supervised by the fire alarm panel. The sprinkler contractor shall also provide all power, wiring and conduit required for a complete and operational dry-pipe system (if required), unless such electrical is shown on the electrical drawings.

3. Existing buildings without sprinkler systems: If an existing building has not previously had a fire sprinkler system, the Sprinkler Contractor is responsible to consult with a Structural Engineer and verify, in writing, that the existing building structure is capable of supporting the required new active sprinkler system.

1.2 CODES AND STANDARDS

A. The sprinkler system is to be designed and installed in accordance with the latest applicable building codes, State and Local Fire Marshals requirements, and all applicable NFPA Standards.
PART 2 – PRODUCTS

2.1 SUBMITTALS

A. The Engineering Technician shall prepare and submit the following submittal data:

1. Complete equipment list of all equipment to be installed, including manufacturer's name and catalog number.
2. Layout drawing of complete sprinkler system indicating relationship of all other overhead items, including ductwork, lights, and structural members.
3. Complete details and sections as required to clearly define and clarify the design.
4. Plot plan indicating location of all underground connections, piping, valves, and related items.
5. Grooved joint couplings and fittings shall be shown on drawings and product submittals, and be specifically identified with the applicable style or series number.
6. Sprinklers shall be referred to on drawings, submittals and other documentation, by the sprinkler identification or model number as specifically published in the appropriate agency listing or approval. Trade names or other abbreviated designations shall not be allowed.

2.2 MATERIALS AND EQUIPMENT

A. All materials shall be as specified below, or in accordance with applicable NFPA Standards:

1. Piping shall be black steel per NFPA 13 requirements. Threadable, thin wall piping will not be allowed. CPVC is allowed for underground only.
2. Fittings shall be 125 psi screwed cast or malleable iron for all threaded piping.
3. Fittings shall be Victaulic FireLock®, Anvil Gruviok, Grinnell or Shurjoint fire protection products for all grooved or plain end piping. Couplings shall consist of two ductile iron housings conforming to ASTM A536, a pressure responsive elastomer gasket, and zinc electroplated carbon steel bolts and nuts. Rigid type or flexible type where necessary.
   a. Rigid Type: Housings shall be cast to provide system rigidity and support and hanging in accordance with NFPA 13. Tongue and recess rigid type couplings shall only be permitted if the contractor uses a torque wrench for installation. Required torque shall be in accordance with the manufacturer’s recommendations. Contractor shall remove and replace any improperly installed joints. 11/4” and Larger: Standard rigid joint equal to Victaulic FireLock® Style 009 or equal.
   b. Flexible Type: Use in seismic areas where required by NFPA 13, Victaulic Style 75 or 77 or equal.
4. Alarm valves or dry pipe valves shall be installed in system risers per local water purveyor requirements.
   a. Alarm Check Valve: Black enamel coated ductile iron body, aluminum bronze clapper, stainless steel spring and shaft, brass seat, EPDM seal, and Nitrile seat o-rings with grooved end connections and waterflow detectors. Valve internal parts shall be replaceable without removing the valve from the installed position. Victaulic FireLock® Series 751 or equal.
   b. Dry Pipe Valve: Low differential, latched clapper design, black enamel coated ductile iron body, aluminum bronze clapper, stainless steel spring and shaft, brass seat, EPDM diaphragm and seal, with
Nitrile seat o-rings. Valve internal parts shall be replaceable without removing the valve from the installed position and be externally resettable. Valve shall be pre-trimmed with shut-off valve, 3-way ball valve, and actuator. Required air pressure is 13 psi with a maximum water pressure rating of 300 psi. Valve shall have grooved ends for vertical installation only.

5. Butterfly control valves with supervisory tamper devices shall be installed for system control.

6. All materials and equipment shall conform to the requirements of Underwriter Laboratories (UL) or Factory Mutual Global (FMG), and shall be so stamped.

7. Pressure switches (water flow device) shall be installed in each system riser (dry pipe systems).

8. Flow switches (water flow device) shall be installed in each system riser (wet pipe systems).

9. Alarm Bell shall be 10-inch outdoor electric bell. Furnish for installation by the electrical contractor.

10. Sway Bracing, both lateral and longitudinal, shall be required and shall be installed per applicable NFPA Standards.

11. Fire Department Connection shall be provided for each system riser or manifold assembly. Install a 90 degree elbow with drain connection at each fire department connection to allow for system drainage to prevent freezing.

12. Sprinkler heads in main entry type areas and main conference room type areas shall be concealed flush mounted style with white paintable covers. All other sprinkler heads shall be Reliable Designer Model F1, (or equal), recessed with screw-on type escutcheon, below finished ceilings. Where surface mounted obstructions are installed, two-piece escutcheons and pendent sprinklers may be used, if required. Where sprinkler heads are subject to damage such as gymnasiums or mechanical lofts all sprinkler heads shall be provided with protective covers. Escutcheons shall be listed, supplied, and approved for use with the sprinkler by the sprinkler manufacturer. Where piping is exposed, install standard bronze upright or pendent sprinklers. Quick response dry sidewall sprinklers shall be used as required to comply with IBC requirements for exterior canopies.

13. Provide 12 extra sprinkler heads mounted together in a suitable cabinet. Include spares of all types of sprinklers installed in the building.

14. Hangers, drains, and Inspectors Test Connections shall be installed in accordance with applicable NFPA Standards.

15. Test and Drain Valve: Globe design valve providing test port with ½” integral orifice and drain port in one unit. Bronze body with copper alloy internals, polycarbonate sight glasses, Nitrile o-rings and EPDM valve seats.


17. Post indicator valves as required by the State and Local Fire Marshall, or as shown on plans.

18. All piping penetrations through finished walls shall be provided with chrome escutcheons.

B. Underground piping materials and installation shall comply with N.F.P.A. #24 and local water company specifications.
PART 3 – EXECUTION

3.1 INSPECTION

A. Upon completion of the system, secure the inspection of the required authorities and perform such tests as may be required to demonstrate compliance with local and state standards. Upon acceptance of the system by the inspecting authority, inform the Architect/Engineer in writing, showing proof of acceptance. Submit all required test certificates to required authorities.

3.2 INSTALLATION

A. Grooved joint piping systems shall be installed in accordance with the manufacturer’s guidelines and recommendations. All grooved couplings, fittings, valves and specialties shall be supplied by a single manufacturer. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be supplied by grooved pipe manufacturer. Grooved end shall be clean and free from indentations, projections and roll marks in the area from pipe end to groove for proper gasket sealing. Contractor’s field personnel shall be properly trained in the installation of the manufacturer’s grooved piping products. A Factory trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.

B. The sprinkler bulb protector must remain in place until the sprinkler is completely installed and before the system is placed in service. Remove bulb protectors carefully by hand after installation. Do not use any tools to remove bulb protectors.

END OF SECTION 21 00 00
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**DIVISION 22 - PLUMBING**

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SECTION 22 00 00

PLUMBING GENERAL REQUIREMENTS

PART 1 – GENERAL

1.1 SCOPE

A. General:
1. The Bidding Requirements, Contract Requirements, and the General Requirements (Division 01) of these specifications shall govern all parts of the work.

B. Work Included:
1. Install work in accordance with these specifications and the accompanying plans. Furnish all labor, material, and equipment together with all incidental items not specifically shown or specified which are required by good practice to provide the complete plumbing systems as described.

C. Coordination and Site Visits:
1. This section of the work requires examination of and reference to all architectural, structural, utility, and electrical drawings for construction conditions that may affect the work. Inspect the building site and existing facilities for verification of existing conditions. Base all measurements from established benchmarks. Any discrepancy between actual measurements and those indicated, which prevents following good practices or the intent of the drawings and specifications, shall be reported to the Architect/Engineer, and work halted until instructions are received from the Architect/Engineer.

1.2 CODES, PERMITS, FEES

A. Install all work in accordance with applicable codes and standards. Obtain all required permits; pay all required fees including utility connections or extensions, in connection with this portion of the construction. Obtain all required certificates of inspection for the work.

PART 2 – PRODUCTS

2.1 MATERIALS AND WORKMANSHIP

A. Materials:
1. All materials and equipment shall be of first quality, new, full size and weight, standard in every respect, and suitable for the space required. Use the same manufacturer for products of similar class or service, such as valves and pumps. Protect all materials against loss, theft, or damage before and after installation.
2. Furnish and install all necessary foundations, supports, pads, bases, and piers required for all materials and equipment furnished under this contract.
3. Provide all required firestopping at piping penetrations of fire rated walls, floors, ceilings, and roofs. Firestopping shall be Dow Corning Fire Stop Sealant 2000 or Fire Stop Foam 2001, or approved equal.

B. Workmanship:
1. All materials and equipment shall be installed in a neat and workmanlike manner by competent specialists for each subtrade. Work shall be installed to the satisfaction of the Architect/Engineer with unsatisfactory work removed and reinstalled to his satisfaction at no extra cost to the Owner.
2. Provide all cutting and patching necessary to install the work specified in this section. Patching shall match adjacent surfaces. No structural members shall be cut without
the approval of the Architect/Engineer. Provide all sleeves and inserts required before the floors and walls are built.

3. Locate all equipment that must be serviced in fully accessible positions. Provide clearance for removal of replacement parts and components, and with necessary couplings or flanges to remove the component for maintenance.

2.2 SUBMITTALS AND SUBSTITUTIONS

A. Prebid Approval:
   1. Manufacturer’s trade names and catalog numbers stated herein are intended to indicate the quality of equipment or materials desired. All manufacturers not specifically listed require prior approval. Submit catalog data, including specifications, of the proposed equipment to the Architect/Engineer for his approval at least 10 calendar days prior to bid opening. Notice of such approvals will be published in an addendum. Approval of listed alternate equipment manufacturers is for bidding only. Final approval is to be based on requirements of the plans and specifications.

B. Submittals:
   1. Within thirty days after award of this contract, provide six copies of a complete list of all materials and equipment proposed for this project. List shall contain make, type, manufacturer’s name, and trade designation of all materials and equipment. Submittal shall also include manufacturer’s complete specification for each item, including ratings, and dimensions as required to check space requirements. Provide six copies of all submittals. The scheduled equipment is the basis of design for physical size, etc. Alternate manufacturers shall not exceed the weight or physical size. Any changes to the Architectural, Structural and Mechanical systems due to alternate manufactures shall be the responsibility of the Contractor and Supplier. Submittals for fixtures, trim, and other plumbing related items, requiring submittals, shall be submitted in a single complete package. Individual items will not be reviewed independently unless approved by the Engineer. Electronic submittals will be allowed when approved by the Architect and, or Owner. The requirements of electronic submittals are the same as those noted above.

   2. Approval of submittals shall not relieve the contractor from responsibility for deviations from the plans or specifications, unless he has, in writing, called the Architect’s/Engineer’s attention to deviations at the time of submission, and obtained his written approval. Approval of submittals does not relieve the contractor from responsibility for errors in shop drawings or literature.

C. Equipment Requiring Submittals:
   1. Plumbing Fixtures & Trim

PART 3 – EXECUTION

3.1 ACCESSIBILITY & SAFETY

A. Accessibility:
   1. All equipment which must be serviced or operated shall be located in fully accessible position. Minor changes from the drawings may be made to allow for better accessibility. All changes shall be approved prior to actual installation.

   2. Access panels shall be provided if required for accessibility. Access panels to be steel, flanged, hinged doors by Cendrex, model AHD, or equal. Size as required for installation. Subcontractor shall furnish the required panels to the General Contractor and the required location for all access panels, unless otherwise specified in the Architectural specifications. Panels shall be installed by the General Contractor.

B. Safety:
1. No water piping shall run immediately over or within a 3-foot plan view clearance of any electrical panel or motor starter. Where piping must be located within these zones, install piping inside a conduit to prevent water access to electrical equipment.

3.2 COORDINATION

A. Coordinate all work with the various trades involved to provide a complete and satisfactory installation. The exact details of piping and equipment are not shown. No additional compensation will be made for offsets or relocation required in coordination with other trades.
B. Alterations required due to improper supervision by the subcontractor shall be made at no extra cost, to the satisfaction of the Architect/Engineer.

3.3 EXCAVATION & BACKFILL

A. Excavate trenches required for underground piping to proper elevation and grade. Provide trenches with solid bottoms to allow support of piping along entire length with excavation at bells as required for jointing and inspection. Provide repairing of finished surfaces, and all required shoring, bracing, pumping, and protection for safety of persons and property. Observe all Local or State Safety Codes. Verify that elevations of existing utilities will allow for proper grading of piping connecting to existing utilities.
B. Excavation and Backfill shall be in accordance with the requirements of Division 31, of these specifications.

3.4 IDENTIFICATION AND CODING

A. General:
   1. The Contractor shall use ASME 13 standards for all piping identifications, color coding, and compliance.
B. Painting:
   1. All painting of equipment, accessories, and piping shall be furnished and applied under the Architectural section of these specifications. All painting shall be completed before any identification markings are applied.
C. Piping:
   1. Identify all piping as to the service of the pipe and the direction of flow. The letters shall be 3/4 inch high on piping two inches or smaller, and 1-1/4 inches high on piping up to six inches. Flow arrows shall be at least six inches long. The letters and flow arrows shall be made by precut stencils and oil base paint, one inch high and black, or factory fabricated plastic pipe markers. Piping shall be identified at 25 foot maximum intervals, on long continuous lines; adjacent to each item of equipment; on each riser and junction, and on both sides of all wall penetrations. Underground piping shall be identified with bright colored continuously printed plastic tape of not less than 6" wide by 4 mil thick, manufactured for direct burial service. Install directly above all buried pipe, 6 to 8 inches below finished grade.
D. Valves:
   1. Regardless of size, all valves shall be tagged with a numbered brass tag, 1-1/2 inches by 3 inches minimum in size and 0.051 inch thick. A valve chart indicating valve tag number, location, service, and normal position shall be mounted in a suitable framed and glassed cover in the main mechanical room or as directed. Valve chart shall be duplicated in the Maintenance and Operations Manual.

3.5 TESTING
A. Piping:
   1. All plumbing piping (drainage, water, gas) shall be tested in accordance with the requirements of the Idaho State Plumbing Code, latest edition. Other piping systems shall be tested hydrostatically to 1.5 times the operating pressure but not less than 100 psi, for a minimum period of two hours. If the test pressure falls more than 5 percent during the test period, the leak shall be located, repaired, and the test repeated.
   2. Piping shall be tested before insulation has been installed. Delicate control mechanisms shall be removed during tests to prevent shock damage. The use of chemicals or compounds to stop leaks shall not be permitted.
   3. A test report shall be submitted for each piping system test. Test report forms are part of Specifications Section 220100, or are available from the Engineer.

B. Systems:
   1. All plumbing systems shall be tested at the completion of the building to establish that the systems operate as specified and required.

3.6 CLEANING AND ADJUSTING

A. Thoroughly clean all parts of the system at the completion of the work. Flush all water circulating systems with fresh water and then drain. Clean all strainers and refill system. Adjust all devices for proper operation and lubricate all equipment as required. Repaint any painted surface that has been damaged.

B. All potable water systems shall be flushed and disinfected after tests are completed. Disinfection shall be in accordance with local municipal and State Plumbing Inspector’s criteria. In lieu of such criteria, the following procedure shall be followed for disinfection:
   1. Completely flush system. Add alkali or acid (hydrochloric) to bring water pH level to between 7.4 and 7.6.
   2. Inject chlorine (liquid, powder, tablet, or gas) throughout the system to obtain 50 to 80 mg/L residual.
   3. Bleed water from outlets to ensure distribution, and test for residual at a minimum of 15 percent of the outlets.
   4. Maintain disinfection in system for 24 hours.
   5. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
   6. Flush disinfectant from system until residual is equal to that of incoming water, or 1.0 mg/L.
   7. Take samples no sooner than 24 hours after flushing, from 10 percent of the outlets and the incoming water.

3.7 PROJECT CLOSEOUT

A. Operations & Maintenance Manual:
The Contractor shall provide an operations and maintenance manual at least thirty days prior to completion of work. The manual shall be of the three ring binder type, entitled "Operations and Maintenance Manual", with the job name and year of completion also included. O & M manuals shall be submitted in a single package. Individual items will not be accepted independently unless approved by the Engineer. The manual shall include, as a minimum:
   1. Maintenance instructions for all equipment, including lubrication requirements.
   2. Fixture supplier’s names, addresses, and telephone numbers.
   3. Fixture catalog cuts, ratings tables, model numbers, serial numbers, and accessories.
   4. Parts numbers for all replaceable parts.
   5. Valve tagging chart as hereinbefore specified.
   7. Any additional information required to enable the Owner to properly maintain the
building plumbing system.

8. After approval of the Operations and Maintenance Manual by the Architect/Engineer, the Contractor shall furnish two copies of the manual to the Owner.

B. As-Built-Drawings:
   1. Provide two sets of blue-line mechanical drawings showing the work as it was actually installed. The drawings shall indicate all departures from the contract drawings, and shall locate all underground utility lines with dimensions from established building lines. Make all notations neat and legible, with red indelible pencil. At the completion of the work, these as-built drawings shall be signed and dated by the Plumbing Contractor, and returned to the Architect/Engineer.

C. Guarantee:
   1. All work furnished under this section shall be guaranteed in writing to be free from defective work or materials for a period of one year after acceptance of the contract. All repairs or replacements because of defective materials or workmanship or noncompliance with code shall be provided without additional cost to the Owner. Contractor shall furnish a letter indicating above guarantee with space for date of acceptance and expiration of guarantee. Letter shall be included in O & M Manual.

END OF SECTION 22 00 00
SECTION 22 01 00

PLUMBING

PART 1 – GENERAL

1.1 SCOPE

A. This section covers the work necessary for the plumbing system, complete. The Plumbing General Requirements, Section 22 00 00, are to be included as a part of this section of the specifications.

1.2 CODES

A. The plumbing system shall be installed in accordance with the Idaho State Plumbing Code, latest edition, International Fuel Gas Code, latest edition; and all local and State Codes.

1.3 FIXTURES & EQUIPMENT

A. General:

1. Plumbing fixtures and equipment shall be as listed on the drawings. In addition to those specifically listed, the following manufacturers are approved for bidding only. All other manufacturers require prior approval. Final approval for installation is based on submittal data furnished:

d. Stainless Steel Sinks: Elkay, Just.
e. Faucets: American Standard, Kohler, Chicago Faucets, Delta, Moen, Geberit, T&S Brass, Gerber, CHG Encore Saniguard, Zurn Aquaspec, Symmonds, Sloan & AMTC.
f. Sensor Faucets: Chicago Faucets, Symmons, Sloan, Mac Faucets.
g. Valves and Trim: T&S Brass, Dearborn Brass, Brasscraft, ProFlo, & Sloan.
h. Flush Valves: Sloan, Delany, Delta and Zurn, American Standard Selectronic, Kohler, Moen (sensor-operated only) & AMTC.
i. Carriers and Drainage Products: Jay R. Smith, Josam, Zurn, Wade, Watts, Neenah Foundry, NDS, & MIFAB.
j. Toilet Seats: Bemis, Church, Comfort Seats, Beneke, Zurn, American Standard, & Kohler.
o. Washfountains: Bradley, Intersan, Willoughby, Sloan.
p. Service Sinks: Fiat, Acorn, Stern Williams, Zurn, Proflo, Mustee.
q. Water Heaters: Rheem, A.O. Smith, PVI, Bradford-White, American,
Heat Transfer-Phoenix, Rinnai, Bock, Navien, Lochinvar Shield.

r. Backflow Preventers: Watts, Conbraco/Apollo, & Wilkins.
s. Hose Bibbs: Woodford, Josam, Zurn, J.R. Smith, Prier.
t. Utility Sinks: Fiat, Proflo, Mustee.

2. Plumbing Fixture Standards:
All plumbing fixtures shall meet or exceed the following standards:
a. ANSI A112.6.1 - Supports for Off-the Floor Plumbing Fixtures for Public Use.
b. ANSI A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.
d. ANSI A112.19.2 - Vitreous China Plumbing Fixtures.
e. ANSI A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use).
f. ANSI A112.19.4 - Porcelain Enameled Formed Steel Plumbing Fixtures.
g. ANSI A112.19.5 - Trim for Water-Closet Bowls, Tanks, and Urinals.
h. ANSI Z358.1 - Emergency Eye Wash and Shower Equipment.
i. ARI 1010 - Drinking Fountains and Self-Contained Mechanically Refrigerated Drinking Water Coolers.
j. AWSI/ASSE 1001 – Atmospheric Vacuum Breaker
k. ANSI/ASSE 1012 - Backflow Preventers with Immediate Atmospheric Vent.
l. ANSI/ASSE 1011 - Hose Connection Vacuum Breakers.
m. ANSI/ASSE 1013 - Backflow Preventers, Reduced Pressure Principle.
n. ANSI/ASSE 1015 – Backflow Preventers, Double Check Principle
o. ANSI/ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types.
p. AWSI/ASSE 1020 – Pressure Vacuum Breaker
q. AWSI/ASSE – 1-52 – Hose Connection, Double Check
r. ANSI A112.21.1 - Floor Drains.
s. ANSI A112.21.2 - Roof Drains.
u. PDI WH-201 - Water Hammer Arresters.

PART 2 – PRODUCTS

2.1 PLUMBING FIXTURES & TRIM

A. All plumbing fixtures shall be provided complete with all required trim for a complete and operational system. All piping penetrations through finished walls shall be provided with chrome escutcheons. All plumbing fixtures shall be caulked and sealed to surrounding surfaces. All sink traps shall be provided with a cleanout plug in the bottom of the trap. All interior exposed pipe, valves, and fixture trim shall be chrome plated, including kitchen compartment sinks. Braided stainless steel pipe risers are approved for concealed locations only, such as behind casework doors or lav shields. Each fixture shall be provided with stop valves and the stop valves shall be quarter-turn brass ball type. All fixtures and trim must be lead free. All floor drains and floor sinks shall be provided with trap primers (PPP, Zurn or Wade as needed for appropriate use. Provide ball valve type shut-off valve upstream of all trap primer valves).

2.2 PIPING AND FITTINGS

A. General:
1. Underground sanitary sewer and storm drain lines shall be installed at 1/4" per foot slope, unless otherwise indicated. If such slope is not possible due to existing inverts, approval shall be obtained from the Architect/Engineer and the authority having
jurisdiction before any piping is installed at a lesser slope.

2. Connections between piping of dissimilar materials shall be made with dielectric waterway fittings or unions.

3. Provide standard manufactured water hammer arresters at all flush valves. Size and locate per manufacturers recommendations. Provide access panels for access to all water hammer arresters.

B. Domestic & Non Potable Hot and Cold Water:

1. Piping inside building above slab or above grade in crawl space shall be ASTM B88, Type "L", hard drawn copper. Fittings shall be ANSI/ASME B16.22 cast brass, or ANSI/ASME B16.29 wrought copper. Joints shall be ANSI/ASTM B32 solder, Grade 95-5, lead free.
   
   b. Piping Option – Mechanically Formed Extruded Outlets:
      1) Mechanically formed extruded outlets shall be perpendicular to the axis of the run tube (header). They shall be formed by drilling a pilot hole and drawing out the tube surface to form a collar having a height of not less than three times the thickness of the branch wall, and shall conform to ASME B31.9 and NFPA 99. T-Drill or approved equal.
      2) Branch tubes shall not restrict the flow in the run tube. To ensure this by conforming the branch tube to the shape of the inner curve of the run tube, a dimple / depth stop shall be formed in the branch tube to ensure that penetration into the collar is of the correct depth. For inspection purposes, a second dimple shall be placed 0.25 inch above the first dimple. Dimples shall be aligned with the tube run.
      3) Branches can be formed up to the run tube size as shown in ASTM F 2014. Forming procedures shall be in accordance with the tool manufacturer’s recommendations.
      4) Joints shall be made with the use of approved brazing alloys BCup2 thru BCup5 (0-15% silver content). Brazed with a filler that has a melting point above 540 deg. Centigrade (1000 deg. F). Soft soldered joints are not allowed.
      5) K and L copper types allowed.
      6) Soft and Hard copper allowed.
      7) Each model used for making branch connections shall be permanently marked with manufacturer’s name and appropriate model number.
      8) Mechanically formed extruded outlets can (but not limited to) be used on commercial and residential buildings.
      9) Fitter / Plumber shall be trained and certified to operate the equipment.

2. Piping underground within 5 feet of the building line, smaller than 4 inches, shall be ASTM B88, Type "K", hard drawn copper. Piping below floor slab, smaller than 4 inches, shall be type “K”, soft annealed copper. Fittings shall be ANSI/ASME B16.29 wrought copper. Joints shall be ANSI/ASTM B32 solder, Grade 95-5, lead free. No joints shall be installed beneath concrete floor slabs, unless approved by the Engineer. Underground or underslab copper piping shall be provided with a polyethylene jacket, ANSI/AWWA C105, or shall be wrapped with double layer, half-lapped, 10 mil
polyethylene tape.
a. Underground (below slab) Piping Option- ½” to 4”, High Density Polyethylene (HDPE) pressure pipe. ASTM D3350, ASTM D3035 & ASTM F714. AWWA C901 & AWWAC906, NSF. Fittings shall be HDPE, solvent weld. Piping shall be rated for not less than 150 psig.
b. Trap Primer Piping (below floor or concealed only) –
   1) ½” Wirsbo Aquapex Tubing or equal.
3. Piping underground beyond 5 feet from building line shall be Schedule 40 PVC, ASTM D1785 or D2241. Fittings shall be PVC, ANSI/ASTM D2466. Joints shall be solvent weld, ASTM D2855, or gasketed, ASTM F477. Piping shall be rated for not less than 150 psig pressure.

C. Sanitary Sewer and Vent:
1. Piping and fittings shall be Schedule 40 PVC-DWV (cellular core), per ASTM F1488 and ASTM F891, solvent welded per solvent manufacturer’s instructions, or ABS Schedule 40 piping and fittings per either ASTM D2661 or ASTM F628 with solvent cement conforming to ASTM D2235. All sewer risers (2 story or more) shall be service weight cast iron, no-hub or single-hub, ASTM A74. All piping penetrations through fire rated walls, floors, or ceilings, and all piping located above ceilings used as return air plenums shall also be cast iron or galvanized steel, ASTM A53. Underground PVC-DWV piping shall be installed per ASTM D-2321.
2. Piping and fittings beyond 5 feet from the building line shall be PVC, ASTM D3033 or D3034, SDR 35. Joints shall be ASTM F477 with elastomeric gaskets. Underground piping shall be installed per ASTM D-2321.
3. All 90 degree waste line elbows shall be formed per the latest issue of the adopted plumbing code, latest edition.
4. All exposed vent piping located in occupied areas or rooms, is to be cast iron with cast iron fittings.
5. All flush valve fixtures that are installed back to back shall have offset waste outlet fittings.
6. Cleanouts shall be provided at each horizontal drainage pipe, at its upper terminal, and each run of piping which is more than 100 feet, and shall be provided for each 100 feet developed length, or fraction thereof of such piping. An additional cleanout shall be provided for each aggregate horizontal change of direction exceeding one hundred and thirty-five degrees, per applicable plumbing code. This shall be provided regardless of what is shown on the drawings.
7. All floor drains, floor sinks, and hub drains shall be installed with a trap primer.
   a. Flush Valve Primer: Trap primer shall be Precision plumbing products model FVP-1VB with vacuum breaker.
   b. Pressure Activated Primer: Trap primer shall be Precision plumbing products Model CPO-500 with DU distribution unit if required.
8. All vent’s through roof (VTR’S) shall be extended at least 1 foot above the roof surface, or to the top of the closest adjacent parapet wall, whichever is greater.

D. Storm Drains:
1. Piping and fittings shall be Schedule 40 PVC-DWV (cellular core), per ASTM F1488 and ASTM F891, solvent welded per manufacturer’s instructions, or ABS Schedule 40 piping and fittings per either ASTM D2661 or ASTM F628 with solvent cement conforming to ASTM D2235. All piping located above ceilings used as return air plenums, and all piping penetrations through fire rated walls, floors, or ceilings shall be service weight cast iron, ASTM888 no-hub or single hub, ASTM A74. Underground piping shall be installed per ASTM D-2321.
2. Piping underground beyond 5 feet from the building line shall be PVC, ASTM D3033 or D3034, SDR 35, with PVC fittings. Joints shall be ASTM F477 with elastomeric gaskets. Underground piping shall be installed per ASTM D-2321.
3. Cleanouts shall be provided at each horizontal drainage pipe, at its upper terminal, and each run of piping 2" size which is more than 50 feet and shall be provided for each 50 feet developed length. 4" size or larger which is more than 100 feet developed length, or fraction thereof of such piping. An additional cleanout shall be provided for each aggregate horizontal change of direction exceeding one hundred and thirty-five degrees, per applicable plumbing code. This shall be provided regardless of what is shown on the drawings. Final determination of cleanout spacing shall be per local jurisdiction and code requirements and shall be installed accordingly.

E. Natural Gas:
1. Piping shall be Schedule 40 black steel pipe, ASTM A53. Exposed fittings 2 inches and smaller shall be ANSI/ASME B16.3, screwed, black malleable iron.
2. Fittings larger than 2 inches and all underground fittings shall be Schedule 40 steel butt-welded type. Underground piping shall be provided with a polyethylene jacket, ANSI/AWWA C105, or shall be wrapped with double layer, half-lapped, 10 mil polyethylene tape.
   a. Contractors Option for Underground Pipe:
      2) Piping and fittings underground and outside the building line may be JM Eagle UAC 2000 MDPE, medium-density polyethylene yellow gas pipe or an approved equal. Piping shall be installed in accordance with JM Eagle Publication JME-12B, “Polyethylene Yellow Gas Distribution Installation Guide.” JM Eagle’s UAC 2000 system can be joined by butt heat fusion, socket fusion, or saddle fusion. Installing contractors shall be licensed for fusion pipe installation of polyethylene pipe. ASTM D2513.
3. All exterior piping exposed to the weather shall be coated with a rust inhibitor – Rustoleum #866 Pro-Guard Primer – red or gray color – or approved equal.

F. Condensate Drain Piping:
1. Exterior to building, or located in a plenum: Piping shall be Type L hard drawn copper, ASTM B88, with solder joints. Copper piping shall not be used on 90% condensing type equipment.
2. Interior: Piping shall be Type L hard drawn copper, ASTM B88, with solder joints, grade 95TA, or shall be Schedule 40 PVC. Copper piping shall not be used on 90% condensing type equipment. Provide a neoprene or rubber gasket at all copper piping support hangers to inhibit corrosion.
   a. Inside Mechanical Rooms: Piping shall be Type L hard drawn copper, ASTM B88, with solder joints, grade 95TA, unless otherwise specified by the equipment manufacturer.

G. Hanger and Supports:
1. Pipe hangers shall be provided to adequately support all piping systems. Hangers shall be vertically adjustable to provide for proper pitch and drainage. Hangers shall allow for expansion and contraction of the piping system. Reference “General Regulations” of the latest edition of the adopted plumbing code, latest edition.
2. Hangers for pipe sizes 1/2 to 6 inches shall be adjustable clevis type, or unistrut saddles with all-thread hanger rod.
3. Hangers for hot pipe, sizes 6 inches and over shall be adjustable steel yoke, cast iron roll, double hanger type.
5. All insulated piping shall be provided with minimum 18 gauge galvanized insulation.
shields, 12 inches long, and oversized hangers. Pipe sizes 2 inches and over shall also be provided with 12 inch long calcium silicate insulating blocks between the piping and the galvanized insulation shield.

a. Alternate: Insulated pipe support inserts may be provided at hanger, support, and guide locations on piping requiring insulation. The insert should consist of either Hydrous Calcium Silicate or Polyisocyanurate Foam insulation (Urethane) encircling the entire circumference of the pipe with a 360 deg. PVC (1.524 mm thick) or galvanized steel jacket and installed during the installation of the piping system. These insulated pipe support inserts shall be provided by the Mechanical Contractor and installed by the same during pipe support installation.

6. Hanger rod sizing and spacing for pipe shall be as follows:

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<thead>
<tr>
<th>Pipe Size</th>
<th>Minimum Rod Diameter</th>
<th>Maximum Spacing</th>
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<tbody>
<tr>
<td>To 1-1/4 inches</td>
<td>3/8 inch</td>
<td>6.5 feet</td>
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<tr>
<td>To 2 inches</td>
<td>3/8 inch</td>
<td>10 feet</td>
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<tr>
<td>To 3 inches</td>
<td>1/2 inch</td>
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<tr>
<td>To 6 inches</td>
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<td>8 to 12 inches</td>
<td>7/8 inch</td>
<td>12 feet</td>
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<tr>
<td>PVC &amp; ABS (all sizes)</td>
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<td>4 feet</td>
</tr>
</tbody>
</table>

7. Provide hangers within 12 inches of each horizontal elbow.

8. Provide hangers with minimum 1-1/2 inches vertical adjustment.

2.3 INSULATION

A. General:

1. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

2. Fire-Test-Response Characteristics: Insulation and related materials NFPA 255, UL Classified per UL 723 or meeting ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement containers, with appropriate markings of applicable testing and inspecting agency.

   a. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

   b. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

B. Piping:

1. All domestic, potable & non-potable, hot and cold water lines and rain drains shall be insulated with preformed insulation.

   a. Fiberglass insulation with a vapor barrier jacket. Insulation shall have a conductivity not exceeding 0.28 Btu-inch/hour-sq. ft.-degrees F. Laps and butt joints shall be sealed with pressure sensitive joint sealing tape of the same finish as the insulation jacket to provide a continuous vapor seal. Fittings and valves shall be insulated with PVC fitting covers and fiberglass insulation inserts, or with hydraulic setting insulating cement and four ounce canvass jacket with vapor barrier adhesive.

   Insulation thicknesses shall be as follows:

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<th>System</th>
<th>Pipe Sizes</th>
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PIONEER SCHOOL OF THE ARTS GYMNASIUM ADDTION 22 01 00/6 04/18/2018
2. Roof and overflow drain sumps shall be insulated with 1/2" thick fiberglass with a vapor barrier, extending 2" onto adjacent insulation.

3. Insulation shall be installed in strict accordance with manufacturer’s instructions.

4. Insulation shall be continuous through penetrations.

5. All insulation shall be installed in a neat and workmanlike manner.

2.4 VALVES & STRainers

A. Ball Valves:
1. Valves 2-inches and smaller shall be lead free cast bronze body, chrome-plated brass ball, teflon seats, and lever handle, 600 psi CWP. Valves shall comply with MSS SP-110, NSF/ANSI 61, NSF/ANSI 372 Lead Free. Valves over 2-inches shall be cast steel body, chrome plated steel ball, teflon seats, and lever handle. Victaulic, Anvil Gruvlok, Grinnell, or Shurjoint ball valves are acceptable if grooved piping is used. Valves mounted higher than 7'-0" A.F.F. shall be provided with chain, wheel, and guides. Basis of design: Apollo #77CLF-A Series, Lead Free.

B. Check Valves:
1. Valves 2-inches and smaller shall be bronze body Y-pattern, ASTM B-62, swing check, bronze disc, 200 psi WOG. Valves shall comply with MSS SP-80, NSF/ANSI 61-8 F&G, NSF/ANSI 372 Lead Free. Valves, over 2-inches shall be iron body, ASTM A-126, bronze trim, swing check, renewable disc and seat. Valves shall comply with MSS SP-71. Victaulic, Anvil Gruvlok, Grinnell, or Shurlock check valves are acceptable if grooved piping is used. Basis of design: Apollo # 161T-LF/161S-LF Lead Free Bronze, Apollo # 920F-LF Lead Free Cast Iron.

2. Swing check valves with outside lever and spring (not center guided) is to be used on sewage ejector or storm-water sump pumps. Basis of design: Apollo # 910FLW-LF Lead Free Cast Iron.

C. Strainers:
1. Strainers shall be cast steel body, Y-pattern, 20-mesh stainless screen. Victaulic, Anvil Gruvlok, Grinnell, or Shurjoint strainers are acceptable if grooved piping is used.

PART 3 – EXECUTION

3.1 WORKMANSHIP

A. General:
1. Install all piping, fixtures, equipment, and accessories as shown, and in strict accordance with the plumbing laws, rules, and regulations of the State and/or City. All work shall be done in a neat and orderly fashion, and left in a condition satisfactory to the Architect/Engineer.

B. Piping:
1. All piping shall be run parallel or perpendicular to established building lines. Install piping so as to allow for expansion. Waste and vent piping occurring above floor slab shall be installed true and plumb. Extend vents at least 1 foot above roof, or to the top of the closest adjacent parapet wall, whichever is greater, and provide watertight flashing sleeves. Excavation and backfill shall be in accordance with Section 220000 of these specifications.
C. Fixtures:
1. Install fixtures true and plumb with building walls. Caulk all plumbing fixtures at joints along walls, countertops, and other intersecting surfaces. Locate fixtures as shown and per manufacturer’s instructions. Furnish all required trim for fixtures to provide a complete and workable installation.

3.2 TESTS

A. General:
1. All piping, fixtures, and equipment shall be inspected and approved before concealing or covering. All work shall be tested as required by Section 220000 of these specifications, and shall be leak proof before inspection is requested. All tests shall be repeated if required by those making the inspection.
2. All potable water systems shall be flushed and disinfected in accordance with Section 220000 of these specifications. Following disinfection, system shall be flushed and water sampled to show compliance with requirements of public health authority having jurisdiction. If tested water does not meet requirements, disinfecting shall be repeated until water quality meets requirements.

B. Fixtures and Equipment:
1. Fill all plumbing fixtures with water and check for leaks or retarded flow. Repair as required. Adjust each piece of plumbing equipment as required to insure proper functioning. Leave all fixtures and equipment in first class operating condition.
2. The Plumbing Contractor is responsible for all backflow devices to be inspected by a certified backflow technician before use of the building potable water system.

C. Smoke Test:
1. A smoke test shall be performed on the entire waste and vent system before building occupancy. After all fixtures are permanently connected and traps are filled with water, fill entire drainage systems with smoke under pressure of 1.3 pKa (1 inch of water) with a smoke machine. If leaks are detected, they shall be repaired and the smoke test shall be performed again until no leaks are found.
**PIPING SYSTEM TEST REPORT**

STRUCTURE/BUILDING: ___________________  TEST NUMBER: __________
LOCATION: ________________________________  CONTRACT NO. __________

DESCRIPTION OF SYSTEM/PIPING BEING TESTED:

<table>
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<tr>
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<th>Test Pressure</th>
<th>Test Duration</th>
<th>Pass/Fail</th>
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<tr>
<td>Hydrostatic:</td>
<td>P.S.I.</td>
<td></td>
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<tr>
<td>Inert Gas:</td>
<td>P.S.I.</td>
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<tr>
<td>Compressed Air:</td>
<td>P.S.I.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste &amp; Vent Smoke Test:</td>
<td>1” Water Column</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NAME AND TITLE OF PERSON IN CHARGE OF PERFORMING TEST’S FOR CONTRACTOR:

Name: _______________________________  Title: _______________________________

Signature: ____________________________

**I hereby certify that the above described system has been tested as indicated above and found to be entirely satisfactory as required in the contract specifications.**

Signature of Inspector: ___________________  Date: _________________________

REMARKS:

____________________________________

____________________________________

____________________________________

END OF SECTION 22 01 00
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PART 1 – GENERAL

1.1 SCOPE

A. General:
   1. The Bidding Requirements, Contract Requirements, and the General Requirements (Division 1) of these specifications shall govern all parts of the work.

B. Work Included:
   1. Install work in accordance with these specifications and the accompanying plans. Furnish all labor, material, and equipment together with all incidental items not specifically shown or specified which are required by good practice to provide the complete mechanical systems as described.
   2. The HVAC Contractor(s) and all Sub-tier Contractors shall provide installed equipment cut sheets and purchase orders required for utility rebates.

C. Coordination and Site Visits:
   1. This section of the work requires examination of and reference to all architectural, structural, utility, and electrical drawings for construction conditions that may affect the work. Inspect the building site and existing facilities for verification of existing conditions. Base all measurements from established benchmarks. Any discrepancy between actual measurements and those indicated, which prevents following good practices or the intent of the drawings and specifications, shall be reported to the Architect/Engineer, and work halted until instructions are received from the Architect/Engineer.

1.2 CODES, PERMITS, FEES

A. Install all work in accordance with applicable codes and standards. Obtain all required permits; pay all required fees including utility connections or extensions, in connection with this portion of the construction. Obtain all required certificates of inspection for the work.

PART 2 – PRODUCTS

2.1 MATERIALS AND WORKMANSHIP

A. Materials:
   1. All materials and equipment shall be of first quality, new, full size and weight, standard in every respect, and suitable for the space required. Use the same manufacturer for products of similar class or service, such as valves, pumps, controls, and air handlers. Protect all materials against loss, theft, or damage before and after installation.
   2. Furnish equipment that will operate under all conditions of load without any sound or vibration that is objectionable in the opinion of the Architect/Engineer. Vibration or noise considered objectionable will be corrected by the Subcontractor at his expense.
   3. Furnish and install all necessary foundations, supports, pads, bases, and piers required for all materials and equipment furnished under this contract.
   4. Provide all required firestopping at duct penetrations of fire rated walls, floors, ceilings, and roofs. Firestopping shall be Dow Corning Fire Stop Sealant 2000 or Fire Stop Foam 2001, or approved equal.
B. Workmanship:
1. All materials and equipment shall be installed in a neat and workmanlike manner by competent specialists for each subtrade. Work shall be installed to the satisfaction of the Architect/Engineer with unsatisfactory work removed and reinstalled to his satisfaction at no extra cost to the Owner.
2. Provide all cutting and patching necessary to install the work specified in this section. Patching shall match adjacent surfaces. No structural members shall be cut without the approval of the Architect/Engineer. Provide sleeves at all piping penetrations of exterior walls and floors on grade. Provide all sleeves and inserts required before new floors and walls are built.
3. Locate all equipment that must be serviced in fully accessible positions. Provide clearance for removal of replacement parts and components, and with necessary couplings or flanges to remove the component for maintenance.

C. Protection of Equipment During Construction:
1. At the end of each shift, all duct openings and open ends shall be covered with a plastic poly sheeting film to protect against dust and construction contamination from entering the ductwork.

2.2 SUBMITTALS AND SUBSTITUTIONS

A. Prebid Approval:
1. Manufacturer’s trade names and catalog numbers stated herein are intended to indicate the quality of equipment or materials desired. All manufacturers not specifically listed require prior approval. Submit catalog data, including specifications, of the proposed equipment to the Architect/Engineer for his approval at least 10 calendar days prior to bid opening. Notice of such approvals will be published in an addendum. Approval of listed alternate equipment manufacturers is for bidding only. Final approval is to be based on requirements of the plans and specifications.

B. Submittals:
1. Within thirty days after award of this contract, provide six copies of a complete list of all materials and equipment proposed for this project. List shall contain make, type, manufacturer's name, and trade designation of all materials and equipment. Submittal shall also include manufacturer's complete specification for each item, including capacities, ratings, etc., and dimensions as required to check space requirements. Provide six copies of all submittals. The scheduled equipment is the basis of design for capacity, weights, physical size, etc. Alternate manufacturers shall not exceed the weight or physical size. Any changes to the Architectural, Structural, Mechanical, Electrical, and Control systems due to alternate manufacturers shall be the responsibility of the Contractor and Supplier. Submittals for each major trade (i.e., dryside HVAC, wetside HVAC, or Plumbing) shall be submitted in a single complete package. Individual items will not be reviewed independently unless approved by the Engineer. Electronic submittals will be allowed when approved by the Architect and, or Owner. The requirements of electronic submittals are the same as those noted above.
2. Approval of submittals shall not relieve the contractor from responsibility for deviations from the plans or specifications, unless he has, in writing, called the Architect's /Engineer's attention to deviations at the time of submission, and obtained his written approval. Approval of submittals does not relieve the contractor from responsibility for errors in shop drawings or literature.

C. Equipment Requiring Submittals:
1. Roof Top Units
2. Exhaust Fans
3. Electric Heaters
4. Destratification Fans
5. Flex Duct
6. Grilles, Registers, and Diffusers
7. Penthouse

PART 3 – EXECUTION

3.1 ACCESSIBILITY & SAFETY

A. Accessibility:
1. All equipment which must be serviced or operated shall be located in fully accessible position. Minor changes from the drawings may be made to allow for better accessibility. All changes shall be approved prior to actual installation.
2. Access panels shall be provided if required for accessibility. Access panels to be steel, flanged, hinged doors by Cendrex, or equal. Sized as required for installation. Subcontractor shall furnish the required panels to the General Contractor and the required location for all access panels, unless otherwise specified in the Architectural specifications. Panels shall be installed by the General Contractor.

B. Safety:
1. Subcontractor shall provide guards for all belt drives and rotating machinery.

3.2 COORDINATION

A. Coordinate all work with the various trades involved to provide a complete and satisfactory installation. The exact details of ductwork and equipment are not shown. No additional compensation will be made for offsets or relocation required in coordination with other trades.

B. Alterations required due to improper supervision by the subcontractor shall be made at no extra cost, to the satisfaction of the Architect/Engineer.

3.3 ELECTRICAL

A. Electric motors required for equipment specified in this section shall be provided and installed by this Subcontractor. Motor starters, disconnects, relays, pilot lights, etc., are in general, to be furnished and installed by the Electrical Contractor. Starters, relays, controls, etc., which are factory assembled into packaged equipment shall be furnished by the Mechanical Contractor under this section of the specifications.

B. All motors shall be provided with adequate starting and protective equipment as specified or required. Motor capacity shall be sufficient to operate driven device under all conditions of operation and load without overload. Minimum horsepower shall be as specified.

3.4 IDENTIFICATION AND CODING

A. Painting:
1. All painting of mechanical equipment, accessories and ductwork shall be furnished and applied under the Architectural section of these specifications. All painting shall be completed before any identification markings are applied.

B. Equipment:
1. Identify all equipment with a black Formica label, with white reveal when engraved. Lettering to be 3/16 inch high minimum. In general, identify equipment as to area served in addition to title and code number of the equipment as taken from the plans.

C. Piping:
1. Identify all piping as to the service of the pipe and the direction of flow. The letters
shall be 3/4 inch high on piping two inches or smaller, and 1-1/4 inches high on piping up to six inches. Flow arrows shall be at least six inches long. The letters and flow arrows shall be made by precut stencils and oil base paint, one inch high and black, or factory fabricated plastic pipe markers. Piping shall be identified at 25 foot maximum intervals, on long continuous lines; adjacent to each item of equipment; on each riser and junction, and on both sides of all wall penetrations. Underground piping shall be identified with bright colored continuously printed plastic tape of not less than 6" wide by 4 mil thick, manufactured for direct burial service. Install directly above all buried pipe, 6 to 8 inches below finished grade.

3.5 TESTING

A. Systems:
   1. All systems, including heating, ventilating and air conditioning, shall be tested at the completion of the building to establish that the systems operate as specified and required. Testing shall be performed after air balancing is completed.
   2. All controls shall be calibrated accurately and all equipment shall be adjusted for satisfactory operation. Excessive vibration or noise from any system shall be corrected.
   3. The air conditioning system shall be tested for satisfactory operation when the outside air temperature reaches 60 degrees F. or warmer. All other systems shall be tested at building completion. All tests shall be performed in the presence of the Architect/Engineer or his representative.

3.6 BALANCING

A. Scope:
   1. Prior to final acceptance by the Owners, all air systems shall be balanced to deliver the quantities as specified or directed. The air balance shall be performed by an independent agency specializing in balancing and is certified by the National Environmental Balancing Bureau.
   2. Balance contractor’s main office shall be located within 50 miles from the project site. Approved balance contractors are Felts-House Engineering, Ro-Bar Technical Services, and Building Systems Technologies. All other contractors must receive prior approval from the Engineer, in writing, before bidding the project.
   3. The Mechanical Contractor shall provide assistance to the Balancing Contractor by identifying all installed mechanical systems and assisting access to all installed mechanical systems. All mechanical systems shall be completely operational and functional prior to the Balancing Contractor performing their specified work.

B. Air balancing:
   1. Balancing of the air system shall consist of:
      a. Adjust all air volumes to the quantities shown, with allowable variation of plus 10, minus 10 percent.
      b. Record all system, zone, diffuser, grille, and register C.F.M. Use volume control devices to regulate air quantities only to the extent that adjustments do not create objectionable air motion or sound levels. Balancing Engineer shall work with the Contractor to set minimum & maximum CFM quantities for zone dampers, or zone dampers/heaters.
      c. Test and record all system static pressures, inlet and discharge, on all packaged units, fans, and terminal units. Vary total system air quantities by adjustment of fan speeds. Provide drive changes as necessary. Vary branch air quantities by damper regulation.
      d. Test and record motor full load amps and nameplate amps.
e. Test and record entering and leaving temperatures at all coils.

f. Adjust all automatically operated dampers, in cooperation with the Control Contractor, to the required settings. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions within specified tolerances. Where modulating dampers or economizers are provided, take measurements at full return air, minimum outside air, and 100 percent outside air mode of operation.

g. Adjust diffusers and grilles for proper deflection, throw, and coverage. Eliminate drafts and excessive noise where possible.

h. Mark final positions of all balance dampers with a red felt pen.

i. Air systems shall be balanced in accordance with standard procedures and recognized practices of the Associated Air Balance Council, and the Testing Adjusting, and Balancing Bureau.

C. Quality Assurance:
   1. The Balancing Contractor shall demonstrate to the Engineer of record, flow verification for at least 10% of the balanced devices as selected by the Engineer. If more than 25% of the tested devices do not meet the designed or balance report, then the entire system balance must be rebalanced.

D. Balance Reports:
   1. Submit four copies of the air system balance report to the Architect/Engineer for evaluation and approval. Reports shall be on TABB/SMACNA forms that indicate information addressing each of the testing methods, readings, and adjustments.

3.7 CLEANING AND ADJUSTING

A. Thoroughly clean all air conditioning units, air handling units, and all associated parts of the system at the completion of the work. Install new, clean air filters in all systems. Adjust all devices for proper operation and lubricate all equipment as required. Repaint any painted surface that has been damaged.

3.8 PROJECT CLOSEOUT

A. Operations & Maintenance Manual:
   The Contractor shall provide an operations and maintenance manual at least thirty days prior to completion of work. The manual shall be of the three ring binder type, entitled "Operations and Maintenance Manual", with the job name and year of completion also included. O & M manuals shall be submitted in a single package. Individual items will not be accepted independently unless approved by the Engineer. The manual shall include, as a minimum:
   1. Maintenance instructions for all equipment, including lubrication requirements.
   2. Equipment suppliers names, addresses, and telephone numbers.
   3. Equipment catalog cuts, ratings tables, model numbers, serial numbers, and accessories.
   4. Parts numbers for all replaceable parts.
   5. Air and/or water systems balance report as hereinbefore specified.
   6. Control diagram or drawing and operation sequence.
   7. Valve tagging chart as hereinbefore specified.
   8. Filter chart listing unit callout, size of filters, and quantity of filters.
   9. Guarantee letter as specified below.
   10. Any additional information required to enable the Owner to properly maintain the building mechanical system.
   11. Mechanical Equipment Start-up forms, which are included in this specification, if they are required.
   12. After approval of the Operations and Maintenance Manual by the Architect/Engineer,
the Contractor shall furnish two copies of the manual to the Owner.

B. Mechanical System Training Period:
   1. After the mechanical system is completely installed and operational, the mechanical contractor shall provide a minimum of 8 hours training and instruction time for the building Owner or his representative. During this period, the contractor shall instruct the Owner in the operation and maintenance of all parts of the mechanical system, using the O & M manual where applicable. The contractor shall provide a copy of the Project Owner Mechanical Systems Training Form (attached to this specification), with proper signatures, to the Engineer prior to substantial completion and insure that a copy is inserted into the project O & M manuals.

C. As-Built-Drawings:
   1. Provide two sets of blue-line mechanical drawings showing the work as it was actually installed. The drawings shall indicate all departures from the contract drawings. Make all notations neat and legible, with red indelible pencil. At the completion of the work, these as-built drawings shall be signed and dated by the Mechanical Contractor, and returned to the Architect/Engineer.

D. Guarantee:
   1. All work furnished under this section shall be guaranteed in writing to be free from defective work or materials for a period of one year after acceptance of the contract. All repairs or replacements because of defective materials or workmanship or noncompliance with code shall be provided without additional cost to the Owner. Contractor shall furnish a letter indicating above guarantee with space for date of acceptance and expiration of guarantee. Letter shall be included in O & M Manual.

END OF SECTION 23 00 00
OWNER MECHANICAL SYSTEM TRAINING FORM

Upon completion of the equipment and systems installation and connections, the contractor shall assemble all required equipment factory representative and subcontractors together for system Owner training.

These people shall assist in Owner training their system(s) and remain at the site until the total system operations is acceptable and understood by the Owner’s representative(s), maintenance and/or operation personnel, on operation and maintenance of their equipment. To prove acceptance of operation and instruction by the Owner’s representative(s), the contractor shall provide a copy of this form, with proper signatures, to the Engineer prior to substantial completion, and insure that a copy is inserted into the project Operation and Maintenance manuals.

“I, the Contractor, associated factory representative and subcontractors, have started each system and the total system(s); and have proven their normal operation to the Owner’s representative(s) and maintenance/operation personnel and have instructed him/them ___________, hours in the operation and maintenance thereof.”

__________________________________   ________________________________
Owner’s Representative    Contractor

__________________________________   ________________________________
Signature      Signature

________________________    _______________________
Date      Date
PART 1 - GENERAL

1.1 SCOPE

A. This section covers the work necessary for the heating, ventilating, and air conditioning system, complete. The HVAC General Requirements, Section 230000, is to be included as a part of this section of the specifications.

1.2 CODES & STANDARDS

A. The heating, ventilating, and air conditioning system shall be installed in accordance with the latest adopted edition of the following codes and standards:
1. International Mechanical Code (IMC)
2. International Building Code (IBC)
3. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
4. National Fire Protection Association (NFPA)
5. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)

PART 2 – PRODUCTS

2.1 AIR HANDLING UNITS AND APPURtenANCES

A. Packaged Rooftop Air Conditioning Unit:
1. General:
   a. The packaged unit shall consist of condensing section, evaporator section, heating section, blower, filter, and controls, all contained in weatherproof casing suitable for installation on the roof. The entire unit is to be factory wired, piped, and tested. Unit shall bear the UL label for the intended application.
2. Casing:
   a. Casing shall consist of welded steel reinforced framework with 18-gauge zinc grip steel finished with weatherproof baked enamel paint. Cooling section shall be insulated with minimum 1" thick, 1.5 density coated sound absorbing insulation. Easily removable panels shall be provided for access to internal components.
3. Condensing Section:
   a. Condensing section shall include spring mounted hermetic compressors; air cooled condenser and fans, evaporator coil, and refrigeration piping and specialties. Compressors shall be furnished with current and temperature overload protection, oil sight glass, and shall carry a 5-year guarantee. Condenser fans shall be upflow propeller type with direct or belt drive motors with overload protection. Propeller fans shall be coated with weather resistant finish and protected by fan guard. Evaporator coils shall be direct expansion coils complete with thermostatic expansion valves. Furnish galvanized drain under coil. Refrigerant piping system shall be completely factory piped with a full operating charge of R-410a. Suction line to be insulated. Units shall be furnished with low ambient control, for operation...
down to 0 degrees F (not required on units furnished with economizers).

4. Gas Heating Section:
   a. Gas heating section shall be AGA certified and include gas fired furnace with steel heat exchanger and burners, power vent, manual main and pilot shutoff valves, automatic gas valve, electronic ignition, and flame proving controls. Entire unit shall be tested and certified for operation down to -30 degrees F outdoor temperature.

5. Blower:
   a. Blower section shall consist of heavy duty, centrifugal blower wheels, balanced to eliminate vibration. Furnish adjustable motor mount and v-belt drive. Motors shall be furnished with overload protection.

6. Filters:
   a. Filters for units 2 ½ tons or smaller shall be 1inch thick replaceable pleated media type, rated at MERV 8.
   b. Filters for units 3 ton and above shall be 2 inch thick replaceable pleated media type, rated at MERV 8. Provide with 2 inch filter rack.
   c. Provide 4 extra sets of filters per unit.

7. Control Section:
   a. Controls shall include a factory installed control circuit transformer, starters, 3-leg overload protection, high and low pressure refrigerant controls, and terminal strip for connection of remote controls.

8. Manufacturer, Capacity and Accessories:
   a. See drawings.

2.2 EXHAUST FANS

A. Ceiling Cabinet Exhaust Fan (Standard):
   1. Description:
      a. Fan shall be ceiling, wall, or inline mounted, direct driven, centrifugal exhaust fan.
   2. Certifications:
      a. Fan shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (cUL 705). Fan shall bear the AMCA certified ratings seal for sound and air performance.
   3. Construction:
      a. The fan housing shall be minimum 20 gauge galvanized steel and acoustically insulated housing above 200 cfm. Blower and motor assembly shall be mounted to a minimum 14 gauge reinforcing channel and shall be easily removable from the housing. Motor shall be mounted on vibration isolators. Unit shall be supplied with integral wiring box and disconnect receptacle shall be standard. Discharge position shall be convertible from right angle to straight through by moving interchangeable panels. The outlet duct collar shall include a reinforced aluminum damper with continuous aluminum hinge rod and brass bushings. To accommodate different ceiling thickness, an adjustable prepunched mounting bracket shall be provided. A powder painted white steel grille shall be provided as standard.
   4. Wheel:
      a. Wheel shall be centrifugal forward curved type, constructed of galvanized steel. Wheel shall be balanced in accordance with AMCA Standard.
   5. Motor:
      a. Motor shall be open drip proof type with permanently lubricated sealed bearings, built-in thermal overload protection and disconnect plug. Motor
shall be furnished at the specified voltage.

6. Manufacturer, Capacity & Accessories:
   a. See Drawings.

2.3 AIR DISTRIBUTION

A. Ductwork:

1. Low pressure ductwork shall be fabricated from galvanized sheet metal, unless otherwise indicated. Construction requirements shall be in accordance with SMACNA - HVAC Duct Construction Standards, metal and flexible, latest edition. All sheet metal ductwork shall be sealed with McGill United Sheet Duct Sealer or equal, in accordance with the International Energy Compliance Code, latest edition. Adjustable (twist) elbows are not allowed. Low pressure ductwork shall be constructed to the following SMACNA static pressure standards:
   a. Supply air ductwork = 2" W.G.
   b. Return, Exhaust, Outside Air Intake ductwork = 1" W.G.

2. Low pressure ductwork located exposed in exposed ceiling areas, shall be spiral type ducts with a “paint-grip” finish, on ductwork and associated fittings that can be painted.
   a. Joints: 0” to 20” diameter, interior slip coupling beaded at center, fastened to duct with screws and with sealing compound applied continuously around joint before assembling and after fastening. Sealing compound shall be applied in an evenly and professional manner.
   b. Joints 22” – 72” diameter, use 3-piece, gasketed, flanged joints consisting of 2 internal flanges (with integral mastic sealant) split to accommodate minor differences in duct diameter, and one external closure band designed to compress gasketing between internal flanges. Manufacturer shall be Ductmate Spiralmate or equal.
   c. All takeoff or branch entrances shall be by means of factory-fabricated fittings. Field taps shall not be allowed.

3. Low pressure ductwork which is exposed or located in mechanical rooms shall be fabricated from galvanized sheet metal. Construction requirements shall be in accordance with SMACNA HVAC Duct Construction Standards, metal and flexible, latest edition.

4. Ductwork penetrating protective elements of fire-rated corridor walls, with no openings into corridor, shall be constructed of minimum 26 gauge galvanized steel.

5. Exterior exposed ductwork shall be fabricated from galvanized sheets. All joints and seams shall be standing-seam type with sealing mastic to provide watertight construction. All ductwork shall be internally insulated as hereinafter specified. All exposed surfaces shall be primed and painted two coats of exterior enamel paint, color as selected by the Architect.

6. Flexible ducts shall be listed per UL-181 standard as Class 1 flexible, acoustical insulated air duct and complying with NFPA Standards 90A and 90B. Ducts shall be insulated with a minimum R-5 value, and shall have a maximum vapor transmission value of .05 perms. Ducts shall be factory made with and composed of: a PE liner duct permanently bonded to a coated spring steel wire helix. Duct shall be chlorine free and carry a ten-year warranty for the labor to replace the duct should there be a factory defect. Low permeability outer vapor barrier of fiberglass bidirectional reinforced metalized laminate shall complete the composite. Pressure rating shall be 6" w.g. and maximum length shall be 6 feet. Attach to duct take-off, diffuser, register, or grille only, with nylon or stainless steel duct clamp or tie. Flexmaster 1-M, Thermaflex M-KE (R6.0), or approved equal.

B. Duct Accessories:
1. Turning vanes shall be installed in all rectangular or square elbows. Vanes shall be installed in vane side rails. Vanes shall be single wall vanes, and be fabricated and installed per SMACNA standards.

2. Volume dampers shall be fabricated from galvanized steel in accordance with SMACNA standards. Dampers shall have a continuous galvanized steel shaft on ducts 13” diameter or larger, with damper regulators and end bearings. Dampers located above inaccessible ceilings (hard ceilings) shall be furnished with concealed ceiling damper regulators. Dampers shall be pressure rated equal to the design duct pressure rating. Dampers shall be provided at all diffuser and supply/exhaust grille takeoffs, regardless if indicated on the plans. Dampers are not required on the return air takeoffs unless specifically indicated.

3. Flexible connections shall be provided at all rotating fan equipment. Connectors shall be of fire, water, and weather resistant material.

4. A plastic flex elbow support by Flexible Technologies Inc., Titus FlexRight, or approved equal, is required at all flex duct elbows supplying ceiling diffusers & return grilles. Elbow support shall be fully adjustable, or be of universal design, to support flexible diameters 6” – 16”, sized to fit flex duct. Elbow supports shall be UL rated for use in return air plenum spaces. At the Contractor’s option, a hard elbow may be used in lieu of a flexible elbow.

C. Diffusers, Registers, Louvers, Grilles, Weathercaps:
   1. See Drawings for requirement.

D. Duct Cleanliness:
   1. Ductwork Delivery To Site
      a. During ductwork being delivered from the premises of the manufacturer, care must be taken to prevent damage during transportation and off-loading.
   2. Temporary Storage
      a. Job site duct material storage areas should be clean, dry, and located away from high dust generating processes such as masonry or tile cutters, cutoff saws, drywall sanding, mortar and plaster mixers, roof pitch kettles, portable electric generators, and main walkways that will be constantly broom swept. The general contractor should designate a suitable area for temporary storage.
      b. To prevent ductwork material damage from standing water, storage locations should include pallets or blocking to keep fabricated metal ductwork above the floor surface. If there is a risk of water runoff from above or dusty areas cannot be avoided, coverage should be used to protect stored materials.
   3. Installation
      a. Before the installation of individual duct sections, they are to be inspected to insure that they are free from all debris.
      b. All ductwork risers must be covered to prevent the entry of debris into the duct.
      c. Downward facing and horizontal ductwork openings will not be required to be covered.
      d. Access covers shall be firmly fitted in position on completion of each section of the work. Open ends on completed ductwork and overnight work-in-progress shall be sealed.
      e. The working area should be clean and dry and protected from the elements.
      f. The internal surfaces of the uninsulated ductwork shall be wiped to remove excess dust immediately prior to installation.

2.4 PIPING SYSTEMS

A. Condensate Drain Piping:
1. Exterior to building, or located in plenum: Piping shall be Type L hard drawn copper, ASTM B88 with solder joints. Copper piping shall not be used on 90% condensing type equipment.

2. Interior: Piping shall by Type L hard drawn copper, ASTM B88, with solder joints, grade 95TA, or shall be Schedule 40 PVC. Copper piping shall not be used on 90% condensing type equipment.

B. Pipe Hangers and Supports:
1. See Section 220100 for hanger and support requirements for piping systems. See drawings for seismic support requirements for piping systems.

2.5 INSULATION

A. General:
1. All insulation shall have composite fire and smoke hazard ratings, as tested by ASTM E-84, NFPA 255, and UL 723, not exceeding:

<table>
<thead>
<tr>
<th>Flame Spread</th>
<th>Smoke Developed</th>
</tr>
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<tbody>
<tr>
<td>25</td>
<td>50</td>
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B. Ductwork - External Insulation:
1. Insulation shall be fiberglass insulation with aluminum foil scrim kraft facing. All joints shall be taped with UL listed tape to provide a continuous vapor barrier. The following ducts shall be externally insulated:
   a. Supply ducts in unconditioned spaces (unless internally insulated)
   b. Return ducts in unconditioned spaces (unless internally insulated)
   c. Combustion air ducts
   d. Outside air intake ducts
   e. Exposed ductwork located within conditioned spaces shall not be externally insulated

2. Insulation thickness & "R" values shall be as follows:
   a. R-6 – ducts located in unconditioned spaces (such as above ceiling, but below roof insulation).
   b. R-12 – ducts located outside of the building's insulation envelope (such as above the attic insulation).

C. Ductwork - Internal Insulation:
1. Insulation shall be Armacell, AP Armaflex closed cell, duct liner, with EPA approved anti-microbial additive, or approved equal. Liner shall be attached with 100% coverage of manufacturers recommended adhesive and welded and mechanically fastened galvanized steel pins. All exposed edges of liner shall be coated with adhesive. Duct dimensions shown are net air side face-to-face of duct liner. The following ducts shall be internally insulated:
   a. Supply and Return ducts within 15'-0" of air handler
   b. Supply and Return ducts in mechanical rooms
   c. 15'-0" downstream of VAV terminal units.
   d. 15'-0" downstream of fan coil units.
   e. Exterior ducts (located outdoors)
   f. Buried ductwork below concrete slab
   g. Ducts as indicated on plans

2. Insulation thickness & "R" values shall be as follows:
   a. R-6 – ducts located in unconditioned spaces (such as above ceiling, but below roof insulation, or buried ductwork)
   b. R-12 – ducts located outside of the building's insulation envelope (such as above the roof).
2.6 VIBRATION ISOLATION

A. General:
1. All rotating equipment and appurtenances connected to rotating equipment shall be vibration isolated from the supporting structure. No metal to metal contact will be permitted between fixed and floating parts. All metal isolators exposed to weather shall be hot dipped galvanized after fabrication. Piping connected to rotating equipment shall be hung with spring hangers for first 50 pipe diameters.

2.7 SEISMIC SUPPORTS

A. All equipment, ductwork, and piping shall be seismically supported as required by the International Building Code, latest edition.

2.8 CONTROL SYSTEM

A. General:
1. The Control Contractor shall be responsible for a complete and operable control system, including equipment, installation, and accessories required to perform the functions specified on the drawings. The Control Contractor shall supervise the installation of all control equipment and accessories and shall submit shop drawings of the proposed system for approval.

2. The Control Contractor shall furnish and install all control conduit and wiring. All wiring shall be installed in EMT in accordance with the section Electrical. Provide plastic covered wires of not less than 18-gauge (16-gauge if longer than 50’), with at least one spare circuit at each control device. Control voltage shall not exceed 30 volts, except in starter pilot circuits.

3. The control system shall be basically electric, with supplementary electronic devices as required.

4. The Control Contractor shall be a contractor who is regularly engaged in control system work, and can furnish a verified list of satisfactory installations of this type and size, for a period of 5 years or more.

5. Reference section 230900 for additional information and requirements.

B. Control Equipment and Accessories:
1. Air Duct Smoke Detector:
   a. Smoke detector shall be products of combustion detector and shall be UL listed. The unit shall be designed for detection of combustion gases, fire, and smoke in air ducts in compliance with NFPA Pamphlet 90A. The sheet metal contractor shall provide a minimum 18”x18” hinged access door, in inaccessible ceilings, for each detector that is furnished. The sheet metal contractor is also responsible for providing all necessary transitions in the ductwork for mounting of the duct detector.

2. Equipment Control Schematics:
   a. See Drawings for schematics and sequence of operations.

PART 3 – EXECUTION

3.1 WORKMANSHIP

A. General:
1. Install all materials and equipment as shown and in strict accordance with the applicable codes for the State and/or city. Plans do not attempt to show exact details of all piping and ductwork, and no extra payment will be allowed for offsets required...
due to obstructions by other trades. All work shall be done in a neat and orderly fashion and left in a condition satisfactory to the Architect/Engineer.

2. All piping shall be run parallel or perpendicular to established building lines. Install piping so as to allow for expansion. Install all valves with stems horizontal or above. Install air vents at all high points. Provide all piping which passes through walls, floors, or ceilings with standard weight pipe sleeves.

B. Insulation:
1. All piping insulation shall be applied over clean, dry surfaces after system has been pressure tested and any leaks corrected. Finished appearance of all insulation shall be smooth and continuous. Provide coat of insulating cement where needed to obtain this result.
2. Flexible duct insulation shall be secured to duct surface with 4-inch wide bands of adhesive applied on maximum 18-inch centers. Additional galvanized tie-wire support shall be furnished as required and recommended by the insulation manufacturer.

C. Diffusers, Registers and Grilles:
1. All diffusers, grilles, and registers shall be installed tight on their respective mounting surfaces and shall be accurately centered on ceiling tile, recesses, windows, or doors.

D. Ductwork:
1. All sheet metal work shall be done by qualified, experienced mechanics in accordance with the requirements of ASHRAE and the latest edition of the applicable SMACNA Manual. All ductwork shall be installed in a neat and orderly manner, and shall be adequately supported to prevent vibration or sagging. All sheet metal ductwork shall be sealed with United-Sheet Metal Duct Sealer or equal.

E. Air Conditioning Units:
1. Units shall be installed approximately where shown on the plans to provide access space for filter changing, motor, drive and bearing servicing, and fan shaft and coil removing. Pipe drain pan connection through a running trap to floor drain. Unit shall not be operated until filters are installed. Isolate sheet metal ducts from all fans with flexible connectors.

END OF SECTION 23 01 00
PART 1 – GENERAL

1.1 SCOPE

A. General:
1. The purpose of the mechanical start-up is to provide the owner of the facility with a high level of assurance that the mechanical system has been installed and operates per the requirements of the mechanical construction plans and specifications. The Mechanical General Provisions, Section 23 00 00, is to be included as a part of this section of the specifications.

B. Pre-start and Start-up checklist:
1. The contractor shall be responsible for the completion of pre-start and start-up checklist forms. These forms can usually be obtained from the equipment manufacturer. If the forms cannot be obtained from the manufacturer, forms may be the mechanical contractor’s in-house forms.

2. After completion of pre-start and start-up checklists, the contractor shall provide a copy of the pre-start and start-up checklist to the engineer for review and approval prior to substantial completion.

3. Approved Mechanical Equipment Start-up forms shall be included in the operations and maintenance manual.

PART 2 – START-UP PROCESS

2.1 RESPONSIBILITIES

A. Mechanical Contractor:
1. Coordinate with other trades involved in the installation of mechanical equipment to complete the requirements of mechanical start-up specifications.

2. Complete the pre-start and start-up checklist forms obtained from the equipment manufacturer.

3. Notify the mechanical engineer of tests to be witnessed. Contractor shall give the engineer a minimum of 48 hours’ notice prior to test.

B. Engineer:
1. Review the completed pre-start and start-up check lists provided by the mechanical contractor.

2. At final inspection, spot check items on the pre-start and start-up checklist forms to ensure that they have been completed.

2.2 EQUIPMENT PRE-START

A. Before starting any equipment or system, complete the system pre-start checklist forms. As part of the pre-start process, the following items shall be completed as applicable:
1. Piping systems shall be pressure tested as specified, found to be tight, with reports submitted.

2. Piping systems shall be flushed and cleaned as specified, all required reports submitted, and the system shall be filled or charged per plans.

3. Air system cleaning is complete and final filters shall be installed.

4. Vibration isolation and seismic restraints shall be installed per plans and specifications.
5. Equipment drives shall be aligned.
6. Electrical services shall be installed and checked.
7. Control points checkouts shall be completed.
8. Safety controls shall be installed and operation checked.
9. Manufacturer’s representatives have carried out major equipment start-up, and all checks shall be documented on the relevant checklists as they are carried out.
10. Equipment has been thoroughly cleaned (interior and exterior of units), of construction debris.
11. Deficiencies or incomplete work shall be corrected and pre-start shall be repeated until the installation is ready for operation.

2.3 EQUIPMENT START-UP

A. After the pre-start up process described in Section 2.2, complete the system start-up checklist and document findings with forms provided. As part of the Start-up process, the following items shall be completed as applicable:
   1. Air systems balanced as specified in plans and specifications.
   2. Problems revealed during balancing of air and water systems shall be corrected.
   3. All automatic temperature controls devices shall be calibrated, including adjustments to control valves and damper actuators.
   4. Set up or program controls for accurate response and precise sequencing to meet specified performance.
   5. The controls contractor and balancing contractor shall adjust and set air flows and calibrate controls of equipment as applicable.
   6. Ensure final adjustments to vibration isolation and seismic restraints are carried out per the manufacturer’s requirements.
   7. Check the operation of all fire dampers; smoke dampers and combination fire/smoke dampers.

B. Deficiencies or incomplete work shall be corrected, and the startup shall be repeated until correct installation and function has been confirmed and the installation is ready for engineer verification.

2.4 TRAINING AND INSTRUCTION

A. Once the substantial completion has been approved, the mechanical contractor shall provide the Owner and engineer with a training schedule for operation of the mechanical equipment and systems and their controls as listed in the specifications and plans. Reference Section 23 00 00 Mechanical General Provisions, “Project Closeout” of these specifications.

PART 3 – EXECUTION

A. The following systems and equipment shall be completed under the mechanical start-up plan as described above and documented with equipment pre-start and start-up forms provided.
   1. Roof Top Units
   2. Exhaust Fans / Destratification Fans
   3. Electric Heaters

B. Pre-start and start-up forms are to be provided to the engineer for final approval before substantial completion.

C. Approved forms shall be included in the operations and maintenance manual.

END OF SECTION 23 01 50
SECTION 23 08 00
HVAC COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes requirements for commissioning the HVAC system and its subsystems and equipment, including the Direct Digital Control system.
B. The registered design professional (or approved alternate) is responsible to provide evidence of mechanical systems commissioning and completion in accordance to the provisions of this section.
C. The commissioning of the building will be performed by the Owner. The specifications pertaining to commissioning are to provide the contractor information and guidance as to their work scope requirements in assisting and demonstrating to the Owner the functional performance of the mechanical and lighting systems.

1.3 DEFINITIONS

A. Architect: Includes Architect identified in the Contract for Construction between Owner and Contractor, plus consultant/design professionals responsible for design of HVAC, electrical, communications, controls for HVAC systems, and other related systems.
B. RDP: Registered Design Professional
C. Systems, Subsystems, and Equipment: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, and equipment.
D. TAB: Testing, Adjusting, and Balancing.

1.4 COMMISSIONING DOCUMENTATION

A. Commissioning Plan: A commissioning plan will be developed by a registered design professional or approved agency and shall include the following items:
1. A narrative description of the activities that will be accomplished during each phase of commissioning, including the personnel intended to accomplish each of the activities.
2. A listing of the specific equipment, appliances or systems to be tested and a description of the tests to be performed.
3. Functions to be tested, including, but not limited to calibrations and economizer controls.
4. Conditions under which the test will be performed. At a minimum, testing shall affirm winter and summer design conditions and full outside air conditions.
5. Measurable criteria for performance
B. Test Checklists: RDP, with assistance of Architect/Engineer, shall develop test checklists for each system, subsystem, or equipment including interfaces and interlocks, and include a separate entry, with space for comments, for each item to be tested. Prepare separate checklists for each mode of operation and provide space to indicate whether the mode under test responded as required. Provide space for testing personnel to sign off on each checklist.
1. Name and identification of tested item.
2. Test number.
3. Time and date of test.
4. Indication of whether the record is for a first test or retest following correction of a problem or issue.
5. Date of the test and name of parties involved as applicable.
6. Individuals present for test.
8. Note if re-test is necessary.

C. Test and Inspection Reports: RDP shall record test data, observations, and measurements on test checklists. Photographs, forms, and other means appropriate for the application shall be included with data. RDP shall compile test and inspection reports and tests and inspection certificates and include them in systems manual and commissioning report.

D. Corrective Action Documents: RDP shall document corrective action taken for systems and equipment that fail tests. Include required modifications to systems and equipment and revisions to test procedures, if any. Retest systems and equipment requiring corrective action and document retest results.

E. Issues Log: RDP shall prepare and maintain an issues log that describes design, installation, and performance issues that are at variance with the Contract Documents. Identify and track issues as they are encountered, documenting the status of unresolved and resolved issues.
   1. Creating an Issues Log Entry:
      a. Identify the issue with unique numeric or alphanumeric identifier by which the issue may be tracked.
      b. Assign a descriptive title of the issue.
      c. Identify date and time of the issue.
      d. Identify test number of test being performed at the time of the observation, if applicable, for cross-reference.
      e. Identify system, subsystem, and equipment to which the issue applies.
      f. Identify location of system, subsystem, and equipment.
      g. Include information that may be helpful in diagnosing or evaluating the issue.
      h. Note recommended corrective action.
      i. Identify commissioning team member responsible for corrective action.
      j. Identify expected date of correction.
      k. Identify person documenting the issue.
   2. Documenting Issue Resolution:
      a. Log date correction is completed or the issue is resolved.
      b. Describe corrective action or resolution taken. Include description of diagnostic steps taken to determine root cause of the issue, if any.
      c. Identify changes to the Contract Documents that may require action.
      d. State that correction was completed and system, subsystem, and equipment is ready for retest, if applicable.
      e. Identify person(s) who corrected or resolved the issue.
      f. Identify person(s) documenting the issue resolution.
   3. Issues Log Report: On a periodic basis, but not less than for each commissioning team meeting, RDP shall prepare a written narrative for review of outstanding issues and a status update of the issues log. As a minimum, RDP shall include the following information in the issues log and expand it in the narrative:
      a. Issue number and title.
      b. Date of the identification of the issue.
      c. Name of the commissioning team member assigned responsibility for resolution.
      d. Expected date of correction.

F. Commissioning Report: RDP shall document results of the commissioning process including unresolved issues and performance of systems, subsystems, and equipment. The
The commissioning report shall indicate whether systems, subsystems, and equipment have been completed and are performing according to the Contract Documents. The commissioning report shall include, but is not limited to, the following:

1. Lists and explanations of substitutions; compromises; variances in the Contract Documents; record of conditions; and, if appropriate, recommendations for resolution. This report shall be used to evaluate systems, subsystems, and equipment and shall serve as a future reference document during Owner occupancy and operation. It shall describe components and performance that exceed requirements of the Contract Documents. It may also include a recommendation for accepting or rejecting systems, subsystems, and equipment.

2. Commissioning plan.


4. Testing plans and reports.

5. Corrective modification documentation.

6. Issues log.

7. Completed test checklists.

8. Listing of off-season tests not performed and a schedule for their completion.

G. Systems Manual: RDP shall gather required information and compile systems manual. Systems manual shall include, but is not limited to, the following:

1. Submittal Data stating equipment size and selected options for each piece of equipment requiring maintenance.

2. Operation and maintenance data on each piece of equipment requiring maintenance. Required routine maintenance actions shall be clearly identified.

3. Name and address of at least one service agency.

4. HVAC controls system maintenance and calibration information.

5. A narrative of how each system is intended to operate, including recommended setpoints.

PART 2 – PRODUCTS – NOT USED.

PART 3 - EXECUTION

3.1 BALANCING

A. Scope:

1. Prior to final acceptance by the Owners, all air systems shall be balanced to deliver the quantities as specified or directed. The air balance shall be performed by an independent agency specializing in balancing and is certified by the National Environmental Balancing Bureau.

2. The Mechanical Contractor shall provide assistance to the Balancing Contractor by identifying all installed mechanical systems and assisting access to all installed mechanical systems. All mechanical systems shall be completely operational and functional prior to the Balancing Contractor performing his specified work.

B. Air balancing:

1. Balancing of the air system shall consist of:
   a. Adjust all air volumes to the quantities shown, with allowable variation of plus 10, minus 10 percent.
   b. Record all system, zone, diffuser, grille, and register C.F.M. Use volume control devices to regulate air quantities only to the extent that adjustments do not create objectionable air motion or sound levels. Balancing Engineer shall work with the Contractor to set minimum & maximum CFM quantities for zone dampers, or zone dampers/heaters.
   c. Test and record all system static pressures, inlet and discharge, on all packaged units, fans, and terminal units. Vary total system air quantities by
adjustment of fan speeds. Provide drive changes as necessary. Vary branch air quantities by damper regulation.

d. Test and record motor full load amps and nameplate amps.

e. Test and record entering and leaving temperatures at all coils.

f. Adjust all automatically operated dampers, in cooperation with the Control Contractor, to the required settings. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions within specified tolerances. Where modulating dampers or economizers are provided, take measurements at full return air, minimum outside air, and 100 percent outside air mode of operation.

g. Adjust diffusers and grilles for proper deflection, throw, and coverage. Eliminate drafts and excessive noise where possible.

h. Mark final positions of all balance dampers with a red felt pen.

i. Air systems shall be balanced in accordance with standard procedures and recognized practices of the Associated Air Balance Council, and the Testing Adjusting, and Balancing Bureau.

C. Quality Assurance:

1. The Balancing Contractor shall demonstrate to the Engineer of record, flow verification for at least 10% of the balanced devices as selected by the Engineer. If more than 25% of the tested devices do not meet the designed or balance report, then the entire system balance must be rebalanced.

D. Balance Reports:

1. Submit four copies of the air system balance report to the Architect/Engineer for evaluation and approval. Reports shall be on TABB/SMACNA forms that indicate information addressing each of the testing methods, readings, and adjustments.

3.2 TESTING

A. Test systems and intersystem performance after test checklists for systems, subsystems, and equipment have been approved.

B. Perform tests using design conditions whenever possible.

1. Simulate conditions by imposing an artificial load when it is not practical to test under design conditions and when written approval for simulated conditions is received from RDP. Before simulating conditions, calibrate testing instruments. Set and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions

2. Alter set points when simulating conditions is not practical and when written approval is received from RDP.

3. Alter sensor values with a signal generator when design or simulating conditions and altering set points are not practical. Do not use sensor to act as signal generator to simulate conditions or override values.

C. Scope of HVAC Subcontractor Testing.

1. Testing scope shall include entire HVAC installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. It shall include measuring capacities and effectiveness of operational and control functions.

2. Test all operating modes, interlocks, control responses, responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

D. Detailed Testing Procedures: RDP, with HVAC Subcontractor, TAB Subcontractor, and HVAC Instrumentation and Control Subcontractor, shall prepare detailed testing plans, procedures, and checklists for HVAC systems, subsystems, and equipment.

E. HVAC Instrumentation and Control System Testing.
1. Field testing plans and testing requirements are specified in Division 15 Sections "HVAC Instrumentation and Controls" and "Sequence of Operation." The CxA, HVAC Subcontractor, and the HVAC Instrumentation and Control Subcontractor shall collaborate to prepare testing plans.

2. CxA shall convene a meeting of appropriate entities to review test report of HVAC instrumentation and control systems.

F. Energy Supply System Testing: HVAC Subcontractor shall prepare a testing plan to verify performance of refrigerant systems and equipment. Plan shall include the following:

1. Sequence of testing and testing procedures for each equipment item and pipe section to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed to Drawings for each pipe sector showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in system testing plan.

2. Tracking checklist for managing and ensuring that all pipe sections have been tested.

G. Heat-Generation System Testing: HVAC Subcontractor shall prepare a testing plan to verify performance of auxiliary heating equipment. Plan shall include the following:

1. Sequence of testing and testing procedures for each item of equipment and section of heat strip to be tested, identified by identification marker. Markers shall be keyed to Drawings for each heating sector showing the physical location of each item of equipment and test section. Drawings shall be formatted to allow each item of equipment and section of heat strip to be physically located and identified when referred to in the system testing plan.

2. Tracking checklist for managing and ensuring that all heating sections have been tested.

H. Refrigeration System Testing: HVAC Subcontractor shall prepare a testing plan to verify performance of all condensing units, refrigerant compressors and condensers, heat pumps, and other refrigeration systems. Plan shall include the following:

1. Sequence of testing and testing procedures for each item of equipment and section of pipe to be tested, identified by identification marker. Markers shall be keyed to Drawings showing the physical location of each item of equipment and pipe test section. Drawings shall be formatted to allow each item of equipment and section of piping to be physically located and identified when referred to in the system testing plan.

2. Tracking checklist for managing and ensuring that all pipe sections have been tested.

I. HVAC Distribution System Testing: HVAC Subcontractor shall prepare a testing plan to verify performance of air, and refrigerant distribution systems; special exhaust; and other distribution systems. Include HVAC terminal equipment and unitary equipment. Plan shall include the following:

1. Sequence of testing and testing procedures for each item of equipment and section of pipe to be tested, identified by identification marker. Markers shall be keyed to Drawings showing the physical location of each item of equipment and pipe test section. Drawings shall be formatted to allow each item of equipment and section of piping to be physically located and identified when referred to in the system testing plan.

2. Tracking checklist for managing and ensuring that all pipe sections have been tested.

J. Deferred Testing:

1. If tests cannot be completed because of a deficiency outside the scope of the HVAC system, the deficiency shall be documented and reported to Owner. Deficiencies shall be resolved and corrected by appropriate parties and test rescheduled.
2. If the testing plan indicates specific seasonal testing, appropriate initial performance tests shall be completed and documented and additional tests scheduled.

END OF SECTION 23 08 00
PART 1 - SYSTEM OVERVIEW

1.1 DDC CONTROL SYSTEM

A. Statement of Intent:

1. The intent of this specification is to provide a high-quality Direct Digital Control system with Web based software front end and top-of-the-line control hardware. System is to include a Graphical User Interface (GUI) residing on a WebServer accessible with an industry standard non-proprietary WebBrowser. Connectivity shall be over the owner’s internal Ethernet system and, when allowed, over the Internet using the servers IP address. If connection to an Intranet or to the Internet is not available on initial installation the server shall be accessed via a web browser locally hosted on the server. The graphic user interface shall display real time values of all system operating conditions. Additionally, it shall include graphic displays of system programming, operating logic and logic flow. It shall be capable of displaying that logic flow with real time values of logical inputs and outputs. This graphical display capability is required for system diagnostics of both the mechanical systems controlled by the DDC system and of the operating logic and sequences themselves. The features of the system must be fully installed, configured and demonstrated in a manor that provides maximum benefit to the end user.

B. Specification Compliance:

1. These specifications are intended to provide a minimum capability for the DDC system. Manufacturer’s data sheets included in the submittals will be reviewed to verify significant hardware and software system features. Key system features must be documented by manufacturer’s data sheets in the submittals or by demonstration of an existing installation.

Approved DDC Contractor and System

DDC Control shall be located within 2-hours of project.

BASE BID: Automated Logic WebCTRL by Clima-Tech Corporation

1.2 SCOPE OF WORK

A. Control Hardware and Software

1. Automatic Temperature Control Contractor shall be responsible to furnish and install all control hardware and software necessary for complete DDC control system as specified. ATC contractor shall furnish all modules, temperature sensors, flow sensors, humidity sensors, IAQ sensors, control valves, control valve actuators, dampers, damper actuators and any other items necessary for a complete system and sequence of control, except those valves, dampers and actuators specified to be furnished by equipment supplier. When actuators are specified to be furnished by equipment supplier, that supplier shall be responsible for coordination of actuator control input for interface with DDC system without use of transducers. Automatic control valves, dry wells for fluid temperature sensors, dampers and actuators shall be installed by Mechanical Contractors.

The controls contractor shall also note that all lighting control system shall be included in their scope of work. Specifically, specification sections 26 08 00 and 26 09 23 shall be included in the controls contractor’s scope of work.
requirements. In general, the controls contractor shall be responsible to furnish and install all required lighting control panels, electrical contractor shall provide and install all line voltage systems, and the controls contractor shall be required to provide and install all low voltage systems. Finally, the controls contractor shall

Specifically, the ATC Contractor shall furnish the following:

Individual unitary control modules for each unitary system:
   Rooftop Units
Individual control modules for all non unitary air handlers or package units:
   None
Required peripheral mechanical components to be furnished by ATC contractor:
   Economizer damper actuators not specified as part of mechanical equipment

Required non HVAC controls to be furnished by ATC contractor:
   Lighting Control System

B. Control Wiring and Interface to Line Voltage Control
   1. ATC Contractor shall be responsible for all conduit and back boxes unless indicated on the electrical drawings for Electrical Contractor to provide and install. ATC Contractor shall be responsible for control wiring to all control modules, sensors, pilot duty control relays and actuators required to provide sequences of operation as noted in Part 5. ATC contractor shall provide control interface to rooftop units, heat recovery units, fans, and lighting control systems. This shall include pilot duty relays where interface to line voltage switching devices is required. ATC Contractor shall provide all conduit within mechanical room or at equipment locations unless specifically shown on Division 26 drawings. Electrical Contractor shall provide all required contactors, magnetic starters and motor control centers required for operation of mechanical systems except where specifically noted to be provided by equipment manufacturer. The Electrical Contractor shall also be responsible for line voltage connection to ATC panels, including lighting control panels. Unitary equipment will be supplied with required fan relays, compressor contactors, electric heat sequencers and transformer ready for connection to control modules.
   2. Control Integration with Third Party Digital Controls Supplied by Others
   The following paragraphs define the scope of responsibility for those projects where integration with third party digital controls is required by this specification or sequences of operation:
   Automatic Temperature Contractor shall be responsible for all programming of controls furnished by them to accomplish the required integration. ATC shall provide necessary hardware to maintain these programs. Local area network wiring required for connection to interface hardware provided under the ATC project scope is the responsibility of the Controls Contractor. If Ethernet connection to third party controls is required, that network connection shall be the responsibility of the owner.

Suppliers of equipment that is required to be integrated with the DDC system shall be responsible to coordinate integration software protocol and connectivity with Controls Contractor(s) prior to bid to insure satisfactory integration and system operation. Equipment suppliers are required to confirm that their factory installed controls are capable of achieving sequences of operation listed under this section
and that required points are available to the DDC system. If specified sequences can not be met with factory installed controls the equipment supplier shall be responsible to furnish and install required external controls or peripheral devices. Any required communication wiring between digital control devices provided by equipment suppliers shall be the responsibility of that supplier. This may be under separate agreement with the Controls Contractor.

Equipment suppliers shall provide complete points list including Usage Description, Addresses and Device ID numbers, and network number if applicable.

Acceptable protocols:
Variable Frequency Drives, lighting systems or power monitoring systems shall use either Modbus or BACnet software protocols for integration to this DDC system.

All other systems shall use BACnet software protocol for integration to this DDC system.

C. Commissioning
1. ATC Contractor shall be responsible for self-commissioning of all hardware and software furnished with the project, and specifically as noted in specification section 26 08 00. Completed field commissioning sheets shall be included with the final “as-built” O&M manuals. These sheets shall include validation check fields for all physical and LAN inputs and outputs and graphics for each operating unit or system within the facility. Each system and point shall be listed, using logical names for future reference by the owner. Commissioning shall include calibration and verification of operation of each I/O and graphic field. Functional commissioning of software programming to meet sequences of operation as submitted and approved shall be verified on the field commissioning sheets.

D. Training and Technical Support
1. Contractor shall provide 8 hours of training to owner representatives on operation and servicing of automatic temperature control system. Training shall be oriented to making the owner self sufficient in the day to day use and operation of the DDC system. Additionally, the training shall include information specifically focused on showing the owners representative methods of troubleshooting the mechanical systems using the DDC system. For this purpose, the trainer must be well grounded in both DDC system operation and in mechanical systems service.

The contractor shall provide unlimited phone technical support to the owner’s representative during the one year warranty period. If the technical support location of the contractor is outside of the toll free calling area for the customer, the contractor shall have a toll free number or accept collect calls for the purpose of providing technical support.

1.3 SUBMITTALS AND O&M MANUALS

A. Submittals:
Submittals shall include the following sections:
Shop Drawings with:
Title Page
Table of Contents
Typical Device Wiring Drawings
Summary Bill of Materials
Sequences of Operation
Local Area Network Drawings
Drawings for all operating systems showing both equipment and module connections
(Note: drawings for individual operating systems shall include individual Bills of Materials)
Manufacturer’s specification data sheets for all control modules, sensors, dampers, valves, actuators, flow switches, current sensors and transducers required in the project.

If the contractor wishes to substitute any item after approval of submittal they shall submit appropriate data sheets for approval before including substituted product on the project.

B. O&M Manuals
1. O&M Manuals shall be furnished upon project completion and include technical instructions for all items originally included in the submittal with “as built” modifications and completed Commissioning Worksheets. O&M Manuals shall be in a separate three ring binder. Contractor’s toll free technical support number or the words “Call Collect” with the contractor’s regular phone number shall be on the front of the manual.

1.4 SYSTEM SOFTWARE

A. System Software
1. All operating program and site specific software shall be furnished to the owner on 3½” diskettes or CD ROM disks.

PART 2 - CONTRACTOR CAPABILITY

A. Contractor shall maintain toll-free technical support phone line or accept collect phone calls during warranty period.
B. Contractor shall provide service within 24 hours.
C. Contractor service and installation technicians shall be technically proficient in both control systems and mechanical service.

PART 3 - PRODUCT CAPABILITY – HARDWARE

3.1 SYSTEM SERVER

A. ATC Contractor shall provide seamless integration to the existing Automated Logic front end server.

3.2 FIELD HARDWARE

A. BACnet Compatibility
1. The system shall be fully native BACnet at the time of installation. The system shall use BACnet as the native communication protocol between distributed controllers communicating on the controller network (i.e. Field Bus) and must, as a minimum, support the following Objects and Application Services (Conformance Class 3):

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<tr>
<th>Objects</th>
<th>Binary Input</th>
<th>Binary Output</th>
<th>Binary Value</th>
<th>Analog Input</th>
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<td>Services</td>
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<td>Writeproperty</td>
<td>I-Am</td>
<td>I-Have</td>
<td>ReadMultiple Property</td>
<td>WriteMultiple Property</td>
<td>Who-Has</td>
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</table>
B. Distributed Control
1. System shall observe the concept of distributed control. All modules shall have “stand alone” capability and shall maintain operator setpoints without connection to primary controllers or central station equipment. Modules shall be located at each operating equipment location such that individual systems or zones shall remain functional without communication to other systems on the network. Equipment operating logic, schedules and current trends shall reside in control modules serving each system. Use of global modules required to maintain programming, schedules or current trend data are not acceptable.

C. Ethernet Gateway Routers
1. System shall include an Ethernet Router/Gateways between the control module network and owners Ethernet. This gateway shall route BACnet communications between the control module network and the owners IP network. If the system is not to be connected to customer Ethernet the gateway shall be capable of connection via a web browser on the local host server.

D. Control Modules
1. Control modules shall include required inputs and outputs to meet sequence of operation and points list. Digital outputs shall be dry contact relays and analog outputs shall be industry standard 0-10 vdc, 2-10 vdc or 4-20 milli-amp. Triac digital outputs are not acceptable. Modules shall be fully programmable for maximum system flexibility.
2. All modules shall have battery backup capable of maintaining all programs, setpoints, schedules and trend information for a minimum of 7 days.
3. All schedules and current trends shall be maintained in the individual control modules. The modules shall be capable of maintaining sufficient trend samples to report 24 hours of trend history in 5 minute increments for each input or output.

E. Temperature Sensors
1. Wall mounted zone temperature sensors shall be 10 k ohm thermistor. Zone sensors in primary occupied areas other than restrooms, hallways or storage rooms shall have setpoint adjustment to allow the occupants to raise or lower setpoint within operator defined parameters. Additionally, sensors in these primary areas shall have a push button to return the system to normal occupancy setpoints for an operator defined period. Exception will be common areas. Zone sensors for restrooms, hallways, storage rooms, gymnasiums, auditoriums and locker rooms shall be mounted on the back of an aluminum electrical box cover plate designed for zone sensing application. Gymnasium sensors shall also include a key access override feature.
2. All other temperature sensors shall be industry standard thermistor or 4-20 milli-amp. Immersion sensors shall be mounted in a blind well for future serviceability.

F. Valve and Damper Actuators
1. Actuators shall be manufactured by Belimo. Torque shall be rated for required load. Modulated actuator input shall be industry standard 0-10 vdc, 2-10 vdc, 4-20 milli-amp, floating motor (tri-state), or pulse width modulation. Two or three position operation is not acceptable for economizers, VAV dampers, multizone dampers, valves or any other application specifying modulated operation.

G. Dampers
1. Outside air control dampers shall have neoprene or vinyl-grip blade seals, stainless spring steel edge seals and a specified leakage rate of not more than 65 CFM/damper face area at 2” W.G. static pressure drop.
H. Wire
1. All wiring in open areas at heights below 12 feet must be run in conduit, otherwise control wiring may be run open in accessible ceiling or underfloor areas. Control wiring in non-accessible ceilings, walls or floors shall be in conduit. All wiring not in conduit or control cabinets shall be rated for plenum installation. Communication wiring shall be run in data cable tray whenever possible.

PART 4 - PRODUCT CAPABILITY - SOFTWARE

4.1 BACnet COMPATIBILITY
A. The system shall be fully native BACnet at the time of installation. This means that the system must use BACnet as the native communication protocol between distributed controllers communicating on the controller network (i.e. Field Bus) and must, as a minimum, support the following Objects and Application Services (Conformance Class 3):

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Programming for the system shall use BACnet objects and services. All BACnet objects and services shall be opened for read and/or read/write access during programming for future exposure to other BACnet systems. The front end software for the system shall be able to query other third party BACnet points for read/write access.

4.2 MULTIPLE OPERATING PLATFORMS
A. The front end server software furnished as a part of the DDC system shall be capable of operating on multiple operating systems such as Microsoft Windows, Linux or Sun Solaris.

4.3 GRAPHICAL PROGRAMMING
A. The system shall be programmed using a graphical programming language for ease of operator understanding. Operating sequences and logic flow shall be assembled in a schematic format using MicroBlocks representing inputs, outputs and logical functions such as setpoints, switches, limits, relays, PIDs etc. The programming software shall be furnished within this scope of work.
B. Full simulation capability shall also be provided with the graphic programming. User shall be able to fully simulate the constructed sequence on screen before the sequences are downloaded into the controllers. The system shall also include the ability to simulate multiple graphic programs communicating with each other on a simulated network.

4.4 GRAPHICAL INTERFACE SOFTWARE
A. System and Equipment Graphic User Interface
1. The operators interface software shall be graphics based and display in 256 colors at a minimum 1024x768 pixel resolution. Graphics display screens shall include a system level graphic of either a map of facilities or an elevation of the building, a
graphic of each building floor plan and graphics for each operating system or unit within each building. Entry to the zone and equipment level interface graphics shall be through area maps and/or floor plans to facilitate user orientation. Additionally the system hierarchy shall be displayed in a fashion similar to Windows Explorer to enable the user to navigate to any graphical screen in the system by expanding building levels or floor levels and selecting a particular zone or system. Graphics shall be accessed by using a mouse or other pointer device. The system shall provide a visual indication of which building, floor and zone the user is accessing at any time. System shall be capable of changing all parameters and schedules, as well as downloading operating software from the same Graphical User Interface software program as that used for viewing system operation.

2. Thermal graphic floor plans shall display each temperature zone in a color appropriate to current space temperature conditions. The system shall display in 8 separate colors the following conditions: High or low temperature alarm, temperature at setpoint, cooling call, heating call, more than 2° above setpoint, more than 2° below setpoint, unoccupied between setpoints and no communication. Floor plans shall also include color graphic indicators for non-zone specific mechanical equipment operation showing On/Off and Alarm Conditions. Status indication colors shall be updated dynamically as conditions change.

3. Mechanical equipment pictorial graphics shall be displayed by the use of point-and-shoot selection using a mouse or other pointer device. Graphics shall be provided for all mechanical equipment and devices controlled by the DDC system. These graphics shall provide a current status of all I/O points being controlled and applicable to each piece of equipment including analog readouts in appropriate engineering units at appropriate locations on the graphic representation.

B. Software Graphic Programming Live User Interface

1. The system shall be able to display the graphic displays of system programming, operating logic and logic flow with real time conditions displayed at each input, output and logical function. This display will allow the operator to observe each step of a control logic process and facilitate system software troubleshooting. Operator shall have the ability to select any MicroBlock in the graphical program to change parameters including the ability to lock values.

4.5 FACILITY MANAGEMENT AND ENERGY MANAGEMENT FUNCTIONS

A. Scheduling

1. The DDC system shall have the ability to schedule each individual zone, each building or floor or the entire network of buildings for any user with a single entry. Additionally, the operator shall have the capability of assembling groups of zones, buildings or floors for single entry programming, e.g. several offices may be grouped for scheduling of Saturday operations. Available schedule types shall include normal operation, unoccupied operation, setback override and holidays. For maximum flexibility, schedules shall reside in the local control modules. Dated schedules shall be self managing and automatically delete after execution.

B. Demand Control

1. The system shall have the ability to receive an analog or digital input of electrical usage/demand through any open input on a general-purpose module. This capability shall be provided without additional hardware except the single input point and digital or analog devices required to read electrical demand levels.

2. Demand control shall be achieved by adjusting zone temperature setpoints as electrical demand thresholds are reached. Zone setpoint offset shall be individually adjustable to allow prioritization of zone comfort conditions. Multiple demand level threshold parameters shall be available to allow more aggressive control as building
demand rises. Additionally the demand control strategy shall automatically adjust the demand level thresholds based on ambient temperature to meet peak space conditioning requirements and minimize peak demand during mild temperature months.

3. The system will be capable of rotating greater or lower demand levels every 10 minutes to alternate zones throughout the facility to minimize long term setpoint offset.

C. Interactive Operations

1. The system shall have the ability to send run requests, heating requests and cooling requests from one module to another for the purpose of optimizing run operations of central plant equipment. Additionally the system shall be capable of limiting operation of various equipment if another mechanical point elsewhere in the system allows that operation. e.g. a boiler loop circulating pump shall run only when requested by a zone requiring heating operation and will shut down during hours that zone demand is satisfied.

4.6 ALARMS, TRENDS AND REPORTS

A. System and Temperature Alarms

1. The system shall have the capability of monitoring conditions throughout the system and sending alarms or messages to an e-mail address, local PC or printer or to remote PC’s, printers or to dial-up pagers. Alarms and messages shall be able to be prioritized for various levels of reporting and action. The operator shall have the ability to customize alarm text and messages.

B. Trends

1. The system shall be capable of trending any input or output, or any logical point within the graphic program. There shall be no limitation to the number of points that can be trended at any particular time. Modules shall store in live memory 288 trend samples points for each trended item. The interval between trend samples shall be adjustable from 1 second to 24 hours. Trends from one or more modules shall be able to be simultaneously displayed on a single trend graph. Operator shall be able to “window” any segment of a trend to enlarge the view by dragging a mouse to form the “window”. The system shall also have the ability of automatically downloading trend information from any module to the server or other computer connected to the network for historical trend storage. This trend information shall be able to be displayed on the trend graph along with live current trends in seamless fashion. Trend data collection requiring the use of a locally connected PC for data storage is unacceptable.

C. Reports

1. The system shall be capable of generating reports of equipment run times, all trended points, temperature conditions, electric demand and usage and alarms or messages. The system shall also have the ability of automatically downloading report information from any module to the server or other computer connected to the network. The operator shall have the ability to create custom report and logging formats.

PART 5 - SEQUENCES OF OPERATION

5.1 GENERAL

A. The following sequences of operation shall be strictly observed. All temperature setpoints, static pressure setpoints, percentage of PID output trip points and reset ratios within this
specification shall be changeable by operator using the operator software furnished with the system.

5.2 DISTRIBUTED CONTROL

System shall observe the concept of distributed control. Modules shall be located at each operating equipment location such that individual systems or zones shall remain functional without communication to other systems on the network.

A. Central Plant, Pump and Fan Operation
   1. Control of all central fan systems and rooftop units shall be based on run requests, heating requests or cooling requests from zone controls. Reset of supply air static pressure, supply air temperature, chilled water temperature and hot water temperature shall be based on zone temperature conditions and heating or cooling requests from zones.

B. Scheduling
   1. For maximum flexibility all occupancy schedules shall be stored in zone control modules. Central fans or pumps shall start when commanded from any associated zones that call for occupancy or for operation to meet setback heating or cooling requirements and shall not require separate scheduling unless required for the sequence of operation. Fans or pumps shall run for minimum of 30 minutes.

5.3 EQUIPMENT OPERATING SEQUENCES

A. See plans for schematics and sequences.

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PART 1 – GENERAL

1.1 CONDITIONS AND REQUIREMENTS

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

B. Provisions of this Section shall apply to all Sections of Division 26.

1.2 SCOPE OF WORK

A. Furnish and install all materials and equipment and provide all labor required and necessary to complete the work shown on the drawings and/or specified in all Sections of Division 26, 27, and 28 and all other work and miscellaneous items, not specifically mentioned, but reasonably inferred for a complete installation, including all accessories required for testing the system. It is the intent of the drawings and specifications that all systems be complete and ready for operation.

1.3 CODE COMPLIANCE

A. All work and materials shall comply with the latest rules, codes and regulations, including, but not limited to, the following:
   1. Occupational Safety and Health Act Standards (OSHA)
   2. NFPA #70 – National Electric Code (NEC)
   3. ADA Standards – Americans with Disabilities Act
   5. NECA – Standard of Installation
   7. International Fire Code
   9. NFPA #72 – Fire Code
   11. All other applicable Federal, State and local laws and regulations.

B. Work to be executed and inspected in accordance with local codes and ordinances. Permits, fees or charges for inspection or other services shall be paid for by the contractor. Local codes and ordinances are to be considered as minimum requirements and must be properly executed without expense to the owner; but do not relieve the contractor from work shown that exceeds minimum requirements.

1.4 CONDITIONS AT SITE

A. Visit to site is recommended of all bidders prior to submission of bid. All will be held to have familiarized themselves with all discernible conditions and no extra payment will be allowed for work required because of these conditions, whether specifically mentioned or not.

B. Lines of other service that are damaged as a result of this work shall be promptly repaired at no expense to the owner to the complete satisfaction of the owner.

1.5 DRAWINGS AND SPECIFICATIONS

A. All drawings and all specifications shall be considered as a whole and work of this Division shown anywhere therein shall be furnished under this Division.
B. Drawings are diagrammatic and indicate the general arrangement of equipment and wiring. Most direct routing of conduits and wiring is not assured. Exact requirements shall be governed by architectural, structural and mechanical conditions of the job. Consult all other drawings in preparation of the bid. Extra lengths of wiring or addition of pull or junction boxes, etc., necessitated by such conditions shall be included in the bid. Check all information and report any apparent discrepancies before submitting bid.

C. Change to location, type, function, brand name, finish, etc., shall not be made without permission of engineer.

D. Some equipment is specifically designated on the drawings. It is not the intent to sole source any item unless explicitly stated. Items have been specified based upon design requirements. All bidders are encouraged to submit products for approval. Prior approval must be obtained as required by these contract documents. Bids submitted with non-approved items will be considered invalid and bidders will be held to provide approved materials at no additional cost to the owner. Submittals received by the engineer after award of contract on non-approved equipment will not be reviewed nor will they be returned.

E. Where conflicting direction is given within the specifications and drawings, the contractor shall include the most expensive option in the bid.

1.6 SAFETY AND INDEMNITY

A. Safety: The contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal working hours.

B. No act, service, drawing review or construction review by the owner is intended to include review of the adequacy of the contractor’s safety measures in, on, or near the construction site.

1.7 CONSTRUCTION OBSERVATION BY THE ENGINEER

A. Prior to covering: any major portion of the materials installed under this section, notify the engineer so that an observation can be made. Notification shall be made at least three (3) working days in advance of the date the items will be covered.

1.8 INSTRUCTION OF OWNER’S PERSONNEL

A. The contractor shall conduct an on-site instructional tour of the entire project. The personnel designated by the owner shall be instructed in: operation of all electrical systems, trouble-shooting procedures, preventative maintenance procedures, uses of Operation and Maintenance manuals, cleaning of lighting fixtures and operation of all special systems.

B. Contractor will include in his bid 4 hours of instruction time to be held at the project location after substantial completion for instruction of owner’s personnel. Coordinate time and number of owner personnel to be present and provide schedule to engineer.

1.9 PROJECT COMPLETION

A. Upon completion of all work and operational checks on all systems, the contractor shall request that a final construction observation be performed.

B. The engineer shall compile a punch list of items to be completed or corrected. The contractor shall notify the engineer upon completion of the items.

1.10 GUARANTEE

A. All work under this section shall be guaranteed in writing to be free of defective work, materials, or parts for a period of one (1) year, except lamps which shall be guaranteed for ninety (90) days,
after final acceptance of the work under this contract or the period indicated under the Division 1 specifications whichever is longer.

B. Repair, revision or replacement of any and all defects, failure or inoperativeness shall be done by the contractor at no cost to the owner.

PART 2 – PRODUCTS

2.1 MATERIAL APPROVAL

A. The design, manufacturer and testing of electrical equipment and materials shall conform to or exceed latest applicable NEMA, IEEE or ANSI standards.

B. All materials must be new, unless noted otherwise, and UL listed. Materials that are not covered by UL testing standards shall be tested and approved by an independent testing laboratory or a governmental agency, which laboratory shall be acceptable to the owner and code enforcing agency.

2.2 SHOP DRAWINGS AND MATERIALS LIST

A. Submit shop drawings and materials lists as specified for review. Seven (7) copies, unless noted otherwise under Division 1, of submittals shall be presented to the architect/engineer.

2.3 OPERATION AND MAINTENANCE MANUALS

A. Submit the Operation and Maintenance Manuals of all Division 26, 27, and 28 equipment to architect/engineer per division 1 requirements.

2.4 RECORD DRAWINGS

A. Submit record drawings to owner.

2.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle materials in a manner to prevent damage.

B. Protect equipment from weather and dampness.

PART 3 – EXECUTION

3.1 WORKMANSHIP AND CONTRACTOR’S QUALIFICATIONS

A. Only quality workmanship will be accepted. Haphazard or poor installation practice will be cause for rejection of work.

B. Provide experienced foreman with a minimum of three years’ experience working on this type of building placed in charge of this work at all times.

3.2 COORDINATION

A. Coordinate work with other trades to avoid conflict and to provide correct rough-in and connection for equipment furnished under trades that require electrical connections. Inform contractors of other trades of the required access to and clearances around electrical equipment to maintain serviceability and code compliance.

B. Verify equipment dimensions and requirements with provisions specified under this Section. Check actual job conditions before fabricating work. Report necessary changes in time to prevent needless work. Changes or additions subject to additional compensation, which are made without the authorization of the owner, shall be at contractor’s risk and expense.
3.3 MANUFACTURER’S INSTRUCTIONS

A. All installations are to be made in accordance with manufacturer’s recommendations. A copy of such recommendations shall at all times be kept in the job superintendent’s office and shall be available to the engineer.

B. Follow manufacturer’s instructions where they cover points not specifically indicated on drawings and specifications. If they are in conflict with the drawings and specifications obtain clarification from the engineer before starting work.

3.4 QUALITY ASSURANCE

A. The contractor shall insure that all workmanship, all materials employed, all required equipment and the manner and method of installation conforms to accepted construction and engineering practices, and that each piece of equipment is in satisfactory working condition to satisfactorily perform its functional operation.

B. Provide quality assurance tests and operational check on all components of the electrical distribution system, all lighting fixtures, and special systems.

3.5 CUTTING AND PATCHING

A. Perform all cutting and fittings required for work of this section in rough construction of the building.

B. All patching of finished construction of building shall be performed under the sections of specifications covering these materials.

C. No joists, beams, girders or columns shall be cut by any contractor without obtaining written permission from the architect/engineer.

END OF SECTION 26 05 00
PART 1 – GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.3 SUBMITTALS
A. Submit shop drawings and product data.

1.4 COORDINATION
A. Coordinate layout and installation of cables with other installations.
B. Revise locations and elevations from those indicated, as required to suit field conditions and as approved by the owner.

PART 2 – PRODUCTS

2.1 BUILDING WIRES AND CABLES
A. Conductors: Stranded, copper, 600-volt insulation, type THHN/THWN, THHN/THWN-2, XHHN/XHHW.
B. Conductors:
   1. Solid or stranded for No. 10 and smaller, stranded for No. 8 and larger, copper, 600-volt insulation, type THHN/THWN. Aluminum conductors not allowed unless noted otherwise.
   2. Insulation Types: THWN-2 for underground, THWN for wet locations, THHN for dry locations; XHHN/XHHW for GFI branch circuits and feeders fed from GFCI breakers.
C. Color-code 208/120-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
   1. Phase A: Black.
   2. Phase B: Red.
   3. Phase C: Blue.
   5. Ground: Green.
D. Color-code 480/277-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
   1. Phase A: Brown.
   2. Phase B: Orange.
   3. Phase C: Yellow.
   5. Ground: Green.
E. Wire connectors and splices: units of size, ampacity rating, material, type and class suitable for service indicated.

F. Signal and communication circuits:
   1. Special cables as indicated on the drawings.
   2. Conductors for general use: stranded copper conductor, #16 AWG minimum, with THWN-2 insulation for underground, THWN for wet locations and THHN insulation for dry locations.

PART 3 – EXECUTION

3.1 GENERAL WIRING METHODS

A. Examine raceways and building finishes to receive wires and cables for compliance with requirements for installation tolerances and other conditions affecting performance of wires and cables. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Use no wire smaller than #12 AWG for power and lighting circuits and no smaller than #18 AWG for control wiring.

C. The contractor is responsible for upsizing conductor sizes to ensure the maximum voltage drop of any branch circuit does not exceed 3%. For reference, use No. 10 AWG conductor for 20 Amp, 120-volt branch circuits longer than 75 feet, and for 20 Amp, 277-volt branch circuits longer than 200 feet.

D. Place an equal number of conductors for each phase of a circuit in the same raceway or conduit.

E. Splice only in junction or outlet boxes.

F. Neatly train or lace wiring inside boxes, equipment, and panelboards.

G. Make conductor lengths for parallel circuits equal.

H. Provide a separate neutral conductor for each ungrounded conductor. Ungrounded conductors may share a neutral when all of the following conditions are met:
   1. The ungrounded conductors are connected to a multi-pole breaker or breakers that are clipped together with a UL listed means that provide a common trip.
   2. The ungrounded conductors contained in the same conduit or raceway.
   3. The ungrounded conductors all originate from a separate and unique phase bus in the panel.

3.2 INSTALLATION

A. Install wires and cables as indicated, according to manufacturer's written instructions, and the "National Electrical Installation Standards" by NECA.

B. Remove existing wires from raceway before pulling in new wires and cables.

C. Pull Conductors: Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means; including fish tape, cable, rope, and basket weave wire/cable grips that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

F. Support cables above accessible ceilings; do not rest on ceiling tiles. Do not fasten cables to ceiling support wires. Use cable ties to support cables from structure.

3.3 CONNECTIONS

A. Conductor Splices: Keep to minimum.

B. Install splices and tapes that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.
C. Use splice and tap connectors compatible with conductor material.
D. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.
E. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer.
F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.
G. Terminate spare conductors with electrical tape.

3.4 LABELING
A. Provide Brady wire markers or equivalent on all conductors. All wire shall be labeled in each box and panel with the circuit number and panel identification.

3.5 FIELD QUALITY CONTROL
A. Inspect wire and cable for physical damage.
B. Perform continuity testing on all power and equipment branch circuit conductors. Verify proper phasing connections.

END OF SECTION 26 05 19
SECTION 26 05 26

GROUNDING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Fixed Price Construction Contract and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.3 SYSTEM DESCRIPTION

A. Ground the electrical service system neutral at service entrance equipment to concrete encased electrode, metal underground water pipe, and effectively grounded metal frame of building.

B. Ground each separately-derived system neutral to nearest effectively grounded metal structural frame of building or point of service entrance ground.

C. Provide communications system grounding conductor to point of service entrance ground.

D. Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductors in raceways and cables, receptacle ground connectors, and plumbing systems.

PART 2 – PRODUCTS

2.1 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Section 26 05 19 - Conductors and Cables.

B. Material: Copper.

C. Equipment Grounding Conductors: Insulated with green-colored insulation. Where green insulation is not available, on larger sizes, black insulation shall be used and suitably identified with green tape at each junction box or device enclosure.

D. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

E. Bare Copper Conductors: Medium hard drawn copper conductor, stranded, sized as shown on the drawings.

F. Hardware: Bolts, nuts and washers shall be bronze; cadmium plated steel or other non-corrosive material, approved for the purpose.

2.2 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.

PART 3 – EXECUTION

3.1 APPLICATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
B. In raceways, use insulated equipment grounding conductors.
C. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

3.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NEC Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NEC are indicated.
B. Install equipment grounding conductors in all feeders and circuits.
C. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by NEC:
   1. Feeders and branch circuits.
   2. Lighting circuits.
   3. Receptacle circuits.
   5. Three-phase motor and appliance branch circuits.
   6. Flexible raceway runs.
D. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.
E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
F. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways bonded to outlet or equipment, sized per Section 250 of the NEC.
G. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
   2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
B. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

3.4 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
   1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
   2. Make connections with clean, bare metal at points of contact.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

C. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer’s published torque-tightening values.

F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

3.5 SYSTEM NEUTRAL GROUND

A. Ground the neutral conductor of each transformer or generator to limit the maximum potential above ground due to normal operating voltage and limit the voltage level due to abnormal conditions.

B. Ground generators or transformers with secondary voltage 600 volt or less as follows:
   1. 3-phase, 4-wire Wye connected: ground neutral point

C. For transformers 75 kVA or smaller with primary voltage 480 volt or less the primary equipment ground conductor may be used for grounding the secondary neutral provided it is adequately sized in accordance with NEC system ground conductor size.

3.6 EQUIPMENT GROUND

A. Ground non-current carrying metal parts of electrical equipment enclosures, frames, conductor raceways or cable trays to provide a low impedance path for line-to-ground fault current and to bond all non-current carrying metal parts together. Install a grounding conductor in each raceway system. Equipment grounding conductor shall be electrically and mechanically continuous from the electrical circuit source to the equipment to be grounded. Size grounding conductors per NEC 250 unless otherwise shown on the drawings.

B. Install metal raceway couplings, fittings, and terminations secure and tight to ensure good grounding continuity. Provide grounding conductor sized per NEC through all raceway and conduit systems.

C. Lighting fixtures shall be securely connected to equipment grounding conductors. Outdoor lighting standards shall have a factory installed ground lug for terminating the grounding conductor.

D. Motors shall be connected to equipment ground conductors with a bolted solderless lug connection on the metal frame.

3.7 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

END OF SECTION 26 05 26
SECTION 26 05 29

SUPPORTING DEVICES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.

1.2 WORK INCLUDED

A. Conduit and equipment supports.
B. Fastening hardware.

1.3 COORDINATION

A. Coordinate size, shape and location of concrete pads with Division 03.

1.4 QUALITY ASSURANCE

A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 – PRODUCTS

2.1 MATERIAL

A. Support Channel: Galvanized or painted steel.
B. Hardware: Corrosion resistant.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors or beam clamps. Do not use spring steel clips and clamps.
B. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.
C. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.
D. Do not use powder-actuated anchors.
E. Do not drill structural steel members.
F. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
G. In wet locations install free-standing electrical equipment on concrete pads.
H. Install surface-mounted cabinets and panelboards with minimum of four anchors.
I. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.
J. All supports and attachments shall meet project seismic zone requirements.

END OF SECTION 26 05 29
SECTION 26 05 33

RACEWAYS AND BOXES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.
B. FMC: Flexible metal conduit.
C. IMC: Intermediate metal conduit.
D. LFMC: Liquidtight flexible metal conduit.
E. RMC: Rigid metal conduit.
F. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.5 COORDINATION

A. Coordinate layout and installation of raceways and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

PART 2 – PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1.
B. IMC: ANSI C80.6.
C. PVC coated Steel Conduit and Fittings: NEMA RN 1; rigid steel conduit with external 40 mil PVC coating and internal two mil urethane coating.
D. EMT and Fittings: ANSI C80.3. Fittings: Set-screw type.
E. FMC: Zinc-coated steel.
F. LFMC: Flexible steel conduit with PVC jacket. Fittings: NEMA FB 1; compatible with conduit/tubing materials.

2.2 NONMETALLIC CONDUIT AND TUBING

A. RNC: NEMA TC 2, Schedule 40 PVC. Fittings: NEMA TC 3; match to conduit and material.

2.3 METAL WIREWAYS

A. Material: Sheet metal sized and shaped as indicated.
2.4 OUTLET AND DEVICE BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
B. Cast-Metal Boxes: NEMA FB 1, Type FD, cast box with gasketed cover.

2.5 FLOOR BOXES

A. Floor Boxes: Cast metal, fully adjustable, rectangular, unless otherwise specified.

2.6 PULL AND JUNCTION BOXES

A. Small Sheet Metal Boxes: NEMA OS 1, galvanized steel.
B. Cast-Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.

2.7 ENCLOSURES AND CABINETS

A. Hinged-Cover Enclosures: NEMA 250, Type 1, 3R, or 4, with continuous hinge cover and flush latch, key operable.
   1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
B. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage, and include accessory feet where required for freestanding equipment.

2.8 J-HOOKS

A. J-hooks: Steel, rated for indoor use in non-corrosive environments. J-hooks shall be rated to support Category 5e cable.
B. Fittings and Support Bodies: Manufacturer’s recommended fittings including side mount flange clips, bottom mount flange clips, beam clamp, rod and flange clip, C & Z purlin clip, and all other components and assemblies to make the system work.
C. Acceptable Product: Caddy CableCat Hanging System, 1-5/16” and 2” hooks, or approved equal
D. Acceptable Manufacturer: Erico Fastening Products or approved equal.
E. J-hook Supports: Manufacturer's recommended fastening devices.

2.9 INNERDUCT

A. Innerduct: NEMA TC 5. UL Listed, corrugated, specifically designed for optical fiber cable pathways.
B. Acceptable Manufactures: Arnco, Carlon, Dura-line, and Pyramid.
C. Composition:
   1. Non-plenum rated: Polyethylene (PE), or High Density Polyethylene (HDPE).
   2. Plenum rated: per manufacturer.
D. Nominal Size: 1” (inside diameter), minimum.
E. Pulling Strength: minimum of 600 pounds.
F. Color: Orange, solid.
G. Fittings and Innerduct Bodies: Manufacturer’s recommended fittings including couplings, adapters, end caps, end bells, expansion couplings, plugs, sleeves, a full compliment of
connective devices, and all other components to make the system work.

PART 3 — EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRING METHODS

A. Outdoors: Use the following wiring methods:
   1. Exposed: Rigid steel or IMC.
   2. Concealed: Rigid steel or IMC.
   3. Underground, Single Run: RNC or PVC Externally Coated Rigid Steel Conduit where required by NEC 517.13.
   4. Underground, Grouped: RNC or PVC Externally Coated Rigid Steel Conduit where required by NEC 517.13.
   5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
   6. Boxes and Enclosures: NEMA 250, Type 3R or Type 4.

B. Indoors: Use the following wiring methods:
   1. Exposed: EMT or “Wiremold” metallic raceways or equal.
   2. Exposed in public areas: “Wiremold” metallic raceways or equal. Use of exposed raceways in public areas must be approved by the architect prior to installation for each location. Use of exposed EMT in areas visible to the public is not allowed unless specifically approved by the architect prior to installation. Replacement of unapproved installations of exposed raceways will be at the expense of the contractor if deemed necessary by the architect or engineer.
   3. Concealed: EMT, MC-Cable, Hospital Grade MC-Cable for all Patient Care Areas. Note: MC-Cable is not approved for “homeruns”
   4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except in wet or damp locations, use LFMC.
   5. Damp or Wet Locations: Rigid steel conduit.
   6. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
      a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.

3.3 INSTALLATION

A. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.
B. Minimum Raceway Size: 1/2-inch trade size. 3/4-inch minimum for “homeruns”.
C. Conceal conduit and EMT, unless otherwise indicated, within finished walls, ceilings, and floors.
D. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
E. Install raceways level and square and at proper elevations. Provide adequate headroom.
F. Complete raceway installation before starting conductor installation.
G. Route exposed conduit and conduit above accessible ceilings parallel and perpendicular to walls and adjacent piping.
H. Use temporary closures to prevent foreign matter from entering raceways.
I. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.
J. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

K. Use raceway fittings compatible with raceways and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, unless otherwise indicated.

L. Run concealed raceways, with a minimum of bends, in the shortest practical distance considering the type of building construction and obstructions, unless otherwise indicated.

M. Raceways shall not be embedded in slabs.

N. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members and follow the surface contours as much as practical.
   1. Run parallel or banked raceways together, on common supports where practical.
   2. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

O. Join raceways with fittings designed and approved for the purpose and make joints tight.
   1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
   2. Use insulating bushings to protect conductors.

P. Tighten set screws of threadless fittings with suitable tools.

Q. Terminiations: Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against the box. Where terminations are not secure with 1 locknut, use 2 locknuts: 1 inside and 1 outside the box.

R. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align raceways so the coupling is square to the box and tighten the chase nipple so no threads are exposed.

S. Install pull wires in empty raceways. Utilize polyester line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of the pull wire.

T. Telephone and Signal System Raceways: In addition to the above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

U. Install raceway sealing fittings according to manufacturer's written instructions. Locate fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
   1. Where conduits pass from warm to cold locations, such as the boundaries of refrigerated spaces.
   2. Where conduit pass from the interior to the exterior of a building.
   3. Where otherwise required by NEC.

V. Apply firestopping to cable and raceway penetrations of fire-rated floor, ceiling, and wall assemblies to achieve fire-resistance rating of the assembly. Boxes installed in fire-rated floor, ceiling, and wall assemblies shall result in no larger than a 16 square-inch penetration in the fire-rated wall surface and the quantity of penetrations shall not be greater than 100 square-inches for every 100 square feet of fire-rated wall area. Where boxes are located on both sides of a fire-rated wall, the boxes shall have a minimum of a 24” horizontal spacing, where a 24” horizontal spacing cannot be achieved, furnish and install listed fire-rated putty on the boxes as required by the IBC.

W. Route conduit through roof openings for piping and ductwork where possible; otherwise, install roof penetrations in accordance with roofing system requirements. Coordinate with roofing installer.

X. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used
6 inches above the floor. Install screwdriver-operated, threaded flush plugs flush with floor for future equipment connections.

Y. Flexible Connections: Use maximum of 6 feet of flexible conduit for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquidtight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.

Z. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.

AA. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying the raceways to receptacle or fixture ground terminals.

BB. Conduits shall not be routed on or above the roof without prior approval from the Engineer. Instead, the branch circuits shall be routed at the structure level below the roof to feed roof-top equipment. When approval is granted to route conduits on or above the roof, the conduits shall be strapped to COOPER industries DB series support blocks at intervals not exceeding NEC requirements. The conduits shall not be rested directly on the roof. It shall be permissible to penetrate the roof adjacent mechanical or electrical equipment to power that respective equipment.

3.4 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers, at least every 8 feet.

D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

F. Install 1/4-inch diameter or larger threaded steel hanger rods, unless otherwise indicated.

G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

I. Simultaneously install vertical conductor supports with conductors.

J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.

K. Install metal channel racks for mounting cabinets, panelboards; disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit. Perform fastening according to the following unless other fastening methods are indicated:

1. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.

2. New Concrete: Concrete inserts with machine screws and bolts.
3. Existing Concrete: Expansion bolts.
4. Steel: Spring-tension clamps on steel.
5. Light Steel: Sheet-metal screws.
6. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

N. Do not drill structural steel members.
O. All supports and attachments shall meet project seismic zone requirements.

3.5 BOX INSTALLATION

A. Do not install boxes back-to-back in walls.
B. Locate boxes in masonry walls to require cutting of masonry unit edge only. Coordinate masonry cutting to achieve neat openings for boxes.
C. Provide knockout closures for unused openings.
D. Support boxes independently of conduit except for cast boxes that are connected to two rigid metal conduits, both supported within 12 inches of box.
E. Use 4” boxes with multiple-gang mudring where more than one device are mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.
F. Install boxes in walls without damaging wall insulation.
G. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
H. Position outlets to locate lighting fixtures as shown on reflected ceiling plans.
I. In inaccessible ceiling areas, position outlets and junction boxes within 6 inches of recessed luminaire, to be accessible through luminaire ceiling opening.
J. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud walls, and adjustable steel channel fasteners for flush ceiling outlet boxes.
K. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.
L. For boxes installed in metal construction, use rigid support metal bar hangers or metal bar fastened to two studs or with metal screws to metal studs.
M. Set floor boxes level and adjust to finished floor surface.
N. Set floor boxes level and trim after installation to fit flush to finished floor surface.
O. Install hinged-cover enclosures and cabinets plumb. Support at each corner.
P. Locate pull and junction boxes above accessible ceilings or in unfinished areas. Support pull and junction boxes independent of conduit.
Q. Minimum box size to be 4” square by 2 1/8” deep.

3.6 LABELING

A. Label coverplate of all pull and junction boxes by system served. Indicate panel circuits for power and lighting boxes.

3.7 CLEANING

A. On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

END OF SECTION 26 05 33
SECTION 26 05 36

CABLE TRAYS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes cable trays and accessories.

1.3 SUBMITTALS

A. Submit shop drawings, product data, manufacturer’s installation instructions and maintenance manuals.

1.4 COORDINATION

A. Coordinate layout and installation of cable tray with other installations.
   1. Revise locations and elevations from those indicated as required to suit field conditions and as approved by owner.

PART 2 – PRODUCTS

2.1 MANUFACTURERS


2.2 CABLE TRAYS

A. Aluminum, 4-inch-deep, width as indicated on the drawings, ladder type, six inch rung spacing.
   B. Fabricate cable tray products with rounded edges and smooth surfaces.

2.3 CABLE TRAY ACCESSORIES

A. Fittings: Tees, crosses, risers, elbows, and other fittings as required, of same materials and finishes as cable tray, to form a continuous cable tray system.
   B. Barrier Strips: Where indicated on the drawings; same materials and finishes as cable tray.
   C. Cable tray supports and connectors as recommended by cable tray manufacturer.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install cable tray in accordance with manufacturer’s written instructions.
   B. Remove burrs and sharp edges from cable trays.
   C. Fasten cable tray supports securely to building structure as specified.
   D. Install expansion connectors where cable tray crosses a building expansion joint and in cable tray runs that exceed 90 feet.
E. Make changes in direction and elevation using standard fittings.
F. Make cable tray connections using standard fittings.
G. Workspace: Install cable trays with sufficient space to permit access for installing cables.

3.2 CLEANING

A. On completion of cable tray installation, including fittings, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes, including chips, scratches, and abrasions.

END OF SECTION 26 05 36
SECTION 26 05 43
UNDER SLAB AND UNDERGROUND ELECTRICAL WORK

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes under slab conduits and related electrical work.

PART 2 – PRODUCTS

2.1 CONDUIT

A. All shall be provided with fittings and accessories approved for the purpose. Refer to Section 26
05 33.

2.2 BARE COPPER GROUND CONDUCTOR

A. Medium hard drawn copper conductor, #4/0 AWG stranded (unless otherwise noted).

PART 3 – EXECUTION

3.1 GENERAL

A. Electrical system layouts indicated on the drawings are generally diagrammatic but shall be
followed as closely as actual construction and work of other trades will permit.

3.2 CONDUIT INSTALLATION

A. Plastic conduit shall be installed on 2-inch sand base and covered by 2-inch sand back fill.
Multiple runs shall maintain 3-inch minimum separation between runs. Plastic conduit shall not
be installed in rock base.
B. Underground conduit entering building shall be provided with one 10-foot section of rigid steel
conduit at point of penetration of foundation, footing or basement wall, with approximately
equal lengths inside and outside building line. Ream the smaller inside diameter conduit smooth
to prevent conductor damage.
C. Stagger conduit couplings by a minimum of 12 inches. All risers to grade shall be rigid steel.
D. All rigid steel conduits shall be encased in 3-inch minimum concrete envelope.
E. After completion of concrete encased duct bank, a 12-inch mandrel, ¼ inch less in diameter than
a conduit, shall be pulled through each conduit.
F. Install 1/8-inch diameter pull line in each underground conduit.
G. Burial depths of conduits shall comply with the NEC (minimum).
H. Provide underground type plastic line markers: permanent, brightly colored, continuously
printed plastic tape, intended for direct burial service, not less than 6 inches wide, reading
“Caution Buried Electrical Line.” Install continuous line markers located directly over buried
line at 6 inches above top of conduit, during back filling operation.

END OF SECTION 26 05 43
SECTION 26 08 00
LIGHTING SYSTEMS COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections, apply to this Section.

1.2 SUMMARY
A. This Section includes requirements for commissioning the lighting system and its controls.
B. The registered design professional is responsible to provide evidence of lighting systems commissioning and completion in accordance to the provisions of this section.

1.3 DEFINITIONS
A. Architect: Includes Architect identified in the Contract for Construction between Owner and Contractor, plus consultant/design professionals responsible for design of HVAC, electrical, communications, controls for HVAC systems, and other related systems.
B. RDP: Registered Design Professional
C. Systems, Subsystems, and Equipment: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, and equipment.

1.4 COMMISSIONING DOCUMENTATION
A. Commissioning Plan: A commissioning plan will be developed by a registered design professional or approved agency and shall include the following items:
   1. A narrative description of the activities that will be accomplished during each phase of commissioning, including the personnel intended to accomplish each of the activities.
   2. A listing of the specific equipment, appliances or systems to be tested and a description of the tests to be performed.
   3. Functions to be tested.
   4. Conditions under which the test will be performed.
   5. Measurable criteria for performance
B. Test Checklists: RDP, with assistance of Architect/Engineer, shall develop test checklists for each system, subsystem, or equipment including interfaces and interlocks, and include a separate entry, with space for comments, for each item to be tested. Prepare separate checklists for each mode of operation and provide space to indicate whether the mode under test responded as required. Provide space for testing personnel to sign off on each checklist.
   1. Name and identification of tested item.
   2. Test number.
   3. Time and date of test.
   4. Indication of whether the record is for a first test or retest following correction of a problem or issue.
   5. Date of the test and name of parties involved as applicable.
   6. Individuals present for test.
   8. Note if re-test is necessary.
C. Test and Inspection Reports: RDP shall record test data, observations, and measurements on test checklists. Photographs, forms, and other means appropriate for the application shall be included with data. RDP shall compile test and inspection reports and tests and inspection certificates and include them in systems manual and commissioning report.

D. Corrective Action Documents: RDP shall document corrective action taken for systems and equipment that fail tests. Include required modifications to systems and equipment and revisions to test procedures, if any. Retest systems and equipment requiring corrective action and document retest results.

E. Issues Log: RDP shall prepare and maintain an issues log that describes design, installation, and performance issues that are at variance with the Contract Documents. Identify and track issues as they are encountered, documenting the status of unresolved and resolved issues.

1. Creating an Issues Log Entry:
   a. Identify the issue with unique numeric or alphanumeric identifier by which the issue may be tracked.
   b. Assign a descriptive title of the issue.
   c. Identify date and time of the issue.
   d. Identify test number of test being performed at the time of the observation, if applicable, for cross-reference.
   e. Identify system, subsystem, and equipment to which the issue applies.
   f. Identify location of system, subsystem, and equipment.
   g. Include information that may be helpful in diagnosing or evaluating the issue.
   h. Note recommended corrective action.
   i. Identify commissioning team member responsible for corrective action.
   j. Identify expected date of correction.
   k. Identify person documenting the issue.

2. Documenting Issue Resolution:
   a. Log date correction is completed or the issue is resolved.
   b. Describe corrective action or resolution taken. Include description of diagnostic steps taken to determine root cause of the issue, if any.
   c. Identify changes to the Contract Documents that may require action.
   d. State that correction was completed and system, subsystem, and equipment is ready for retest, if applicable.
   e. Identify person(s) who corrected or resolved the issue.
   f. Identify person(s) documenting the issue resolution.

3. Issues Log Report: On a periodic basis, but not less than for each commissioning team meeting, RDP shall prepare a written narrative for review of outstanding issues and a status update of the issues log. As a minimum, RDP shall include the following information in the issues log and expand it in the narrative:
   a. Issue number and title.
   b. Date of the identification of the issue.
   c. Name of the commissioning team member assigned responsibility for resolution.
   d. Expected date of correction.

F. Commissioning Report: RDP shall document results of the commissioning process including unresolved issues and performance of systems, subsystems, and equipment. The commissioning report shall indicate whether systems, subsystems, and equipment have been completed and are performing according to the Contract Documents. The commissioning report shall include, but is not limited to, the following:

1. Lists and explanations of substitutions; compromises; variances in the Contract Documents; record of conditions; and, if appropriate, recommendations for resolution. This report shall be used to evaluate systems, subsystems, and equipment and shall serve as a future reference document during Owner occupancy and operation. It shall describe components and performance that exceed requirements
of the Contract Documents. It may also include a recommendation for accepting or rejecting systems, subsystems, and equipment.

2. Commissioning plan.
3. Testing plans and reports.
4. Corrective modification documentation.
5. Issues log.
6. Completed test checklists.

G. Systems Manual: RDP shall gather required information and compile systems manual. Systems manual shall include, but is not limited to, the following:
   1. Submittal Data stating equipment installed and selected options for each piece of equipment requiring maintenance.
   2. Operation and maintenance data on each piece of equipment requiring maintenance. Required routine maintenance actions shall be clearly identified.
   3. Name and address of at least one service agency.
   4. Lighting controls system maintenance and calibration information.
   5. A narrative of how each system is intended to operate, including recommended setpoints.

PART 2 – PRODUCTS – NOT USED.

PART 3 - EXECUTION

3.1 TESTING

A. Testing shall ensure that the control hardware and software are calibrated, adjusted, programmed and in proper working condition in accordance with the construction documents and manufacturers installation instructions.

B. Testing shall ensure that the lighting controls meet all provisions of the applicable energy code.

C. Perform tests using design conditions whenever possible. Where occupant sensors, time switches, programmable schedule control, photosensors or daylighting controls are installed, the following procedures shall be performed:
   1. Confirm that the placement, sensitivity and time-out adjustments for occupant sensors yield acceptable performance.
   2. Confirm that the time switches and programmable schedule controls are programmed to turn the lights off.
   3. Confirm that the placement and sensitivity adjustments for photosensor controls reduce electric light based on the amount of usable daylight in the space as specified.

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SECTION 26 09 23
LIGHTING CONTROL DEVICES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
A. This Section includes time switches, photoelectric relays, occupancy sensors, and multi-pole lighting relays and contactors.
B. Related Sections include the following:

1.3 SUBMITTALS
A. Submit shop drawings and product data, including all wiring diagrams.

PART 2 – PRODUCTS

2.1 GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS

2.2 TIME SWITCHES
A. Description: Electromechanical-dial type complying with UL 917.
   1. Astronomic dial.
   2. Two contacts, rated 30 A at 277-V ac, unless otherwise indicated.
   3. Eight-day program uniquely programmable for each weekday and holidays.
   4. Skip-day mode.

2.3 PHOTOELECTRIC RELAYS
A. Description: Solid state, with single-pole, double-throw dry contacts rated to operate connected relay or contactor coils or microprocessor input and complying with UL 773A.
B. Light-Level Monitoring Range: 0 to 3500 fc, with an adjustment for turn-on/turn-off levels.
C. Time Delay: Prevents false operation.
D. Outdoor Sealed Units: Weather tight housing, resistant to high temperatures and equipped with sun-glare shield and ice preventer.

2.4 OCCUPANCY SENSORS
A. Occupancy sensors indicated on the plans are to establish room controls and sensor quantities. The contractor is to verify sensor placement with the local manufacturer’s representative or the manufacture to ensure proper coverage and functionally of the specific sensor(s) installed. The contractor is to return and make any adjustments necessary to the occupancy sensor settings and/or placement needed to maintain proper functionality within 30 days after the owner/tenant takes occupancy of the project.
B. Lighting control system shall include all occupancy sensors, power packs, and control wiring required to form a complete system.

C. All occupancy sensors shall be dual/multi technology, manufactured by Unenco, Wattstopper, Lightolier Controls, Sensor Switch, or pre-approved equal unless otherwise noted.

D. Ceiling and Wall Mount Units: Shall utilize dual/multi technology detection methods. Unit receives control power from a separately mounted auxiliary power and control unit and operates power switching contacts in that unit.

E. Switch-Box-Mounting Units: Shall utilize dual/multi technology detection methods. Unit receives power directly from switch leg of the 120- or 277-V ac circuit it controls and operates integral power switching contacts. Unit is to have integral manual controls and is to be mounted at standard switch height.

F. Operation: Turns lights on when room or covered area is occupied and off when unoccupied, unless otherwise indicated.
   1. Time Delay for Turning Lights Off: Adjustable over a range from 1 to 30 minutes, minimum. Time delay to be set at 20 minutes unless otherwise directed. Contractor shall verify time delay with the owner/tenant prior to final occupancy.
   2. Manual Override Switch: Where indicated on drawings; turns lights off manually regardless of elapsed time delay.
   3. Sensor shall be located and/or adjusted to detect occupancy within 1-foot of entry into room or area controlled by the occupancy sensor.

G. Auxiliary Power and Control Units: As follows:
   1. Relays rated for a minimum of 20-A normal ballast load.
   2. Sensor Power Supply: Rated to supply the number of connected sensors.
   3. Relays shall have an auxiliary contact(s) for integration with HVAC or other building control systems.

H. Passive-Infrared Type: Detects occupancy by a combination of heat and movement in zone of coverage.

I. Ultrasonic Type: Emits a beam of ultrasonic energy and detects occupancy through use of Doppler's principle in discerning movement in zone of coverage by sensing a change in pattern of reflected ultrasonic energy. Ultrasonic frequency shall be 25 Khz or greater and sensor shall be temperature and humidity resistant.

J. Dual-Technology Type: Uses a combination of passive-infrared and ultrasonic or microphonic detection methods to distinguish between occupied and unoccupied conditions for area covered. Particular technology or combination of technologies that controls each function (ON or OFF) is selectable in the field by operating controls on unit.

K. All sensors shall be capable of operating normally with electronic ballast and compact fluorescent systems.

L. Coverage of sensors shall remain constant after sensitivity control has been set. No automatic reduction shall occur in coverage due to the cycling of air conditioner or heating fans.

M. All sensors shall have readily accessible, user adjustable controls for time delay and sensitivity. Controls shall be recessed to limit tampering.

N. In the event of failure, a bypass manual "override on" feature shall be provided on each sensor. When bypass is utilized, lighting shall remain on constantly. The override feature shall be designed for use by building maintenance personnel and shall not be readily accessible by building occupants.

O. All sensors shall provide an LED indication light to verify that motion is being detected and that the unit is working.

P. All sensors shall have no leakage current in OFF mode and shall have voltage drop protection.

2.5 MULTIPOLe CONTACTORS AND RELAYS

A. Description: Electrically operated and mechanically held and complying with UL 508 and NEMA ICS 2.
PART 3 – EXECUTION

3.1 INSTALLATION
   A. Install equipment level and plumb and according to manufacturer's written instructions.

3.2 CONTROL WIRING INSTALLATION
   A. Install wiring between sensing and control devices according to manufacturer's written instructions.
   B. Wiring Method: Install all wiring in raceways.
   C. Bundle, train, and support wiring in enclosures.
   D. Ground equipment.
   E. Connections: Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.

3.3 IDENTIFICATION
   A. Provide Brady wire markers or equivalent on all conductors.

3.4 FIELD QUALITY CONTROL
   A. Inspect control components for defects and physical damage.
   B. Verify settings of photoelectric devices with photometer.
   C. Electrical Tests: Use particular caution when testing devices containing solid-state components. Perform the following according to manufacturer's written instructions:
      1. Continuity tests of circuits.
      2. Operational Tests: Set and operate devices to demonstrate their functions and capabilities in a methodical sequence that cues and reproduces actual operating functions.
   D. Correct deficiencies, make necessary adjustments, and retest. Verify that specified requirements are met.
   E. The Lighting Control Panel shall be tested and listed under the UL 906 Energy Management Equipment Standards.

3.5 CLEANING
   A. Cleaning: Clean equipment and devices internally and externally using methods and materials recommended by manufacturers, and repair damaged finishes.
SECTION 26 22 00

DRY-TYPE TRANSFORMERS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes dry-type distribution and specialty transformers rated 1000 V and less.

1.3 SUBMITTALS

A. Product Data: Include data on features, components, ratings, and performance for each type of transformer specified. Include dimensioned plans, sections, and elevation views. Show minimum clearances and installed devices and features.

B. Wiring Diagrams: Detail wiring and identify terminals for tap changing and connecting field-installed wiring.

C. Factory Test Reports: Copy of manufacturer's design and routine factory tests required by referenced standards.

D. Sound-Level Test Reports: Copy of manufacturer's sound-level tests applicable to equipment for this project.

E. Maintenance Data: For transformers.

1.4 QUALITY ASSURANCE

A. Listing and Labeling: Provide transformers specified in this section that are listed and labeled as defined in the NEC.

B. Equipment shall conform or exceed requirements of NEMA, ANSI Standard C89.2 for dry-type transformers for general applications.

C. Comply with the NEC.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
   2. GE Electrical Distribution & Control.
   3. Square D; Groupe Schneider.
   4. Siemens
   5. Or approved equal.

2.2 TRANSFORMERS, GENERAL

A. Description: Factory-assembled and -tested, air-cooled units of types specified, designed for 60-Hz service.

B. Cores: Grain-oriented, nonaging silicon steel.

C. Coils: Continuous windings without splices, except for taps.

D. Internal Coil Connections: Brazed or pressure type.
E. Enclosure: Class complies with NEMA 250 for the environment in which installed.
F. Low-Sound-Level Units: Minimum of 3 dBA less than NEMA ST 20 standard sound levels when factory tested according to IEEE C57.12.91.

2.3 GENERAL-PURPOSE DISTRIBUTION AND POWER TRANSFORMERS

A. Comply with NEMA ST 20 and list and label as complying with UL 1561.
B. Cores: One leg per phase.
C. Windings: One coil per phase in primary and secondary.
D. Electrical ratings:
   1. Primary winding voltage: 480 volts, 3 phase, delta.
   2. Secondary winding voltage: 120/208 volts, 3 phase grounded wye.
   3. KVA rating: As indicated on drawings.
E. Enclosure: Indoor, ventilated.
F. Temperature classification:
   1. Winding temperature rise shall be 150 degrees C in accordance with UL specification 506 with insulation Class 220 degree Celsius.
G. Load rating:
   1. Transformer shall be capable of operating at 100% of nameplate rating continuously while in an ambient temperature not exceeding 40 degrees C.
   2. Transformer shall meet the daily overload requirements of ANSI Standard C57.96.
H. Taps: For transformers 3 kVA and larger, full-capacity taps in high-voltage windings are as follows:
   1. Taps, 3 through 10 kVA: Two 5-percent taps below rated high voltage.
   2. Taps, 15 through 500 kVA: Six 2.5-percent taps, 2 above and 4 below rated high voltage.
   3. Taps, 750 kVA and Above: Four 2.5-percent taps, 2 above and 2 below rated high voltage.
I. K-Factor Rating: Transformers indicated to be K-factor rated are listed to comply with UL 1561 requirements for nonsinusoidal load current handling capability to the degree defined by the designated K-factor.
   1. Transformer design prevents overheating when carrying full load with harmonic content corresponding to the designated K-factor.
   2. Nameplate states the designated K-factor of the transformer.
J. Vibration Isolation:
   1. Provide neoprene rubber pads to isolate core and coil assembly from transformer enclosure.
K. Wall-Mounting Brackets: Manufacturer's standard brackets for transformers up to 75 kVA.

2.4 CONTROL AND SIGNAL TRANSFORMERS

A. Units comply with NEMA ST 1 and are listed and labeled as complying with UL 506.
B. Ratings: Continuous duty. If rating is not indicated, provide capacity exceeding peak load by 50 percent minimum.
C. Description: Self-cooled, 2 windings.

2.5 FINISHES

A. Indoor Units: Manufacturer’s standard paint over corrosion-resistant pretreatment and primer.

2.6 SOURCE QUALITY CONTROL

A. Factory Tests: Design and routine tests comply with referenced standards.
B. Factory Sound-Level Tests: Conduct sound-level tests on equipment for this project if specified sound levels are below standard ratings.
PART 3 – EXECUTION

3.1 INSTALLATION
A. Comply with safety requirements of IEEE C2.
B. Arrange equipment to provide adequate spacing for access and for circulation of cooling air.
C. Anchor transformer securely with minimum ½” diameter bolts. Strength of bolts used to secure the transformer shall be sufficient to resist shear and uplift produced by a force equal to one half of the equipment mass applied horizontally at the center of gravity.
D. Provide 1” thick resiliency pads to isolate transformer from floor or platform, Korfund “Elasto Rib” or equal.
E. Tighten electrical connectors and terminals according to manufacturer’s published torque-tightening values.
F. The grounding conductor for each transformer shall be routed back to the Main Grounding Bar used for the building ground system.

3.2 GROUNDING
A. Separately Derived Systems: Comply with the NEC requirements for connecting to grounding electrodes and for bonding to metallic piping near the transformer.
B. Comply with Section 26 05 26 - Grounding for materials and installation requirements.

3.3 CONNECTIONS
A. Use flexible conduits at least 24” long for electrical connections.

3.4 IDENTIFICATION
A. Provide engraved lamacoid nameplate for each transformer.

3.5 FIELD QUALITY CONTROL
A. Test Objectives: To ensure transformer is operational within industry and manufacturer’s tolerances, is installed according to the contract documents, and is suitable for energizing.
B. Tests: Include the following minimum inspections and tests according to manufacturer’s written instructions. Comply with IEEE C57.12.91 for test methods and data correction factors.
   1. Inspect accessible components for cleanliness, mechanical and electrical integrity, and damage or deterioration. Verify that temporary shipping bracing has been removed. Include internal inspection through access panels and covers.
   2. Inspect bolted electrical connections for tightness according to manufacturer’s published torque values.
C. Test Failures: Compare test results with specified performance or manufacturer’s data. Correct deficiencies identified by tests and retest. Verify that transformers meet specified requirements.

3.6 CLEANING
A. On completion of installation, inspect components. Remove paint splatters and other spots, dirt, and debris. Repair scratches and mars on finish to match original finish. Clean components internally using methods and materials recommended by manufacturer.

3.7 ADJUSTING
A. After installing and cleaning, touch up scratches and mars on finish to match original finish.
B. Adjust transformer taps to provide optimum voltage conditions at utilization equipment throughout normal operating cycle of facility. Record primary and secondary voltages and tap settings and submit to owner.
C. Adjust buck-boost transformer connections to provide optimum voltage conditions at utilization equipment throughout normal operating cycle of facility.

END OF SECTION 26 22 00
SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes load centers and panelboards, overcurrent protective devices, and associated auxiliary equipment rated 600 V and less for the following types:
   1. Lighting and appliance branch-circuit panelboards.
B. Related sections:
   1. Section 26 05 26 - Grounding.

1.3 SUBMITTALS

A. Product Data: For each type of panelboard, overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers’ technical data on features, performance, electrical characteristics, ratings, and finishes.
B. Shop Drawings: For each panelboard and related equipment.
   1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
      a. Enclosure types and details for types other than NEMA 250, Type 1.
      b. Bus configuration, current, and voltage ratings.
      c. Short-circuit current rating of panelboards and overcurrent protective devices.
      d. UL listing for series rating of installed devices.
      e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
C. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.
D. Maintenance Data: For panelboards and components, include the following:
   1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
   2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in the NEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
B. Comply with NEMA PB 1.
C. Comply with the NEC.

1.5 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that
penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
   1. Panelboards, Overcurrent Protective Devices and Accessories:
      c. Siemens
      d. Square D Co.; Schneider Electric Brands
      e. Or approved equal.

2.2 FABRICATION AND FEATURES

A. Enclosures: Flush or surface mounted cabinets (as indicated on drawings). Construct cabinets with code gauge galvanized steel. Provide minimum 20” wide cabinets and extra wiring space where incoming feed-through or parallel lines are shown. NEMA PB 1, Type 1, to meet environmental conditions at installed location.

B. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.

C. Doors: Provide door-in-door construction, made of cold-rolled steel. Inner door shall provide access to breaker handles and outer door shall provide access to wiring space as well. Inner door shall be completely flush with no visible bolts, screw-heads or hinges and with flush catch and lock. Outer door shall have concealed hinges, flush catch and lock to match inner door, located in line with inner door catch. (Tee bar handles are not acceptable).

D. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.

E. Directory Card: With transparent protective cover, mounted inside metal frame, inside panelboard door.

F. Bus: Hard-drawn copper, 98 percent conductivity. Attach circuit breakers to bus so that circuits 1, 3, and 5; 2, 4, and 6, or any three similarly numbered circuits form one three-phase, four-wire circuit.

G. Main and Neutral Lugs: Compression or mechanical type suitable for use with conductor material.

H. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.

I. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

J. Gutter Barrier: Arrange to isolate individual panel sections.

K. Feed-through Lugs: Compression or mechanical type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device. For two-section panels.

L. Panels located adjacent to each other shall have identically sized enclosures and trims.

2.3 PANELBOARD SHORT-CIRCUIT RATING

A. UL label indicating series-connected rating with integral or remote upstream devices. Include size and type of upstream device allowable, branch devices allowable, and UL series-connected short-circuit rating. If not series rated: Fully rated to interrupt symmetrical short-circuit current available at terminals or the rating indicated on the plans, whichever is higher.
2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Branch Overcurrent Protective Devices:
1. 120/208Y volt branch circuit panelboards: Quick-make, quick-break, molded case plug-in type designed for 120/208Y volt, three-phase, four-wire service with minimum 10,000 amperes rms short circuit rating.
2. 277/480Y volt branch circuit panelboards: Molded case bolt-on type designed for 277/480Y volt, three-phase, four-wire service with minimum 14,000 amperes rms short circuit rating.
3. Provide multi-pole units with common trip elements.
4. Breaker shall have center-tripped position in addition to the ON and OFF positions.
5. Provide lockouts for all circuits that should not be inadvertently tripped (as indicated on the drawings).

2.5 OVERCURRENT PROTECTIVE DEVICES

A. Feeder Circuit Breaker Assemblies 150 Amp and below:
1. Feeder Circuit breakers 150 Amp and below shall be thermal Magnetic Circuit breaker: Inverse time, Current element for low level overloads, and instantaneous magnetic trip element for short circuits, unless otherwise indicated or required to meet Section 2.4 C above. Minimum features below:
   a. UL listed for 80 percent load application unless otherwise indicated on plans.
   b. Circuit Breaker shall allow the UL listed field installation internal accessories (Auxiliary Switch, Shunt Trip, Undervoltage release, Bell Alarm Switch) without removal of cover to install. Circuit Breaker shall include Accessories as indicated on plans.
   c. Circuit breaker handle accessories shall provide provisions for locking handle in the ‘ON’ or ‘OFF’ position.
2. Where specifically indicated, or required by NEC
   a. Adjustable [L] Long time time-delay and ampere setting with Long time pickup (ampere setting) determined by interchangeable rating plug.
   b. Adjustable [S] Short time-delay and pick-up.
   c. Adjustable [I] Instantaneous trip.
   d. Adjustable [G] Ground fault pick-up and delay where indicated or required by NEC.
   e. Where indicated special zone control interlocking for main breaker and future main and tie breaker of double-ended substation switchboard
   f. Short circuit, overload and ground fault trip indicators.
   g. Trip device of circuit breakers shall be of same type for tripping coordination.

B. General Breaker Requirements:
1. Minimum interrupting capacity shall match the minimum required interrupt rating of the panel.
2. Standard frame sizes, trip ratings, and number of poles.
3. Lugs: Mechanical or compression style, suitable for number, size, trip ratings, and material of conductors.
4. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
5. GFCl Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.
3.1 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.
B. Clearances: Minimum code required clearances around panelboards must be maintained.
C. Mounting Heights: Top of trim 78 inches above finished floor, unless otherwise indicated.
D. Mounting: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
E. Mounting Hardware: Provide all necessary blocking, channels and other hardware for securing panelboards to wall, column or other parts of building structure.
F. Circuit Directory: Create a directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
G. Install filler plates in unused spaces.
H. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components.
B. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws. Label shall include panel designation, voltage and phase in minimum ¼” high letters.

3.3 CONNECTIONS

A. Install equipment grounding connections for panelboards with ground continuity to main electrical ground bus.
B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.

3.4 FIELD QUALITY CONTROL

A. After installing panelboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements
   1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
B. Balancing Loads: After Substantial Completion, measure load balancing and make circuit changes as follows:
   1. Measure as directed during period of normal system loading.
   2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed.
   3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
   4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.
3.5 ADJUSTING

A. Adjust all operating mechanisms for free mechanical movement.

3.6 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 26 24 16
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PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes receptacles, switches, and finish plates.

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

1.4 SUBMITTALS

A. Submit shop drawings and product data.

1.5 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
   1. Wiring Devices:
      a. Bryant; Hubbell, Inc.
      b. GE Company; GE Wiring Devices.
      c. Hubbell Wiring Device – Kellems
      d. Leviton Manufacturing Co., Inc.
      e. Pass & Seymour/Legrand; Wiring Devices Div.
      f. Cooper Wiring Devices
      g. Or approved equal.
   2. Multi-outlet Assemblies:
      a. Wiremold.
      c. Or approved equal.

2.2 RECEPTACLES

A. General Requirements for All Devices:
   1. Each device shall have an amperage rating not less than that of the branch circuit(s) overcurrent protection device. White color, unless noted otherwise.
   2. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   3. All devices shall be Commercial Specification Grade (Construction specification grade is
prohibited), unless noted otherwise.

a. All Convenience Receptacles, shall be Heavy-Duty 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596. Subject to compliance with requirements, provide Hubbell Wiring Device-Kellems; 5362 Series or similar

B. Straight-Blade: All devices shall be Tamper Resistant where required by the National Electric Code and/or local amendments.
   1. Tamper Resistant—Convenience Receptacles: 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596. Subject to compliance with requirements, provide Hubbell Wiring Device-Kellems; HBL5362xxTR Series or similar.
   2. Tamper Resistant—Convenience Receptacles: 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596. Subject to compliance with requirements, provide Hubbell Wiring Device-Kellems; HBL5362xxTR Series or similar.

C. GFCI Receptacles: Duplex convenience receptacle with integral ground fault current interrupter. Provide one device for each location, daisy-chaining devices to achieve GFCI protection is not approved for this project.
   1. Duplex GFCI Convenience Receptacles, 125 V, 20 A.
   2. Straight Blade, non-feed through type.
   3. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
   4. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
   5. Subject to compliance with requirements, provide Hubbell Wiring Device-Kellems; GFRST20xx Series or similar

2.2 SWITCHES

A. Snap Switches: General-duty, quiet type, rated 20 amperes, 120/277 volts AC. Handle: white plastic. Pilot light type (where indicated): lighted handle.
   1. TOGGLE SWITCHES: Heavy-duty, quiet type, rated 20 amperes, 120/277 volts AC Comply with NEMA WD 1, UL 20, and FS W-S-896.
      a. Single Pole: Subject to compliance with requirements, provide Hubbell Wiring Device-Kellems; 1221 Series or similar
      b. Double Pole: Subject to compliance with requirements, provide Hubbell Wiring Device-Kellems; 1222 Series or similar
      c. Three Way: Subject to compliance with requirements, provide Hubbell Wiring Device-Kellems; 1223 Series or similar
      d. Four Way: Subject to compliance with requirements, provide Hubbell Wiring Device-Kellems; 1224 Series or similar
   2. Pilot-Light Switches, Single pole, with neon-lighted handle, illuminated when switch is “on”, 20 A, for 120 and 277 V. Subject to compliance with requirements, provide Hubbell Wiring Device-Kellems; HBL1221PL Series or similar
   3. Illuminated Switches, Single pole, with neon-lighted handle, illuminated when switch is "off." 20 A, for 120 and 277 V. Subject to compliance with requirements, provide Hubbell Wiring Device-Kellems; HBL1221IL Series or similar
   4. Key-Operated Switches, 120/277 V, 20 Amp, with factory-supplied key in lieu of switch handle. Subject to compliance with requirements, provide Hubbell Wiring Device-Kellems; HBL1221L Series or similar

B. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible and electromagnetic noise filters.
2. Incandescent Lamp Dimmers: Modular, 120 V, 60 Hz with continuously adjustable slide; single pole with soft tap or other quiet switch; electromagnetic filter to eliminate noise, RF, and TV interference; and 5-inch wire connecting leads.

3. Fluorescent Lamp Dimmers: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming to a maximum of 1 percent of full brightness.

2.4 WALL PLATES

A. Single and combination types match corresponding wiring devices.
   1. Cover plate: Smooth white plastic.
   2. Cover plate for surface mounted devices: Galvanized steel.
   3. Weatherproof cover plate: While in use, gasketed, cast metal, hinged device covers.
   4. Plate-Securing Screws: Metal with head color to match plate finish.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies plumb and secure.
B. Install wall plates when painting is complete.
C. Install wall dimmers to achieve indicated rating after derating for ganging as instructed by manufacturer.
D. Do not share neutral conductor on load side of dimmers.
E. Arrangement of Devices: Unless otherwise indicated, mount flush, vertically, with height as indicated or six inches above counters.
F. Group adjacent switches under single, multi-gang wall plates.
G. Protect devices and assemblies during painting.
H. Install wall switches with off position down.
I. Install cover plates on switch, receptacle, and blank outlets.

3.2 IDENTIFICATION

A. Switches and receptacles: Identify panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on the outside of the face plate for receptacles and on the inside of the face plate for switches; utilize durable wire markers or tags within all outlet boxes. Labels shall be Brother ½" TZ tape, black ink on clear, extra-strength adhesive tape, with size 18 text or engineer approved equal. Use matching label printer.

3.2 CONNECTIONS

A. Connect wiring device grounding terminal to outlet box with bonding jumper.
B. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.
C. Isolated-Ground Receptacles: Connect to isolated-ground conductor routed to designated isolated equipment ground terminal of electrical system.
D. Tighten electrical connectors and terminals according to manufacturer’s published torque-tightening values.

3.4 FIELD QUALITY CONTROL

A. Test wiring devices for proper polarity and ground continuity. Check each device to verify operation.
B. Test GFCI operation according to manufacturer's written instructions.
C. Replace damaged or defective components.

3.5 CLEANING

A. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION 26 27 26
SECTION 26 28 13

FUSES

PART 1 – GENERAL

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

1.2 SUMMARY
A. This Section includes cartridge fuses, rated 600 V and less, for use in switches, panelboards, switchboards, starters, and motor control centers; and spare fuse cabinets.

1.3 SUBMITTALS
A. Product Data: Include dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings for each fuse type indicated.

1.4 QUALITY ASSURANCE
A. Source Limitations: Provide fuses from a single manufacturer.
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in the NEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
C. Comply with NEMA FU 1.
D. Comply with the NEC.

1.5 PROJECT CONDITIONS
A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION
A. Coordinate fuse ratings with HVAC and refrigeration equipment nameplate limitations of maximum fuse size.

1.7 EXTRA MATERIALS
A. Furnish extra materials described below that match products installed and that are packaged in original cartons or containers and identified with labels describing contents.
   1. Fuses: Furnish one set of three of each type and size.

PART 2 – PRODUCTS

2.1 MANUFACTURERS
A. Manufacturers:
   2. Gould Shawmut.
   4. Or approved equal.
2.2 CARTRIDGE FUSES
A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

2.3 SPARE FUSE CABINET
A. Cabinet: Wall-mounted, 0.05-inch thick steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.
   1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
   2. Finish: Gray, baked enamel.
   3. Identification: "SPARE FUSES" in 1-1/2-inch- high letters on exterior of door.
   4. Fuse Pullers: For each size fuse.

PART 3 – EXECUTION

3.1 EXAMINATION
A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION
A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
B. Install spare fuse cabinet.

3.3 IDENTIFICATION
A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION 26 28 13
PART 1 – GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.

1.2 WORK INCLUDED
A. Provide and install motor disconnects.
B. Provide and install circuit disconnects.

1.3 REFERENCES
A. Underwriters' Laboratory, Inc. - Annual Product Directories.
B. NEMA - Classification of Standard Types of Nonventilated Enclosures for Electric Controllers.

1.4 REGULATORY REQUIREMENTS
A. Conform to National Electrical Code and to applicable inspection authority.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS
A. Cutler-Hammer/Westinghouse, General Electric, Siemens, Square D, or approved equal.

2.2 COMPONENTS
A. Motor and circuit disconnects shall have an Underwriters' Laboratory label.
B. Single Phase 120 Volt Disconnect Switches: Single pole toggle switch with thermal overload motor protection where indicated. A Horse Power rated switch may be used where fractional horse power motors have internal overload protection.
C. Single or Three Phase Motor Disconnect Switches: two or three pole heavy duty or fusible where other loads are on same circuit, 250 or 600 volt as required in NEMA Type 1, 3R, or 4 enclosures designed to reject all except Class 'R' fuses.

2.3 ACCEPTABLE MANUFACTURERS – FUSES
A. Cooper Bussmann, Edison, Littelfuse, Ferraz Shawmut, or approved equal.

2.4 FUSES
A. As indicated on the drawings. All shall be of the same manufacturer. Provide one spare set of fuses (minimum of three) for each current rating and type used.

PART 3 – EXECUTION

3.1 INSTALLATION
A. Install motor and circuit disconnect as indicated on Drawings and as required by Code. Where fuses are indicated, provide fuses correlated with full load current of motors provided.

END OF SECTION 26 28 15
SECTION 26 51 00
INTERIOR LIGHTING

PART 1 – GENERAL

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

1.2 SUMMARY
A. This Section includes interior lighting fixtures, lighting fixtures mounted on exterior building
   surfaces and recessed in canopies, lamps, ballasts, emergency lighting units, and accessories.
B. Related Sections include the following:
   1. Section 26 09 23 Lighting Control Devices.

1.3 SUBMITTALS
A. Product Data: For each type of lighting fixture indicated, arranged in order of fixture
   designation. Include data on features and accessories.
B. Maintenance data for lighting fixtures.
C. Emergency lighting units including battery and charger.

1.4 QUALITY ASSURANCE
A. Fixtures, Emergency Lighting Units, and Accessories: Listed and labeled as defined in the NEC,
   Article 100, by a testing agency acceptable to authorities having jurisdiction.
B. Comply with the NEC.
C. FM Compliance: Fixtures for hazardous locations shall be listed and labeled for indicated class
   and division of hazard by FM.
D. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.5 COORDINATION
A. Coordinate layout and installation of lighting fixtures and suspension system with other
   construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-
   suppression system, partition assemblies, and other construction.

1.6 WARRANTY
A. Special Warranty for Emergency Lighting Batteries: Manufacturer’s standard form in which
   manufacturer of battery-powered emergency lighting unit agrees to repair or replace
   components of rechargeable batteries that fail in materials or workmanship within specified
   warranty period.
   1. Warranty Period for Emergency Lighting Unit Batteries: Five years from date of
      Substantial Completion. Full warranty shall apply for first year, and prorated
      warranty for the remaining four years.
B. Special Warranty for Ballasts: Manufacturer’s standard form in which ballast manufacturer
   agrees to repair or replace ballasts that fail in materials or workmanship within specified
   warranty period.
   1. Warranty Period for Electronic Ballasts: Five years from date of Substantial Completion.
PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Products: As indicated on the drawings.

2.2 FIXTURES AND FIXTURE COMPONENTS, GENERAL

A. Metal Parts: Free from burrs, sharp corners, and edges.
B. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit maintenance without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during maintenance and when secured in operating position.
D. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or annealed crystal glass, unless otherwise indicated.
   1. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.
   2. Lens Thickness: 0.125 inch minimum, unless greater thickness is indicated.

2.5 EXIT SIGNS

A. General Requirements: Comply with UL 924 and the following:
   1. Sign Colors and Lettering Size: Comply with authorities having jurisdiction.
B. Internally Lighted Signs: As follows:
   1. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum rated lamp life.
C. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
   1. Battery: Sealed, maintenance-free, nickel-cadmium type.
   2. Charger: Fully automatic, solid-state type with sealed transfer relay.
   3. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
   4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
   5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
   6. Remote Test – Where indicated on the drawings: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
   7. Integral Self-Test – Where indicated on the drawings: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and flashing red LED.

2.6 EMERGENCY LIGHTING UNITS

A. External Type: Self-contained, modular, battery-inverter unit, suitable for powering one or more fluorescent lamps, remote mounted from lighting fixture. Comply with UL 924.
1. Emergency Connection: Operate 1 or 2 fluorescent lamps continuously at an output of 1100 lumens for 90 minutes. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.

2. Battery: Sealed, maintenance-free, nickel-cadmium type.


4. Housing: NEMA 250, Type 1 enclosure.

5. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.

6. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.8 FIXTURE SUPPORT COMPONENTS

A. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fitting and ceiling canopy. Finish same as fixture.

B. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy arranged to mount a single fixture. Finish same as fixture.

C. Rod Hangers: 3/16-inch- minimum diameter, cadmium-plated, threaded steel rod.

D. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

E. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

F. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm)

2.9 FINISHES

A. Fixtures: Manufacturer’s standard, unless otherwise indicated.

1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.


PART 3 – EXECUTION

3.1 INSTALLATION

A. Fixtures: Set level, plumb, and square with ceiling and walls, and secure according to manufacturer’s written instructions and approved submittal materials. Install lamps in each fixture.

B. Furnish and install a protective barrier around fixtures that are not insulation-contact-rated (non-IC-rated) in locations where insulation is installed. The protective barrier shall be installed to yield a 4" air-gap from the fixture on all sides and top.

C. Support for Fixtures in or on Grid-Type Suspended Ceilings: Attach supports to building structure.

1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches from fixture corners.

2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner.

3. Fixtures of Sizes Less Than Ceiling Grid: Arrange as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.

D. Suspended Fixture Support: As follows:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.


3. Continuous Rows: Suspend from cable installed according to fixture manufacturer’s written instructions and details on Drawings.
3.2 CONNECTIONS

A. Ground equipment.
   1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.

3.3 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Tests: As follows:
   1. Verify normal operation of each fixture after installation.
   2. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation.

C. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

D. Ballasts: Replace all noisy ballasts. Ballasts that can be heard shall be considered noisy. Repeat the procedure until a ballast is installed that is not noisy.

3.4 CLEANING AND ADJUSTING

A. Clean fixtures internally and externally after installation. Use methods and materials recommended by manufacturer.

END OF SECTION 26 51 00
SECTION 26 60 00

ELECTRICAL DEMOLITION AND REPAIR

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes electrical demolition and repair. Work includes removal of obsolete wiring and electrical apparatus; relocation, reconnection or replacement of existing wiring affected by demolition or new construction; capping off concealed wiring abandoned due to demolition or new construction.

PART 2 – PRODUCTS

2.1 EQUIPMENT

A. Conductors and Cables: Refer to Section 26 05 19 – Conductors and Cables.
B. Raceways and Boxes: Refer to Section 26 05 33 – Raceways and Boxes.

PART 3 – EXECUTION

3.1 DEMOLITION

A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the work, remove damaged portions and install new products of equal capacity, quality, and functionality.
B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety. Completely remove all exposed traces, hardware, wiring and conduit systems to the source. All knockouts and holes shall be patched or plugged.
C. Contractor shall re-use existing straight conduit runs and factory bends for conduits 2” and larger, provided that they are not damaged in any way and are installed in accordance with Section 26 05 33.
D. Re-use of all other electrical apparatus and material is subject to approval by owner.
E. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.
F. Remove demolished material for recycling as directed by owner.
G. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.
H. Power outages shall be held to a minimum and coordinated with the owner. Contractor shall schedule outages during off-hours.

END OF SECTION 26 60 00
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SECTION 27 11 01

TELECOM RACEWAY SYSTEMS

PART 1 – GENERAL

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

1.2 SUMMARY
   A. This Section includes telecom raceway systems.

1.3 RELATED WORK
   A. Section 26 05 33 – Raceways and Boxes.
   B. Section 26 05 36 – Cable Trays.

1.4 SYSTEM DESCRIPTION
   A. Conduit, cable trays and boxes to form an empty raceway system.

PART 2 – PRODUCTS

2.1 EQUIPMENT
   A. Conduit: Refer to Section 26 05 33.
   B. Cable trays: Refer to Section 26 05 36.
   C. Outlet, pull or junction boxes: Refer to Section 26 05 33.

PART 3 – EXECUTION

3.1 INSTALLATION
   A. Provide pullboxes in telecom conduit runs spaced less than 100 feet apart, and on the backboard
      side of runs with more than two right angle bends.
   B. Place telecom label on pull and junction boxes.
   C. Provide pullwire in each telecom conduit run.

END OF SECTION 27 11 01
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE OF WORK

A. The Contractor shall furnish and install all materials for a complete, functional data and voice communications system in accordance with this specification and the contract drawing. Contractor shall be responsible for providing a complete, functional system including all necessary components, whether included in this specification or not.

B. The installation shall include all cable and raceway (twisted-pair copper, fiber optical cabling, and coax cabling), conduit raceway, innerduct, interconnect-patching equipment, connectors, and jumpers, wiring blocks and telecommunications outlets. There will be two types of installation – 1) UTP installed in surface mount raceway (approved only in unfinished areas), and 2) UTP installed in conduit and boxes within walls or above ceilings. Multiple drops in a single box within wall will be fed by one vertical raceway with raceway sized to accommodate the required cabling – see building drawings for additional information.

C. In addition to material and equipment, Contractor shall provide labor and any incidental material required for installation. All copper station cables shall be terminated on patch panels at distribution frames and on data communication outlets at the workstation end, all fiber optical cables shall be terminated on rack mounted light interface units (LIU), all coax cables to be terminated on amplifiers in rack and on f connectors at the outlet end.

D. The owner and user, upon completion of the project, shall furnish all active equipment unless specifically noted on drawings and within specifications.

E. Upon completion of installation, Contractor shall test all copper, fiber optical, and coax cabling and record the test results in a test results binder and deliver to owner.

F. The work performed under this specification shall be of good quality and performed in a workmanlike manner. In this context “good quality” means the work shall meet industry technical standards and quality of appearance. The owner reserves the right to reject all or a portion of the work performed, either on technical or aesthetic grounds.

G. Voice and data cabling and outlets for pay phones, fax machines, modems, wall telephones, and fire alarm communicators, including Fire Alarm Communicator testing, shall be provided by Contractor.

H. All cable trays, wiring and server racks, etc., shall be furnished and installed by the contractor when indicated on the drawings and/or in this specification.

I. Cable shall be routed as close as possible to the ceiling, floor, or corners to insure that adequate backboard space is available for current and future equipment and for cable terminations. Cables shall not be tie-wrapped to electrical conduit, ceiling grid wire or other equipment. Minimum bend radius shall be observed. Cable transitions between plenum and non-plenum spaces, through drop ceilings (between horizontal and vertical risers), and through walls shall be routed through appropriate sized cable sleeves.

1.3 SUMMARY

A. Section Includes:
1. Pathways.
2. UTP cable.
3. 9/125-micrometer, optical fiber cabling.
5. Cable connecting hardware, patch panels, and cross-connects.
6. Cabling identification products. B. Related Sections:
   a. Drawing and General Provisions of the Contract, apply to work specified in this Section.
   b. Applicable Standards: All work shall be performed in accordance with the latest revisions of the following standards.
      1) ANSI/TIA/EIA-568-C.1 and addenda
         “Commercial Building Telecommunications Cabling Standard - Part 1: General Requirements”
      2) ANSI/TIA/EIA-568-C.2 and addenda
         “Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted-Pair Cabling Components”
      3) ANSI/TIA/EIA-568-C.3 and addenda
      4) ANSI/TIA/EIA-569-A and addenda
         “Commercial Building Standard for Telecommunications Pathways and Spaces”
      5) ANSI/TIA/EIA-606-A and addenda
         “Administration Standard for the Telecommunications Infrastructure of Commercial Buildings”
      6) ANSI/TIA/EIA-607 and addenda
         “Commercial Building Grounding and Bonding Requirements for Telecommunications”
      7) ANSI/TIA/EIA-526-7
         “Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant”
      8) ANSI/TIA/EIA-526-14-A
   c. The most recent versions of all documents apply to this project.

B. Quality Assurance
1. Contractor Qualifications: Work in this section shall be performed by a licensed and bonded low voltage contractor, which has been in business for a minimum of five years in the maintenance and installation of high-speed data and voice networks. Only Contractors whose primary business in that of installing, maintaining, troubleshooting and testing computer and communication network systems shall perform this work.
2. The Contractor shall have installed cable plant in at least three buildings similar in size and scope to the project building and shall furnish references to the Owner and/or Engineer upon request.
3. The Contractor shall be completely familiar with the TIA/EIA standards for telecommunications raceway / pathway infrastructure systems and with the telecommunications design practices as defined in the BICSI Telecommunications Distribution Methods Manual.
4. Contractor must be a trained and certified for the communications cable and hardware, which it installs, and must furnish proof of certification.
5. Contractor should have a BICSI registered RCDD on staff.
6. A Systimax Solutions System Warranty shall provide a complete system warranty to guarantee end-to-end high performance cabling systems that meet application requirements. The guarantee shall include cable and connectivity components and have one point of contact for all cabling system issues. The system shall be warranted for a period of 25 years. The manufacturer of the telecommunications equipment, devices and cable shall warranty the entire telecommunications structured cable system to be in compliance with applicable codes and standards, and to be free from defects in materials and workmanship. The warranty shall apply to all passive structured cabling system components, and shall cover failure of the system to support applications in accordance with the performance levels stipulated in the referenced TIA/EIA standards. This warranty shall extend for a period of at least (25) years from the date of final field-testing and acceptance of the system, and shall cover the full cost of all repairs and all replacement for the entire system.

7. Upon successful completion of the installation and subsequent inspection by the manufacturer’s project manager, the certified SYSTIMAX contractor of the telecommunications equipment, devices and cable shall register the telecommunications structured cable system installation, and shall furnish a numbered registration certificate to the owner immediately upon completion. Both copper and fiber test results should be submitted in the test manufacturers native format to CommScope for review with the submitted Warranty Application. A soft copy of the test results will also be sent to West Ada School District for their record.

8. A factory registered Systimax Solutions System contractor shall be on the construction site at all times while work is being performed; no subcontracting shall be allowed. All products specified herein shall be installed by the contractor represented in the proposal. The contractor shall have completed standards based product and installation training. A copy of the Systimax Solutions System Contractor Registration shall be submitted in the proposal.

a. All Systimax Solutions System non-consumable products have a 25-year guarantee. When installed per TIA or ISO/IEC standards, the Systimax Solutions System Network Cabling System will operate the application(s) for which the system was designed to support. Applications may include, but are not limited to:

10/100/1000/10000 Mbps Ethernet (IEEE 802.3)
4/16 Mbps Token Ring (IEEE 802.5)
155, 622, 1.25 Gbps ATM
SONET
FDDI/CDDI
IBM System 3x-AS/400
Appletalk
ISDN

b. In order to qualify for the guarantee, the structured cabling system must be installed per the following:
1) Meet all TIA/EIA commercial building wiring standards.
2) Systimax Solutions System categorized product must be used in conjunction with an equivalent or higher Category UL or ETL verified cable.
3) Systimax Solutions System must be installed per Systimax Solutions System instruction sheets.
4) Note: All Networks shall be installed per applicable standards and
5) If any Systimax Solutions System product fails to perform as stated above, Systimax Solutions System will provide new components at no charge.

9. LICENSE CLASSIFICATION: Contractor must possess a valid Idaho State Contractor's License.

1.4 DEFINITIONS

B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
C. EMI: Electromagnetic interference.
D. IDC: Insulation displacement connector.
E. LAN: Local area network.
F. RCDD: Registered Communications Distribution Designer.
G. UTP: Unshielded twisted pair.

1.5 BACKBONE CABLE DESCRIPTION

A. Backbone cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross connection.
B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

1.6 PERFORMANCE REQUIREMENTS

A. General Performance: Backbone cabling system shall comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard.
B. Governing Codes and Conflicts
   1. If the requirements of this section or the Project Drawings exceed those of the governing codes and regulations, then the requirements of this section and the Drawing shall govern. However, nothing in this section or the Drawings shall be construed to permit work not conforming to all governing codes and regulations.

1.7 SUBMITTALS

A. Prior to installation of any equipment, the Contractor shall provide the Engineer and/or the Owner with six (6) copies of submittals and drawings for approval. Submittals shall include a list of equipment with model numbers and quantities, catalog cuts, equipment specification sheets and installation instructions. Drawings shall include floor plans with equipment and wire locations, room numbers, one-line risers, and the jack numbering system proposed for the project. No equipment shall be purchased for the project until shop drawings have been reviewed and approved by the engineer and/or the owner.

B. Product Data: For each type of product indicated.
   1. For UTP (Copper) cable, include the following installation data for each type used:
      a. Nominal OD.
      b. Minimum bending radius.
      c. Maximum pulling tension.
2. For Fiber Optical cable, include the following installation data for each type used:
   a. Nominal OD.
   b. Minimum bending radius.
   c. Maximum pulling tension.
3. For coaxial cable, include the following installation data for each type used:
   a. Nominal OD.
   b. Minimum bending radius.
   c. Maximum pulling tension.
4. For all components of the system.
   B. Shop Drawings:
      1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
      2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
      3. Cabling administration drawings and printouts.
      4. Wiring diagrams to show typical wiring schematics including the following:
         b. Patch panels.
         c. Patch cords.
      5. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.
      6. Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:
         a. Vertical and horizontal offsets and transitions.
         b. Clearances for access above and to side of cable trays.
         c. Vertical elevation of cable trays above the floor or bottom of ceiling structure.
         d. Load calculations to show dead and live loads as not exceeding manufacturer's rating for tray and its support elements.
   C. Substitution Requests
      1. Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Use CSI Form 13.1A or contractor/vendor form, which is substantially similar to the CSI form.
      2. Show compliance with requirements for substitutions and the following, as applicable:
         a. Statement indicating why specified material or product cannot be provided.
         b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
         c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
         d. Product Data, including drawings and descriptions of products and fabrications and installation procedures. Provide all available engineering documents, instructions, drawings and third party test reports.
         e. Samples of each of the products being offered for substitution.
         f. List of similar installations for completed projects with project names and addresses and names and address of architects and owners.
         g. Material test reports from a qualified testing agency indicating and
interpreting test results for compliance with requirements indicated.

h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

i. Detailed comparison of Contractor’s Construction Schedule using proposed substitution with products specified in the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer’s letterhead, stating lack of availability or delays in delivery.

j. Cost information, including a proposal of change, if any, in the Contract Sum.

k. Contractor’s certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.

l. Contractor’s waiver of rights to additional payment or time that may subsequently become necessary because of failure or proposed substitution to product indicated results.

m. Acceptance of substitution must be received from the Owner in writing.

D. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

E. Source quality-control reports.

F. Field quality-control reports.

G. Maintenance Data: For splices and connectors to include in maintenance manuals.

H. Software and Firmware Operational Documentation:
   1. Software operating and upgrade manuals.
   2. Program Software Backup: On magnetic media or compact disk, complete with data files.
   3. Device address list.
   4. Printout of software application and graphic screens.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
   1. Installation Supervision: Installation shall be under the direct supervision of Registered Systimax Solutions System Technician, who shall be present at all times when Work of this Section is performed at Project site.
   2. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Testing Agency Qualifications: An NRTL.
   1. Testing Agency’s Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.


1.9 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Patch-Panel Units: One of each type.
   2. Connecting Blocks: One of each type.
3. Device Plates: One of total of each type.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.
   1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical loss test set.
   2. Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in maintenance data.

1.11 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.12 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. All products shall be new, and brought to the job site in original manufacturer’s packaging.
   1. Electrical components shall bear the Underwriter’s Laboratories label.
   2. Comply with TIA/EIA-569-A.

B. Telecommunications System Description
   1. Provide the indicated number of Category 6A cables to each outlet. All horizontal cables are terminated on Category 6A UTP jacks installed in rack-mounted modular patch panels. Horizontal data circuits are connected to LAN electronics within each data rack location.

C. Cable Support: NRTL labeled for support of Category 6A cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
   1. Support brackets with cable tie slots for fastening cable ties to brackets.
   2. Lacing bars, spools and J-hooks.
   3. Straps and other devices.

D. Cable Trays:
   a. Manufacturers: Subject to compliance with requirements, provide products by the following:
      1) WBT
      2) Cooper B Line
   b. See specification section 260536 CABLE TRAYS FOR ELECTRICAL SYSTEMS for further information.

D. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."
   1. Outlet boxes shall be no smaller than 4 inches wide, 4 inches high, and 3 inches deep.
   2. Conduit shall be no smaller than 1”.
2.2 HORIZONTAL DISTRIBUTION SUB-SYSTEM

A. Work Area Faceplate
1. Number of jacks per outlet location is as shown on plans. Use single-gang, flush mounted faceplates. Faceplates, single and double gang boxes shall match receptacle and switch cover plates per spec section 26 “wiring devices”. Provide blank faceplate inserts at any unfilled parts at the faceplates.
2. Approved Manufacturer:
   a. CommScope: M12L-262 (MID: 108168469) 2 PORT WHITE

B. 4pr UTP Cabling
1. Horizontal station cable shall be Category 6A, 23 AWG UTP, UL/NEC CMR or CMP, non-plenum or plenum rated with a PVC jacket as required for the application. Any Horizontal Cabling being installed above drop ceiling shall be Plenum rated unless written permission by West Ada School District to install non-Plenum. In order to run non Plenum cable the vendor must provide verification that the area being run is non Plenum rated and get written permission from the director of I.T and head of facilities.
2. Cable color designation should use to identify the systems application. The following colors will be used:
   a. Blue = Data Network
   b. Green = WAP
   c. Orange = Security Camera and Locks
   d. Yellow = Speakers and Clocks
   Approved manufacturer:
3. Approved manufacturer:
   a. SYSTIMAX: PVC 1091B
   b. SYSTIMAX: Plenum 2091B

C. Modular Jacks
1. All modular jacks shall be wired to the T568B wiring pattern. Modular jacks shall be of Snap into type. Modular jacks shall be UL Listed.
2. Category 6A modular jack devices, 8-position, 8-conductor modular jacks shall terminate unshielded twisted four pair, 22-26AWG, 100 Ohm cable and shall require the use of a punch down tool. Jack module shall use forward motion termination to optimize performance by maintaining cable pair geometry and eliminating conductor untwist.
3. Information Outlet color designation should use to identify outlet application. The following colors will be used:
   a. White = Data Network
   b. Green = WAP
   c. Orange = Security Camera and Locks
   d. Yellow = Speakers and Clocks
4. Refer to drawings and electrical legend for symbol type and/or notes, which dictates the number of jacks and cable drops required.
5. Approved manufacturer:
   a. SYSTIMAX: MGS600–262 (MID: 760092452) CAT6A WHITE
   MGS600-226 (MID: 760092403) CAT6A GREEN
   MGS600-112 (MID: 760092379) CAT6A ORANGE
   MGS600-123 (MID: 760092387) CAT6A YELLOW

D. Raceway
1. Work shall include furnishing all raceway and appropriate fittings and device plates to install a nonmetallic surface raceway system as indicated in the project drawings. Installer shall comply with detailed manufacturer’s instruction sheets which accompany system components.
2. All surface mounted raceways will be affixed to walls with the appropriate screws
via pre-punched mounting holes. No adhesive tape shall be used to secure the raceway.

3. Multiple drops on a single wall will be fed by one vertical raceway.
4. All raceway will be plum and level.
5. Refer to drawing for locations and mounting heights and arrangement.
6. Approved manufacturer:
   a. Panduit
   b. Wiremold

2.3 HORIZONTAL CROSS-CONNECT TERMINATION HARDWARE

A. Horizontal Data Cross-Connect
   1. Copper Patch Panels will be mounted in rack in specific order based on systems application. From Top Down the Panel will be WAP, Informacast & Security, Data Network. See drawings below. Patch Panels will be dedicated for their application. No more than 384 cables per rack. See appendix A.
   2. Single rack configurations: from top down the panel will be WAP, Informacast & Security, Data Network
   3. Two rack configurations:
      a. Rack 1: All panels will be Data Network
      b. Rack 2: From top down the panels will be WAP, Informacast & Security
   4. Patch panels shall be SYSTIMAX 360 1100 series Evolve 24 port, imVision Enabled, flat infopanel.
      a. Approved Manufacturer:
         1) SYSTIMAX: 360-iP-1100-E-GS6-1U-24 (MID: 760201145)
         2) SYSTIMAX: 360-imV-CNTRLR (MID: 760161380)
         3) SYSTIMAX: 360-imV-JMPR-CNTRL-10 (MID: 760164822)
   5. Horizontal data cross-connect patch cords shall be provided for 100% of the patch panel terminations and be of adequate length to ensure proper cable bending radius. Provide patch cords for all devices listed below.
      a. Approved manufacturer:
         1) SYSTIMAX:
            i) Provide 1-foot Black patch cord for all Data Network. Part #: CPCSSX2-01F001
            ii) Provide 10-foot LT Blue patch cord for 50% of all Data Network cables. Part# CPCSSX2-02F010
            iii) Provide 4-foot LT Blue patch cord for 50% of all Data Network cables. Part# CPCSSX2-02F004
            iv) Provide 1-foot green patch cord for all WAP terminations. Part #: CPCSSX2-04F001
            v) Provide 3-foot green patch cord for all WAP. Part #: CPCSSX2-04F003
            vi) Provide 1-foot orange patch cord for all camera and keypad terminations. Part #: CPCSSX2-06F001
            vii) Provide 3-foot orange patch cord for all cameras. Part #: CPCSSX2-06F003
            viii) Provide 1-foot yellow patch cord for all Informacast speakers. Part #: CPCSSX2-09F001
            ix) Provide 3-foot yellow patch cord for all Informacast speakers. Part #: CPCSSX2-09F003
            x) Provide 1-foot red patch cord for all management devices such as climate control. Part# CPCSSX2-07F001
            xi) Provide 1-foot white patch cord for analog devices such as
2.4 **CABLE MANAGEMENT TIES**

A. Bundle all communications cables together with Velcro only. Cables of similar type should be bundled together. ie; Cat6 in a bundle, Cat5e in a separate bundle & Coax in a separate bundle.

B. Approved Manufacturer:
   1. Panduit or similar.

2.5 **COMMUNICATIONS BACKBOARD**

A. Data/Voice terminal backboards shall be ¾” thick plywood painted with two (2) coats of White, fire retardant paint, APA exterior grade Douglas Fir A-C, and fire retardant with flame spread rating not more than 25 when tested according to ASTM E-84. Refer to drawing for locations, quantities and mounting arrangement.

2.6 **EQUIPMENT MOUNTING RACKS**

A. Equipment Rack(s): Contractor will use owners existing enclosed and open racks when possible. Provide 19” wide with number of vertical rack sections as required to allow space for termination of all Category 6 cabling plus mounting space for multi-port switches required to cross-connect all data jacks. See Drawings for details. Rack location to be determined by owner. Owner desires a 4-post rack in each data closet with a minimum of a 4 post in the MDF. If 4 post racks don’t fit in the IDF then a 2-post rack should be installed. If a 2-post rack will not fit, then please contact WestAda School District prior to moving to wall mounted racks. All racks are to be securely mounted to the floor. Note (3-foot area in front and behind the rack should be left open for accessibility). Where possible all power requirements should be put on the rack to prevent tripping hazards behind or in front of the rack.
   1. Approved Manufacturer
      a. Enclosed Wall Mount Cabinet: Chatsworth Part#: 11840-736
      b. Fan Kit for Wall Mount Cabinet: Chatsworth Part#:
      c. Filter Kit for Wall Mount Cabinet: Chatsworth Part#:
      d. CommScope Four Post Rack: MID: 760082560
      e. CommScope Two Post Rack: MID: 760082479

B. Distribution Rack Grounding: furnish ground terminal strip for each rack section installed. Rack shall be grounded using stranded, #6 AWG Green insulated copper conductor. Furnish all required bonding material and hardware, and bond to building grounding electrode subsystem
   1. Approved Manufacturer
      a. Chatsworth

C. Cable Runway: Cable trays shall be installed in hallway above the suspended ceilings supported at a maximum of four-foot intervals. Cable tray path will be determined by owner and contractor and tray size determined by number of cables.
   1. Approved Manufacturer:
      a. WBT P/N WBT54X18

D. Equip each floor rack with ladder style cable runway installed between the backboard and the equipment rack. Securely attach to backboard and rack in accordance with manufacturers written instructions. See Drawings for details.
   1. Approved Manufacturer:
      a. CommScope P/N: 760085647

E. Vertical Wire Management: The Cable Management System shall be used to provide a
neat and efficient means for routing and protecting fiber and copper cables and patch cords on telecommunication racks and enclosures. The system shall protect network investment by maintaining system performance, controlling cable bend radius and providing cable strain relief.

1. The Vertical Wire Management used at West Ada School District projects shall be either Single Sided or Double Sided per the project design. Each floor mounted rack shall have a Vertical Wire Manager on each side of rack for routing of cable on the back side and patch cords on the front side. If two racks are side by side, then only one Vertical Wire Manager is needed in-between with another Vertical Wire Manager on each end of row.

2. No Vertical Wire Manager is required for Wall Mounted racks/cabinets.

3. Approved Manufacturer
   a. Single sided: CommScope VCM-SS-84-6 (MID: 760072868)
   b. Double Sided: CommScope VCM-DS-84-6 (MID: 760072785)

2.7 OPTICAL FIBER

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. SYSTIMAX Solutions; TeraSPEED

B. Interior Optical Fiber Description: Singlemode, OS2, 12-fiber, distribution Plenum, Armored, gel-free optical fiber cable. CommScope number P-012-DZ-8W-FSUYL
   1. Comply with ICEA S-83-596 for mechanical properties.
   2. Comply with TIA/EIA-568-B.3 for performance specifications.
   4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
      a. General Purpose, Nonconductive: Type OFN or OFNG.
      b. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
      c. Plenum Rated, Conductive: Type OFCP, complying with NFPA 262.
   5. Conductive cable shall be aluminum armored type.
   7. Cable cordage jacket, fiber, unit, and group color shall be according to TIA/EIA-598-B. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).

C. Singlemode fiber optic Premises Cable – Zero Water Peak – Riser and Plenum
   1. The cable shall be available in riser and plenum types with a Yellow sheath.
   2. The premises cable shall use a standard colored tight buffered construction.
   3. The higher fiber count cables shall utilize a sub-unitized design with color-coded sub units for easy identification.
   4. The cable shall deliver a cost-effective upgrade path by expanding the available wavelengths by 50% and allowing up to 18 channels of CWDM (Coarse Wave Division Multiplexing) on a single fiber and up to 400 channels of DWDM (Dense Wave Division Multiplexing) on a single cable.
   5. The cable shall operate over the entire wavelength range from 1260 nm to 1625 nm, removing the water peak (high attenuation) in the E-band, adding more than 50% in operational wavelength range over conventional singlemode fiber.

### Physical Specifications:

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Diameter:</td>
<td>8.3 µm nominal</td>
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<tr>
<td>Cladding Diameter:</td>
<td>125.0 (± 0.7) µm</td>
</tr>
<tr>
<td>Core/Clad Offset:</td>
<td>&lt; _ 0.5 µm</td>
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<tr>
<td>Cladding Non-Circularity</td>
<td>&lt; _ 1%</td>
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</table>
### Optical Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Coated Fiber Diameter</td>
<td>245 (± 10) µm</td>
</tr>
<tr>
<td>Cladding/Coating Offset</td>
<td>&lt; 12 µm</td>
</tr>
<tr>
<td>Colored Fiber Diameter</td>
<td>254 (± 7) µm</td>
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<td>Proof Test</td>
<td>0.7 GPa</td>
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<tr>
<td>Fiber Curl</td>
<td>&gt; 4 m</td>
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<tr>
<td>Dynamic Fatigue Parameter</td>
<td>_ 18 &gt;</td>
</tr>
<tr>
<td>Macrobend (100 turns, 50 mm mandrel)</td>
<td>0.10 dB @ 1310 nm and 1550 nm</td>
</tr>
<tr>
<td>Macrobend (1 turn on a 32 mm mandrel)</td>
<td>0.50 dB @ 1310 nm and @ 1550 nm</td>
</tr>
<tr>
<td>Mode Field Diameter</td>
<td>9.2 (± 0.3) µm @ 1310 nm 10.4 (nominal)</td>
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<tr>
<td>Group Index of Refraction</td>
<td>1.466 @ 1310 nm and 1383 (± 3) nm, 1.467 @ 1550 nm</td>
</tr>
<tr>
<td>Attenuation of Tight Buffered Fibers</td>
<td>0.7 dB/km @ 1310 nm</td>
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<tr>
<td>Maximum Displacement</td>
<td>3.5 ps/nm-km @ 1285 to 1330 nm, 18</td>
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<tr>
<td>Dispersion</td>
<td>ps/nm-km @ 1550 nm</td>
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<tr>
<td>Zero-Dispersion</td>
<td>1300 - 1322 nm</td>
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<tr>
<td>Zero-Dispersion Slope</td>
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<tr>
<td>Polarization Mode Dispersion LDV</td>
<td>0.08 ps/(km)³</td>
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</tbody>
</table>

### Exterior Optical Fiber Description:

Single mode, 9/125 micrometer, 12-fiber, Indoor/Outdoor, distribution Plenum, non-armored, gel-free optical fiber cable. CommScope number P-012-LN-8W-F12BK/25D. If fiber is installed in conduit and/or less than 50ft into the building, then Riser rated is acceptable. CommScope number R-012-LN-8W-F12BK/25D.

1. Comply with ICEA S-83-596 for mechanical properties.
2. Comply with TIA/EIA-568-B.3 for performance specifications.
4. Maximum Attenuation: 3.5 dB/km at 850 nm; 1.5 dB/km at 1300 nm.
5. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300nm.

### Jacket:

2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA/EIA-598-B.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).

### 2.8 OPTICAL FIBER CABLE HARDWARE

**A.** Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Systimax SCS.

**B.** Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.
1. **Number of Connectors per Field**: 12 for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.

C. **Patch Cords**: Factory-made, dual-fiber cables in 36-inch (900-mm) lengths.
   1. Approved Manufacturer for 9/125 SM
      a. CommScope: 1 Meter Duplex LC Yellow; Part #: FEWLCLC42-JXM001
      b. CommScope: 2 Meter Duplex LC Yellow; Part #: FEWLCLC42-JXM002
      c. CommScope: 3 Meter Duplex LC Yellow; Part #: FEWLCLC42-JXM003

D. **Fiber Optic Connectors**: SYSTIMAX QWIK II Fiber Optic Connectors shall be pre-polished, cam termination, simplex fiber optic connectors for singlemode glass fiber that fully complies with both the fiber optic connector performance requirements specified in TIA/EIA-568-B.3 and the intermatability requirements specified by the TIA-604 FOCIS-3 standard.
   1. Approved Manufacturer
      a. 9/125 SM: SYSTIMAX SFC-LCF-09-8X (MID: 760117895)

E. **Rack Mounted Fiber Optic Patch Panels**: Provide rack mounted modular enclosure units complete with connector couplings mounted in LC connector panels for interconnection of backbone optical fiber cables as specified herein. Units shall be sized to terminate all fibers indicated on the Drawings using mechanical or fusion splices.
   1. Approved Manufacturer
      a. SYSTIMAX 360G2-1U-MOD-SD (MID: 760193771)
      b. 9/125 SM: 360G2-Cartridge-12-LC-SM-BL (MID: 760109272)

2.9 **COAXIAL CABLE**

A. **Manufacturers**: Subject to compliance with requirements, provide products by one of the following:
   1. CommScope Coax Solutions

B. **General Coaxial Cable Requirements**: Broadband type, recommended by cable manufacturer specifically for broadband data transmission applications. Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss of 20 dB maximum from 7 to 806 MHz. C. RG6/U: NFPA 70, Type CATVR.
   1. No. 20 AWG, solid, silver-plated, copper-covered steel conductor.
   2. Gas-injected, foam-PE insulation.
   3. Triple shielded with 100 percent aluminum polyester tape and 95 percent aluminum braid; covered by aluminum foil with grounding strip.
   4. Color-coded PVC jacket.

C. **NFPA and UL compliance**, listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1655 and with NFPA 70, "Radio and Television Equipment" and "Community Antenna Television and Radio Distribution" Articles. Types are as follows:
   1. CATV Cable: Type CATV.
   2. CATV Plenum Rated: Type CATVP, complying with NFPA 262.
   3. CATV Riser Rated: Type CATVR, complying with UL 1666.
   4. CATV Limited Rating: Type CATVX.

2.10 **COAXIAL CABLE HARDWARE**

A. **Manufacturers**: Subject to compliance with requirements, provide products by one of the following:
   1. Leviton Voice & Data Division.
   2. Siemon Co. (The).

B. **Coaxial-Cable Connectors**: Type F Connector

C. **Coax amplifiers mounted in each rack**: Blonder tongue model HAD-16-860-16
   1. Each IDF room to have Coax cable amplifier with radial feeds to each classroom TV
and incoming feed from MDF.

2.11 UTP CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. CommScope, Inc.

B. Description: 100-ohm, four-pair UTP, binder groups covered with a blue thermoplastic jacket.
   1. Comply with ICEA S-90-661 for mechanical properties.
   2. Comply with TIA/EIA-568-B.1 for performance specifications.
   3. Comply with TIA/EIA-568-B.2, Category 6A.
   4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
      a. Communications, General Purpose: Type CM or CMG.
      b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
      c. Communications, Riser Rated: Type CMR; complying with UL 1666.
      d. Communications, Limited Purpose: Type CMX
      e. Multipurpose: Type MP or MPG
      f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.
      g. Multipurpose, Riser Rated: Type MPR, complying with UL 1666.

2.12 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. CommScope, Inc.

B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

C. Connecting Blocks: 110-style IDC for Category 6A. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
   1. Number of Terminals per Field: One for each conductor in assigned cables.

E. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
   1. Number of Jacks per Field: One for each four-pair UTP cable indicated plus spares and blank positions adequate to suit specified expansion criteria.

F. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.

G. Patch Cords: Factory-made, four-pair cables in 1 Foot length for patch panel end and 10 Foot for outlet end lengths; terminated with eight-position modular plug at each end.
   1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6A performance. Patch cords shall have latch guards to protect against snagging.
   2. Patch cords shall have color-coded boots for circuit identification.
   3. Provide an additional 25% more than the total terminations at patch panels.

2.13 LOW-VOLTAGE CONTROL CABLE

A. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with NFPA 262.

2.14 CONTROL-CIRCUIT CONDUCTORS

A. Class 1 Control Circuits: Stranded copper, Type THHN-THWN, in raceway, complying with UL 83.
B. Class 2 Control Circuits: Stranded copper, Type THHN-THWN, in raceway, complying with UL 83.
C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or Type TF, complying with UL 83.

2.15 GROUNDING

A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems." for grounding conductors and connectors. B. Comply with ANSI-J-STD-607-A.

2.16 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.17 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.
B. Factory test cables on reels according to TIA/EIA-568-C.3.
C. Factory test singlemode optical fiber cables according to TIA/EIA-526-14-A and TIA/EIA-568-C.3.
D. Cable will be considered defective if it does not pass tests and inspections.
E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 PRODUCTION INSPECTIONS

A. The Contractor shall inspect all cable prior to installation to verify that it is identified properly on the reel identification label, that it is of proper gauge, containing correct number of pairs, and is the material ordered. Any physical damage to the cable and wire must be noted: nonuniform jacket thickness and jacket tightness should also be identified. Note any buckling of the jacket, which would indicate possible problems.
B. Installation approval by owner is required at each phase of construction as noted below. Proceeding without owner approval may result in rejection of work and/or installation and result in the contractor removing newly installed raceway, boxes, cables, racks, and etc (all system components).
1. Submittal documents (shop drawings).
2. Substitution requests.
3. Raceway Rough-in.
4. Rack location and installation.
5. Grounding.
6. Patch panel installation.
7. Contractor furnished electronics equipment.
8. Cable installation.
9. Cable terminations at Rack and faceplate.
10. Installation of faceplates.

3.2 INSTALLATION OF CABLES

A. Comply with NECA
B. General Requirements for Cabling:
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Consolidation points may be used only for making a direct connection to telecommunications outlet/connections:
   a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
   b. Locate consolidation points for UTP at least 49 feet (15 m) from communications equipment room.
5. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
6. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
7. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
8. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
9. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
10. Cold-Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not be used for heating.
11. In the communications equipment room, install a 10-foot- (3-m-) long service loop on each end of cable.
12. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
13. Cable shall not be draped on, tied or otherwise secured to electrical conduit, plumbing, ventilation ductwork or any other equipment. Cable shall be secured to building supports or hangers or to additional blocks or anchors specifically installed for this purpose.
14. Conduit and Raceway Usage: All communications cable shall be installed in grounded metal Conduit or raceway dedicated for communications purposes, when called for on the Project Drawings, and not to be shared with electrical wiring. Cable trays shall be installed in hallway above the suspended ceilings supported at a maximum of four-foot intervals. Cable tray path will be determined by owner and contractor and tray size as noted in specifications and on drawings.
15. Cable Lubricants: Lubrications may not be used at any time for installation of inside plant cable.
16. Conduit and Raceway Fill: In general, communication raceway shall not be filled beyond 40% capacity.
17. Backboard and Rack Cable Supports: Clamps, “D-Rings” and Velcro tie-wraps are all
Acceptable ways to support cable. However, installation of these supports must be
done with care so as not to cause crushing or distortion of the cable, nor cause
tighter bends than the minimum radius permitted for each type cable. Refer to
“Part 2-Products” of this specification section for specified supports and tie-wraps.
C. UTP Cable Installation:
b. Do not untwist UTP cables more than 1/2 inch (12 mm) from the point of
termination to maintain cable geometry.

C. Optical Fiber Cable Installation:
2. Cable may be terminated on connecting hardware that is rack or cabinet
mounted.

D. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunications
spaces with terminating hardware and interconnection equipment.
2. Cable shall not be run through structural members or in contact with pipes, ducts,
or other potentially damaging items.

E. Outdoor Coaxial Cable Installation:
1. Install outdoor connections in enclosures complying with NEMA 250, Type 4X.
Install corrosion-resistant connectors with properly designed O-rings to keep out
moisture.
2. Attach antenna lead-in cable to support structure at intervals not exceeding 36
inches (915 mm).

F. Group connecting hardware for cables into separate logical fields.

G. Separation from EMI Sources:
1. Comply with BICSI TDMM and TIA-569-B for separating unshielded copper voice
and data communication cable from potential EMI sources, including electrical
power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic
raceways and unshielded power conductors and electrical equipment shall be as
follows:
   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127
      mm).
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12
      inches (300 mm).
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches
      (610 mm).
3. Separation between communications cables in grounded metallic raceways and
unshielded power lines or electrical equipment shall be as follows:
   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches
      (64 mm).
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches
      (150 mm).
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches
      (300 mm).
4. Separation between communications cables in grounded metallic raceways and
power lines and electrical equipment located in grounded metallic conduits or
enclosures shall be as follows:
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches
      (76 mm).
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches
      (150 mm).
5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.3 DATA/TELEPHONE STATION CABLING

A. Cables shall be coiled in the in-wall or surface-mount boxes if adequate space is present to house the cable coil without exceeding the manufacturers bend radius. No more than 12” of slack shall be stored in an in-wall box. Excess slack may be neatly coiled and stored in the ceiling above each drop location when there is not enough space present in the outlet box to store slack cable. Each cable shall be labeled with a numbering scheme approved by the Owner, at each end of the cable.

B. In addition, each cable type shall be terminated as indicated below:
   1. Cables shall be dressed and terminated in accordance with the recommendations made in the TIA/EIA-568-A document, manufacturer’s recommendations and/or best industry practices.
   2. Pair untwist at the termination shall not exceed one-half an inch for Category 6A connecting hardware.
   3. Bend radius of the cable in the termination area shall not be less than 10 times the outside diameter of the cable.
   4. The cable jacket shall be maintained as close as possible to the termination point.
   5. Voice jacks in horizontally oriented faceplates shall occupy the left-most position(s). Modem jacks shall be considered the last voice jack in the sequence.

C. Station drop cable terminations shall be made at the data port at the patch panel and the same data outlet at the data/telephone station location. Label patch panel port and station outlet the same. At each outlet box, a sufficient length of spare cable will be provided for terminating outlet devices such that the outlet can be easily removed and inspected.

D. If a J-hook or trapeze system is used to support cable bundles all horizontal cables shall be supported at a maximum of four-foot intervals. At no point shall cable(s) rest on acoustic ceiling grids or panels.

E. Horizontal distribution cables shall be bundled in groups of not greater than 40 cables. Cable bundle quantities in excess of 40 cables may cause deformation of the bottom cables within the bundle.

F. Cables shall not be attached to ceiling grid or lighting support wires. Where light support for drop cable legs is required, the contractor shall install clips to support the cabling.

G. The installation of cables around movable devices, instruments, sub panels, etc., shall be provided with adequate support, length, protection, and flexibility so that the cable is not damaged in the event the equipment is moved.

H. Data cable may be run perpendicular, parallel or at 45 degrees to building grid lines (excluding radial and circulate grid lines). Cable in ceilings and below raised floor areas shall be grouped and wrapped in Velcro bundles of two or more cables as appropriate. Every attempt shall be made to avoid running telecommunications close to (less than 24”) and parallel to power raceway and wiring, or close to light fixtures.

3.4 MDF/IDF BACKBOARD CABLING

A. Cable installation must conform to the Project Drawings. All cabling shall be routed so as to avoid interference with any other service or system, operation, or maintenance purposes such as access boxes, ventilation mixing boxes, access hatches to air filters, switch or electrical outlets, electrical panels, fire alarm equipment, clock systems, and lighting fixtures. Avoid crossing areas horizontally just above or below any riser conduit.
Lay and dress cables to allow other cables to enter the conduit/riser without difficulty at a later time by maintaining maximum distance from these openings.

B. Cable shall be routed as close as possible to the ceiling, floor, or corners to insure that adequate backboard space is available for current and future equipment and for cable terminations. Cables shall not be tie-wrapped to existing electrical conduit or other equipment. Minimum bend radius shall be observed.

C. Lay cables via the shortest route directly to the nearest edge of the backboard from the mounted equipment or block. Lace or tie-clamp all similarly routed cables together, and attached by means of clamps screwed to the outside edge(s) of the backboard vertically and/or horizontally, then route via “square” corners over a path that will offer minimum obstruction to future installations of equipment, backboards, or other cables.

3.5 BACKBONE CABLE

A. Backbone cables shall be installed separately from horizontal distribution cables.

B. Where backbone cables and distribution cables are installed in a cable tray, backbone cables shall be installed first and bundled separately from the horizontal distribution cables.

3.6 CABLE LABELING

A. All cables shall be labeled at each end with the same numbering scheme as approved by West Ada School District.

B. The Contractor shall follow the West Ada School District approved labeling scheme for both faceplate and patch panel location (shown below). All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme. Patch Panels shall be labeled A, B, C.... Z continuous without skipping letters for each rack. The Panels shall be labeled on both front and back of Panel. See labeling example below.

C. All label printing will be machine generated label using black on clear adhesive Mylar tape. Self-laminating labels will be used on cable jackets, appropriately sized to the outside diameter of the cable, and placed within view at the termination point on each end. Outlet labels will be the manufacturer’s labels provided with the outlet assembly. The specific nomenclature for labels shall follow West Ada School District labeling Scheme.

D. Station Faceplate and Patch Panel Labeling. Each station outlet terminal shall be identified and marked on the patch panel as described below:

E. All devices that are connected to the network but use a biscuit instead of a wall jack that prevents the user from seeing the jack information w/o having to unmount the device such as wireless access points clock, speakers, and cameras need to be labeled clearly on the device with the IDF and patch panel information. The labeling font need to be large enough that it can be read by a person who may be ground level but the device is mounted on a wall or ceiling.
Labeling of comm room example

Comm Room ID & Rack Number on top of each rack (per allocation)

Rack #
3.7  WIRING METHODS

A.  Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, in attics, and in gypsum board
partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for raceways and boxes specified in Division 26 Section "Raceway and Boxes for Electrical Systems."

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.8 INSTALLATION OF PATHWAYS

A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A.

B. Comply with requirements for demarcation point, pathways, cabinets, and racks specified in Division 27 Section "Communications Equipment Room Fittings." Drawings indicate general arrangement of pathways and fittings.

C. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.

D. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.

E. Install manufactured conduit sweeps and long-radius elbows whenever possible.

F. Pathway Installation in Communications Equipment Rooms:
   1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
   2. Install cable trays to route cables if conduits cannot be located in these positions.
   3. Secure conduits to backboard when entering room from overhead.
   4. Extend conduits 3 inches (76 mm) above finished floor.
   5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

G. Backboards: Install backboards with 96-inch (2440-mm) dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

3.9 FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping." Comply with TIA/EIA-569-A, Annex A, "Firestopping."

B. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.10 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with ANSI-J-STD-607-A.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.11 FIELD QUALITY CONTROL
A. Perform tests and inspections.

B. Tests and Inspections:
   2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
   3. Test UTP copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
      a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

C. Testing UTP Cables and Links
   1. All UTP cabling will be certified to meet and or exceed the specifications as set forth in the Link Performance Testing Specifications in the Transmission Performance Specifications for Field-Testing of Unshielded Twisted-Pair Cabling Systems, TIA/EIA 568-B.2-1 (current draft) using a level III field tester. Certifications shall include the following parameters for each pair of each cable installed (parameters shall be tested up to a frequency sweep of 500 MHz):
      a. Wire map (pin to pin connectivity)
      b. Length (in feet)
      c. Attenuation
      d. Near End Crosstalk (NEXT)
      e. Far End Crosstalk (FEXT)
      f. ELFEXT
      g. Attenuation/Crosstalk Ration (ACR)
      h. Return Loss
      i. Propagation Delay
      j. Delay Skew
      k. Test equipment shall be able to provide an electronic soft copy and printed hard copy record of these tests. Test equipment shall be a Fluke Networks DTX-1200 or Fluke Networks DTX-1800 tester.
      l. Owner reserves the right to hire an independent testing company to spot check the test results. If the results vary more than 10% from the results submitted by the Contractor, the Contractor will be required to prove their results are correct or will need to retest the entire system.
      m. Testing must be conducted using a Fluke tester (DTX1800 or higher) and cable type must be entered into test parameters (2091 or 1091) to guarantee correct NVP is being used during testing.

2. Optical Fiber Cable Tests:
   a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568.C. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
   b. Link End-to-End Attenuation Tests:
      1) Horizontal and Singlemode backbone link measurements: Test at 1310 and 1550nm bidirectional according to TIA/EIA-568.C, Method B, One Reference Jumper.
      2) The Optical Fiber Link Loss Budget used for testing the Fiber
backbone cabling should be determined by utilizing the CommScope Link Loss Calculator. This value should be entered into the Testing Equipment to accurately test the fiber backbone.

D. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

E. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

F. End-to-end cabling will be considered defective if it does not pass tests and inspections.

G. Immediate fix of that cable and apparatus shall be done if it fails the test. Do not move onto next cable until that failed cable has a passing test.

H. Prepare test and inspection reports.

3.12 AS-BUILT DRAWINGS

A. The Cabling Contractor shall provide three sets of As-Built drawings to the Owner, which clearly indicates:

1. A floor plan of the building showing the AS-Built location of data drops, conduit runs, and terminal cabinets.

2. A listing of all stations with each data drop clearly identified according to system labeling scheme. Show all ports and punch downs.
Single Rack Configuration:
Dual Rack Configuration:

DATA Network

END OF SECTION 27 13 00
PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
   A. This Section includes equipment for public address and sound systems.

1.3 DEFINITIONS
   A. Channels: Separate parallel signal paths, from sources to loudspeakers or loudspeaker zones, with separate amplification and switching that permit selection between paths for speaker alternative program signals.
   B. Zone: A separate group of loudspeakers and associated supply wiring that may be arranged for selective switching between different channels.

1.4 WORK INCLUDED
   A. System Functions: Include the following:
      1. Amplifiers
      2. Ceiling speakers
      3. Suspended speakers
      4. Equipment Racks
      5. VOIP Interface Units
      6. Wiring for Equipment and final connection of speakers
      7. Test, operational and demonstration of system operation.

1.5 SUBMITTALS
   A. The submittal package shall include the following, grouped by system location (i.e. Gymnasium, commons, etc.):
      1. Installer and supplier qualifications.
      2. A list of components and quantities for each piece of equipment.
      3. Product data for each piece of equipment in order matching the list of components.
      4. Indicate the specific product part number and options if more than one is listed in the data.
      5. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, required clearances, method of field assembly, components, and location of each field connection. Include control panel layouts, rack layouts and wiring diagrams for each system.
      6. Maintenance data, where applicable.
      7. Warranty information.

1.6 QUALITY ASSURANCE
   A. Installer Qualifications: An experienced installer who is an authorized representative of equipment manufacturer for both installation and maintenance of equipment required for this
section.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in the NEC, Article 100, by a testing agency acceptable to authorities having jurisdiction.

C. Comply with the NEC.

D. Comply with UL 50.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: As indicated in section 2.2 for each system.

2.2 SYSTEMS AND COMPONENTS

A. Public Address System: PA system shall be Berbee Informacast IP paging system.

1. Coordinate features to form an integrated system. Match components and interconnections for optimum performance of specified functions.

2. Equipment: Modular type, using solid-state components, fully rated for continuous duty, unless otherwise indicated. Select equipment for normal operation on input power usually supplied at 110 to 130 V, 60 Hz.

3. Amplifiers: Bogen V250 series power amplifier, 70V output, 250W with rack mounting kit. Provide quantity as required for system operation plus 50% spare capacity.

4. IP Ceiling speakers: Valcom VIP-120 -IC, 8-inch round speaker, white baffle, flush mounted. Provide quantity as indicated on the plans.

5. IP speaker clock combination units: Valcom VIP-412-DF-IC, flush mounted. Provide quantity as indicated on the plans.

6. IP Surface speakers: Valcom VIP-120-IC, 8-inch, round speaker, white baffle. Provide and install V-9816M back box, paint white. Provide quantity as indicated on drawings.

7. VOIP Interface unit: Atlas Soundolier IPS-ZC2 VOIP interface. Rack mounted

8. Equipment Rack: Comply with EIA-310-D. House amplifiers and auxiliary equipment in standard EIA 19-inch racks with the telecommunications equipment.

   a. Group items of same function together, either vertically or side by side, and arrange controls symmetrically.


   c. Arrange all inputs, outputs, interconnections, and test points so they are accessible at rear of rack for maintenance and testing, with each item removable from rack without disturbing other items or connections.

   d. Blank Panels: Cover empty space in equipment racks so entire front of rack is occupied by panels.

   e. Enclosure Panels: Ventilated rear and sides and solid top. Use louvers in panels to ensure adequate ventilation.


   g. Power-Control Panel: On front of equipment housing, with a master power on/off switch and pilot light, and socket for a 5-A, indicating, cartridge fuse for rack equipment power.

   h. Service Light: At top rear of rack and control by an adjacent switch.

   i. Vertical Plug Strip: Grounded receptacles, 12 inches on center the full height of rack, to supply rack-mounted equipment.

   j. Maintenance Receptacles: Duplex convenience outlets supplied independent of equipment plug strip and located in front and bottom rear of rack.

   k. Spare Capacity: 20 percent spare space capacity in rack for future equipment.

9. Cable and Conductors: Jacketed, twisted-pair and twisted-multipair, untinned, solid-copper conductors. All POE and IP cables associated with PA system shall be provided
according to, and installed as required by specification section 270130.

a. Insulation for Wire in Conduit: Thermoplastic, not less than 1/32 inch thick.

B. Gymnasium Sound System

1. Coordinate features to form an integrated system. Match components and interconnections for optimum performance of specified functions. Provide all mounting and support hardware for all equipment and devices.

2. Provide all power distribution/conditioning, remote power control, power sequencers and related equipment for each system.

3. Equipment: Modular type, using solid-state components, fully rated for continuous duty, unless otherwise indicated. Select equipment for normal operation on input power usually supplied at 110 to 130 V, 60 Hz.

4. Mixers: Provide all input/output (I/O) cards for each separate system as required for complete and operational systems.

5. Wireless Microphones: Provide all devices, power supplies, remote mount kits, pre-manufactured low loss antenna cables and all related devices and equipment for a complete installation.

6. All Auxiliary Input Jacks shall be 3.5mm/1.8” with stereo connections. The jacks shall be capable of accepting stereo devices. Each system is a mono system, provide signal combiner for each aux jack and make connections as required between devices and equipment as required. The signal combiners shall be located in the corresponding rack. Provide power supplies as required.

7. Record Out Jacks shall be 3.5mm/1/8” with stereo connections. The Record Out jack shall provide the same signal that is being recorded to allow the content to be recorded on a mobile device. The jacks shall be capable of sending a stereo signal but the Left and Right channels will be the mono source. Provide and install line level a signal amplifier for each record out jack and make connections as required between devices and equipment as required. The signal amplifiers shall be located in the corresponding rack. Provide power supplies as required.

8. All sound system face plates shall be stainless steel.

9. Assisted Listening devices indicated below are on a per system basis. Provide a separate channel for each system to prevent crossover between systems.

10. Components:

    a. Components:


<table>
<thead>
<tr>
<th>Component</th>
<th>Manufacturer</th>
<th>Item Number</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall Mounted Rack – 24U</td>
<td>Atlas Sound</td>
<td>324-15</td>
<td>1</td>
</tr>
<tr>
<td>Caster Kit</td>
<td>Atlas Sound</td>
<td>CT31A</td>
<td>1</td>
</tr>
<tr>
<td>Digital Mixer</td>
<td>TOA</td>
<td>D-901</td>
<td>1</td>
</tr>
<tr>
<td>Security Cover</td>
<td>Mid Atlantic</td>
<td>SECL-3</td>
<td>1</td>
</tr>
<tr>
<td>Digital Mixer Remote</td>
<td>TOA</td>
<td>D-911</td>
<td>1</td>
</tr>
<tr>
<td>Amplifier (Main Floor)</td>
<td>TOA</td>
<td>DA-500F-HL</td>
<td>1</td>
</tr>
<tr>
<td>Amplifier (Bleachers)</td>
<td>TOA</td>
<td>DA-250DH</td>
<td>1</td>
</tr>
<tr>
<td>Wireless Microphone System</td>
<td>Shure</td>
<td>ULXP24D/BETA58</td>
<td>1 (Dual System)</td>
</tr>
<tr>
<td>Antenna Splitter</td>
<td>Shure</td>
<td>UA221</td>
<td>As required</td>
</tr>
<tr>
<td>Audio Combiner/Line Conv.</td>
<td>RDL</td>
<td>TX-LC2</td>
<td>1 per Aux Input</td>
</tr>
<tr>
<td>Power Conditioner</td>
<td>Atlas Sound</td>
<td>AP-S20RT</td>
<td>2 (1 per circuit)</td>
</tr>
<tr>
<td>Storage Drawer 4U</td>
<td>Atlas Sound</td>
<td>SD4-14</td>
<td>1</td>
</tr>
<tr>
<td>Storage Drawer 6U</td>
<td>Atlas Sound</td>
<td>SD6-14</td>
<td>1</td>
</tr>
<tr>
<td>Blank Cover</td>
<td>Atlas Sound</td>
<td>As required</td>
<td></td>
</tr>
</tbody>
</table>
The equipment rack shall be wall mounted, and shall contain all rack mounted equipment for this system including storage drawers. Provide and install blank covers for all unused rack space.

Provide, install and program all required modules and system components for the digital mixer.

There shall be one mixer output for each amplifier channel. Provide equipment and programming as required to set the proper delays for each channel so the amplified audio is delivered in unison.

The remote for the digital mixer shall be located in the rack below the digital mixer. Provide programming and labeling to allow adjustment of each input channel with the remote unit faders. Provide programming and labeling to allow the level of each speaker zone to be adjusted as well as adjustment of mater volume with the remote unit output controls. Label the function of each fader and control with machine printed labels. Provide machine printed instruction for system operation on the inside of the front door.

The remote antennas shall be protected with a wire guard. Provide and install a wire guard that is large enough to allow the antennas to be adjusted in any direction. The antennas shall be aimed to provide the widest range of coverage in the gym space. Set the amplifier gain to manufactures recommendations based on cable length.

Provide and install one Microphone and one Auxiliary Input jack in the floorbox in the Gymnasium.

Provide and install be one Microphone and one Auxiliary Input jack located in the face on the motorized bleachers in the Gymnasium.

Provide and install Microphone and Auxiliary Input jacks at the locations indicated on the plans for this system. Note, there are locations on the plans indicated as Mic Only, no auxiliary jack is needed in these locations.

The Control Panel shall be flush mounted at the location indicated on the plans with remote On/Off Control for this system and Master Volume.
control. The Pilot Light switch shall illuminate when the system is On.

k. The following is a general aiming requirement for the North and South halves of the Gym: The speakers nearest the middle shall be aimed toward the edge of the court near the bleachers, the next row out shall be aimed near the first row of the bleachers (when extended) and the outer row shall be aimed near the 5th row from the top.

l. Assisted Listening Equipment. Provide at least 36 Assisted listening devices. A minimum of 9 of these devices shall be hearing-aid compatible per IBC 1108.2.6. Provide all required system components, amplifiers, transmitters, antennas, cabling, etc as required for a fully operational system.

C. Commons Sound System

1. Coordinate features to form an integrated system. Match components and interconnections for optimum performance of specified functions. Provide all mounting and support hardware for all equipment and devices.

2. Provide all power distribution/conditioning, remote power control, power sequencers and related equipment for each system.

3. Equipment: Modular type, using solid-state components, fully rated for continuous duty, unless otherwise indicated. Select equipment for normal operation on input power usually supplied at 110 to 130 V, 60 Hz.

4. Mixers: Provide all input/output (I/O) cards for each separate system as required for complete and operational systems.

5. Wireless Microphones: Provide all devices, power supplies, remote mount kits, pre-manufactured low loss antenna cables and all related devices and equipment for a complete installation.

6. All Auxiliary Input Jacks shall be 3.5mm/1.8” with stereo connections. The jacks shall be capable of accepting stereo devices. Each system is a mono system, provide signal combiner for each aux jack and make connections as required between devices and equipment as required. The signal combiners shall be located in the corresponding rack. Provide power supplies as required.

7. Record Out Jacks shall be 3.5mm/1/8” with stereo connections. The Record Out jack shall provide the same signal that is being recorded to allow the content to be recorded on a mobile device. The jacks shall be capable of sending a stereo signal but the Left and Right channels will be the mono source. Provide and install line level a signal amplifier for each record out jack and make connections as required between devices and equipment as required. The signal amplifiers shall be located in the corresponding rack. Provide power supplies as required.

8. All sound system face plates shall be stainless steel.

9. Assisted Listening devices indicated below are on a per system basis. Provide a separate channel for each system to prevent crossover between systems.

10. Components

a. Components:

<table>
<thead>
<tr>
<th>Component</th>
<th>Manufacture</th>
<th>Item Number</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall Mounted Rack – 16U</td>
<td>Atlas Sound</td>
<td>316-15</td>
<td>1</td>
</tr>
<tr>
<td>Modular Mixer/Pre-Amp</td>
<td>TOA</td>
<td>M-900MK2</td>
<td>1</td>
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<td>Mixer I/O Cards</td>
<td>TOA</td>
<td></td>
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<tr>
<td>Rack Kit</td>
<td>TOA</td>
<td>MB-25B</td>
<td>1</td>
</tr>
<tr>
<td>Amplifier(s)</td>
<td>TOA</td>
<td>DA-500F-HL</td>
<td>1</td>
</tr>
<tr>
<td>Wireless Microphone System</td>
<td>Shure</td>
<td>ULXP24D/BETA58</td>
<td>1 (Dual System)</td>
</tr>
<tr>
<td>Antenna Splitter</td>
<td>Shure</td>
<td>UA221</td>
<td>As required</td>
</tr>
<tr>
<td>Audio Combiner/Line Conv.</td>
<td>RDL</td>
<td>TX-LC2</td>
<td>1 per Aux Input</td>
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### Component List

<table>
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<th>Manufacture</th>
<th>Item Number</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>Power Conditioner</td>
<td>Atlas Sound</td>
<td>AP-S20RT</td>
<td>2 (1 per circuit)</td>
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<td>Storage Drawer 4U</td>
<td>Atlas Sound</td>
<td>SD4-14</td>
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<tr>
<td>Storage Drawer 6U</td>
<td>Atlas Sound</td>
<td>SD6-14</td>
<td>1</td>
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<tr>
<td>Blank Covers</td>
<td>Atlas Sound</td>
<td>As required to</td>
<td></td>
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<tr>
<td>Active Antenna Amplifier</td>
<td>Shure</td>
<td>UA830STV</td>
<td>4</td>
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<tr>
<td>Remote Antenna</td>
<td>Shure</td>
<td>UA820</td>
<td>2</td>
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<tr>
<td>Hand Microphone w/switch</td>
<td>Shure</td>
<td>SM58S</td>
<td>2</td>
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<tr>
<td>Microphone Cord</td>
<td>Monster</td>
<td>S Series 25 ft</td>
<td>2</td>
</tr>
<tr>
<td>Microphone Cord</td>
<td>Monster</td>
<td>S Series 50 ft</td>
<td>2</td>
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<tr>
<td>Microphone Stand</td>
<td>Atlas Sound</td>
<td>MS-10CE</td>
<td>2</td>
</tr>
<tr>
<td>Remote Control Panel</td>
<td>FSR</td>
<td>WB-3G-4/C</td>
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</tr>
<tr>
<td>Master Volume Control</td>
<td>Custom</td>
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<td></td>
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<tr>
<td>On/Off Control w/Pilot Light</td>
<td>Custom</td>
<td>1</td>
<td></td>
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<tr>
<td>Microphone/Auxiliary Input Jack</td>
<td>2-Gang Cover</td>
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<tr>
<td>Microphone Input</td>
<td>XLR</td>
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<td></td>
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<tr>
<td>Auxiliary Input</td>
<td>3.5mm/1/8&quot;</td>
<td>1 per location</td>
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<td>Speakers (Color to be Selected during submittal process)</td>
<td>Atlas Sound</td>
<td>SM82T</td>
<td>As Indicated</td>
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<td>Speaker Wire (min size)</td>
<td>West Penn</td>
<td>AQ226</td>
<td>As Required</td>
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<td>Microphone/Input Wire</td>
<td>West Penn</td>
<td>77291</td>
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<td>Assisted Listening Devices</td>
<td>Williams Sound</td>
<td>PFM R33 Series</td>
<td>As Noted Below</td>
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</tbody>
</table>

b. The equipment rack shall be wall mounted, and shall contain all rack mounted equipment for this system including storage drawers. Provide and install blank covers for all unused rack space.

c. The remote antennas shall be adjusted to provide line-of-site in the entire space for optimal microphone pickup. There shall be 2 active amplifiers per antenna, one shall be in-line approximately halfway between the receivers and each antenna the second shall be located at the antenna. Set the amplifier gain to manufactures recommendations based on cable length.

d. Provide and install Microphone and Auxiliary Input jacks at the locations indicated on the plans for this system.

e. The Control Panel shall be flush mounted at the location indicated on the plans with remote On/Off Control for this system and Master Volume control. The Pilot Light switch shall illuminate when the system is On.

f. The speakers shall be connected such that they are zoned in groups from North to South and distributed evenly. There shall be one zone for each amplifier channel.

g. Assisted Listening Equipment. Provide at least 36 Assisted listening devices. A minimum of 9 of these devices shall be hearing-aid compatible per IBC 1108.2.6. Provide all required system components, amplifiers, transmitters, antennas, cabling, etc. as required for a fully operational system.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION
A. Install equipment to comply with manufacturer’s written instructions.
B. Install the caster kit for the wall mounted racks to support the center section of the rack where indicated.
C. All speakers located in grid ceilings shall have support that spans the grid, insulated back boxes and tied off to structure as required by code.
D. Wiring Method: ALL 70.7Vrms speaker wiring shall be in separate conduit from all other cables. Provide flex connection to all speakers, coordinate flex connection to speakers and speaker back boxes. All microphone, aux input, remote volume controls, on/off control, record out, etc. shall be in conduit. See Section 260533 for conduit requirements.
E. Speaker Wiring: The quantity of speakers shall be balanced between the available channels on the amplifiers for each system. The systems are made up of 2 channel and 4 channel amplifiers. All channels on each amplifier shall be used, UNO.
F. Balanced Wiring: All audio circuits shall be balanced throughout the system where possible.
G. Testing: Contractor shall test each input channel individually and as a mix to ensure the proper settings are applied to the mixers, delays, amplifier gain.
H. Manual Mixers: Contractor shall provide proper settings for each channel. The optimal level shall be labeled for each channel on the mixer.
I. Digital Mixers: Contractor shall provide programming for each input and output. Provide the optimal settings for each channel. Utilize manufactures software to program the equipment. Provide programming for the remote unit associated with each digital mixer. Install the Security cover over the digital mixer controls.
J. Wireless Systems: The contractor shall coordinate the programming of the wireless system bands and frequencies based on data from the manufacture for the local area. The settings shall prevent the separate systems from interfering with each other assuming that all systems on the campus are all operating at the same time. The settings shall also be coordinated with the auditorium wireless systems specified and provided by other divisions.
K. Handheld microphones, wireless microphones, transmitters, cables and related equipment to be stored in the equipment rack for each system.
L. Provide blank plates for all un-used junction box gangs.
M. Assisted listening devices to be stored in a separate drawer from the other equipment.
N. Labeling: All labels shall be machine printed with permanent black ink on white background.
O. Digital Mixers: Label each input/output as to the source/destination.
P. Digital Mixer Remote: Label each input fader at to the source, each volume control as to what speaker(s) it controls, each switch as to it specific function.
Q. Manual Mixers: Label each input/output as to the source and destination. Label each level control as to the source that is connected. Also, label each channel as to the proper setting for normal operation.
R. Amplifiers: Label each amplifier as to the speakers or sets of speakers it supplies. Label each amp channel as to the speakers it supplies. Label each adjustable dial as to the proper setting for normal operation.
S. Label each wire as to its source and destination for all systems.
T. Label the drawers as to the contents and quantities stored in each drawer.
U. Wireless Microphone Systems: Label each transmitter and receiver with the location and mic number. For the systems that have a handheld and a body pack tied to the same receiver, provide a label on the inside of the rack door that explains that only one of the microphones for receiver # may be used at a time.
V. Label each key as to which system and component it is for.
W. Wiring Method: Install wiring in raceway except within consoles, desks, and counters. Conceal cable and raceway except in unfinished spaces.
X. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess. Use lacing bars in cabinets.
Y. Control-Circuit Wiring: Install number and size of conductors as recommended by system manufacturer for control functions indicated.
Z. Separation of Wires: Separate speaker-microphone, line-level, speaker-level, and power wiring runs. Install in separate raceways or, where exposed or in same enclosure, separate conductors at least 12 inches for speaker microphones and adjacent parallel power and telephone wiring. Separate other intercommunication equipment conductors as recommended by equipment manufacturer.

AA. Splices, Taps, and Terminations: Make splices, taps, and terminations on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

BB. Match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.

CC. Identification of Conductors and Cables: Color-code conductors and apply wire and cable marking tape to designate wires and cables to identify media in coordination with system wiring diagrams.

DD. Wall-Mounting Outlets: Flush mounted.

EE. Conductor Sizing: Unless otherwise indicated, size speaker circuit conductors from racks to loudspeaker outlets not smaller than No. 18 AWG and conductors from microphone receptacles to amplifiers not smaller than No. 22 AWG.

FF. Weatherproof Equipment: Install units that are mounted outdoors, in damp locations, or where exposed to weather consistent with requirements of weatherproof rating.

GG. Line Matching Transformer Connections: Make initial connections using tap settings indicated on Drawings.

HH. Provide and install all hardware required to integrate paging system with VOIP interface in the equipment rack. All interface connections shall be coordinated and completed in accordance with manufacturer’s requirements.

3.2 GROUNDING

A. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment cabinet. Isolate from power system and equipment grounding.

C. Audio circuits shall also observe the grounding practices outlined in “Sound System Engineering”, Don Davis, 1987, SAM Press.

3.3 FIELD QUALITY CONTROL

A. Operational Test: Perform tests that include originating program and page material at microphone outlets, preamplifier program inputs, and other inputs. Verify proper routing and volume levels and freedom from noise and distortion. Correct deficiencies and retest, if required.

B. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Prepare a list of final tap settings of paging speaker-line matching transformers.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train owner’s maintenance personnel to adjust, operate, and maintain equipment.
   1. Train owner’s maintenance personnel on programming equipment for starting up and shutting down, troubleshooting, servicing, and maintaining equipment.
   2. Review data in maintenance manuals.

END OF SECTION 27 51 16
SECTION 27 52 00
CLASSROOM AUDIO SYSTEM

PART 1. – GENERAL

1.1 REGULATORY REQUIREMENTS

A. Conform to (applicable) (specify specific citations) building code for requirements applicable to work specified herein.
B. Conform to appropriate sections of (specify) with regard to applicable requirements (specify).

1.2 QUALITY ASSURANCE

A. Qualifications
   1. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
   2. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction, approving acceptable installer and approving application method.

B. Acceptable Manufacturers
   1. Basis of Design: Lightspeed Technologies, 11509 SW Herman Road, Tualatin, OR 97062, PH 800-732-8999, FAX 503-684-3197
   2. Manufacturer Testing: Manufacturer to provide quality assurance certification for each system and all of its components. A report for each system will be available upon request. Report will include serial numbers and pertinent testing data for all of the system functions.

D. Successful third-party installation (when needed) will be supplied with necessary training to allow for product installation certification by Manufacturer and will be installed according to Lightspeed recommendations.

1.3 SUBMITTALS

A. General: Submit listed submittals in accordance with “Conditions of the Contract”.
B. Manufacturer’s data on all products including but not limited to:
   1. Catalog cut sheets
   2. Installation instructions
   3. Typical wiring diagrams
   4. Drawings showing speaker locations
   5. Operation and maintenance manuals
   6. Manufacturer’s warranty documents
   7. Manufacturer’s parts lists
   8. Product serial numbers

1.4 WARRANTY

A. Warranty: Refer to “Conditions of the Contract” for warranty and repair provisions.
B. Repair: Manufacturer shall offer repair service on all Classroom Audio components. Owner shall pre-pay shipping for all items returned to manufacturer for repair. The Manufacturer shall repair or replace system components as specified under warranty. Manufacturer shall
ship repaired components within five (5) working days of receipt. Items returned to Owner are shipped via the same method in which they were received.

C. Manufacturer’s Warranty: All the major system components (transmitters, receiver-amplifier, sensor, and speakers) must be warranted for five years against defects occurring while used in normal classroom instruction. The warranty shall be equivalent to a Lightspeed Technologies' Five-Year Warranty.

1. Submit, for Owner’s acceptance, manufacturer’s standard warranty document executed by authorized company official. Manufacturer’s warranty is in addition to, and not a limitation of, other rights Owner may have under the Contract Documents.

1.5 OVERALL SYSTEM DESCRIPTION

A. The system must have specifications and features that are equivalent to the Lightspeed Topcat® In-Ceiling Classroom Audio System including the following:

1. All-in-one, in-ceiling audio system with integrated amplifier, speakers and wireless audio receiver/transmitter
2. Two-way hybrid speaker system with exciter technology sound panel and low frequency cone driver
3. Cross over technology to deliver high speech intelligibility and full range sound with even distribution throughout the classroom
4. Up to 2 microphones for whole room instruction, team-teaching or student sharing
5. Pendant-style Flexmike® classroom microphone with audio input utilizing Access Technology (1.9 GHz) for transmission. IR not acceptable
6. Wireless Media Connector utilizing Access Technology (1.9 GHz) to integrate with and wirelessly transmit all classroom multimedia to be played through the Topcat
   a. Includes 4 audio inputs with volume control
   b. 2 audio outputs for ALD and/or recording with volume control
e. Tone control to remotely adjust bass/treble of Topcat
7. Optional PageFirst emergency page priority
8. In-Ceiling mounted
9. Suitable for use in air-handling spaces (plenum-rated)
10. Compatible with Flexcat speaker pods with 2-way audio communication

B. The system must produce high speech intelligibility and full-range multimedia quality sound with excellent distribution throughout a classroom.

C. The system must be capable to be installed in a classroom with no wires installed in or on the walls. The system must be fully operational without speaker wires or sensor cables.

D. The system must be compatible and expandable to operate with 2-way small group speaker pods allowing interoperability between both small group and whole group instruction.

E. The system shall carry a “No Audio Dropout Guarantee” between the wireless microphone and the sound system. The guarantee applies to operation in any room up to its expected range of 200 feet (assuming no walls). The guarantee does not extend into other rooms separated by walls as this can limit transmission range significantly. Should any dropout in audio transmission occur, the manufacturer will correct it at no additional charge.

F. The system shall carry a standard warranty equivalent to the Lightspeed 5-year Warranty.

1.6 OWNER INSTRUCTION

A. Owner’s Instruction: user-training will be performed by the manufacturer’s local representative. The training will include the research and benefits of classroom amplification, system operation, simple troubleshooting guidelines, and incorporating the classroom amplification into teaching styles. The manufacturer will also provide additional
training in trouble-shooting techniques and product return procedures to one specified person per campus. This service shall be rendered to the Owner at no additional cost.

B. Instruction materials and detailed Owner's manual shall be provided to cover operational and basic maintenance procedures.

PART 2. PRODUCTS

2.1 IN-CEILING CLASSROOM AUDIO SYSTEM SPECIFICATIONS

A. Overall System:
   1. Power output: 20 Watts rms
   2. Acoustic Frequency response: 60 Hz to 18 kHz -10dB
   3. AC Mains Power Input: 100-240V ~ 50/60Hz 1.5A
   4. DC Power Input: 24V/2.5A
   5. Signal-to-noise: 60 dB
   6. Total Harmonic Distortion: <1%, 10 W
   7. Wireless Communication: Access Technology (1.9 GHz + RF4CE)
   8. Automatic power down after 2 hour of inactivity
   9. Automatic power on when Flexmike is powered on and linked
   10. Dimensions (W x D x H): 24” x 12” x 3.7” (Removable side spacers to fit international ceiling grids; 595mm x 295mm x 94mm)
   11. Weight: 13.5 lbs (6.1 kg)
   12. Controls:
      a. (1) Microphone volume control
      b. (1) Tone control
      c. (1) Audio input volume control
      d. (1) PageFirst sensitivity adjustment
   13. Connections:
      a. (1) Direct AC mains power input
      b. (1) Optional DC Power Input
      c. (1) Audio input
      d. (1) Optional Page mute (PageFirst™) input (Euro-block)
   14. Device Registration: push button for transmitter(s), remote(s), speaker pods
   15. Wireless audio range: up to 200 feet
   16. Integrated 2-Way Hybrid Speaker System:
      a. Description: exciter technology sound panel plus low frequency cone driver
      b. Integrated cross-over technology
      c. Panel Size: 13.75” x 6.75”
      d. Cone Driver Size: 5.25”
      e. Overall Frequency Response: 60 Hz to 18 kHz -10dB
      f. Impedance: 8 Ω
      g. Power Handling: 25 W

B. The in-ceiling classroom audio system shall use bi-directional wireless Access Technology to communicate with up to two wireless microphones.

C. The in-ceiling classroom audio system shall use bi-directional wireless Access Technology to integrate with other audio sources in the classroom.

D. The in-ceiling classroom audio system shall use bi-directional wireless Access Technology to send a mixed audio output to a media connector located at a convenient/student accessible location in the classroom.

E. The in-ceiling classroom audio system shall use bi-directional wireless Access Technology to communicate with up to 6 optional tabletop speaker pods available to facilitate small group instruction.
F. The all-in-one system must contain a Page mute function (PageFirst™) that passively detects the audio signal of a page coming through the PA system without compromising system performance or voiding warranties. As an audio signal is sent to the PA speaker, the PageFirst passive sensor clip detects that signal and immediately mutes the Topcat.

2.2 WIRELESS MEDIA CONNECTOR

A. Description: Wireless audio transmitter/receiver to integrate with classroom audio sources and send/receive the wireless to the Topcat system in the ceiling.
B. Wireless Communication: Access Technology (1.9 GHz)
C. Audio Inputs: (4) 3.5mm stereo jacks connect to classroom audio sources.
D. Audio Outputs: (2) 3.5mm jack with volume control
E. (1) Microphone volume control
F. (1) Audio input volume control
G. (1) Audio output volume control
H. (1) Power button with LED
I. (1) Tone control
J. (1) Registration button with Registration LED and linked LED
K. Audio frequency response: 80 Hz to 7 kHz ±3 dB
L. Audio distortion: <1%
M. DC Power Input: USB 5V/0.2A (type micro-B)
N. Mounting: table-top or wall
O. Dimensions (W x D x H): 7.6”x 4.1”x 1.1” (193 x 104 x 28mm)

2.3 FLEXMIKE PENDANT-STYLE MICROPHONE / TRANSMITTER

A. Description: the pendant-style wireless microphone
B. Lanyard: adjustable length with magnetic clasp
C. Wireless communication: bi-directional Access Technology (1.9 GHz)
D. Audio distortion: <1%
E. Integrated microphone type: uni-directional electret
F. Audio input: 3.5mm
G. Earbud output: 3.5mm (for to monitor optional Flexcat pods)
H. Push button volume control: +/- 6dB (total range = 12 dB)
I. Power: on/off/mute button
J. Battery Power: 2.4V NiMH battery pack
K. Battery run time: 8 hours (fully charged)
L. Charging: 5V USB; type micro B connector
M. Alkaline Charge Protection: Yes
N. USB Audio: interface with computer USB audio while charging
O. Registration: push button for registration with Topcat
P. Dimensions (L x W x H): 2.9” x 1.1” x 1.0” (74 x 28 x 25mm)
Q. Weight: 1.8 oz (51g)

2.4 OPTIONAL SHAREMIKE HANDHELD MICROPHONE / TRANSMITTER

A. Description: handheld wireless microphone
B. Wireless communication: Access Technology (1.9 GHz)
C. Audio distortion: <1%
D. Integrated microphone type: uni-directional electret
E. Auxiliary Input: 3.5mm
F. Power: on/off/mute button
G. Battery Power: 2 AA NiMH rechargeable battery pack
H. Battery run time: up to 8 hours (fully charged)
I. Charging: 5V USB; 3.5mm DC jack
J. Alkaline Charge Protection: Yes
K. Registration: push button for registration with Topcat
L. Dimensions (L x W x H): 8.25” x 1.3” x 1.3”
M. Weight (with batteries): 7.9 oz

2.5 REGULATORY AND CERTIFICATIONS

A. The classroom audio system and its components shall be manufactured using lead-free processes and free of other materials harmful to the environment (RoHS and WEEE compliant).
B. The classroom audio system and its components shall be listed to UL/CUL standards and requirements for electrical safety by Underwriters Laboratories Inc.
C. The classroom audio system must be suitable for use in air handling spaces and carry appropriate certifications (UL 2043).
D. The classroom audio system and its components shall be CE Certified and conform with the essential requirements of the following European Union Directives: 2004/108/EC Electromagnetic Compatibility (EMC) and 2006/95/EC Low Voltage Directive (LVD).
E. The classroom audio system and its components shall comply with Part 15 of the FCC rules as a Class B digital device (FCC Certified).

PART 3. EXECUTION

3.1 SYSTEM PERFORMANCE

A. Install in accordance with Manufacturer’s installation instructions.
B. Final adjustment: Upon completion, the system shall be clean, adjusted and left in perfect operating condition. Transmitters shall be plugged in and charging and user manual should be left in a conspicuous place.
C. Provisions: There shall be no audible components of hum, noise, or distortion.

3.2 INSTALLATION

A. Provide and install Sound Reinforcement System in the locations shown on drawings as required.
B. All equipment and enclosures described in this specification shall be permanently attached to the structure and held firmly in place. Supports shall be adequate to support their loads per manufacturers specifications.
C. The process of testing the Audio Sound System may necessitate moving and adjusting certain component parts (ex. loud speakers). Contractor shall provide at no additional cost to the owner.
D. Take precautions as necessary to prevent and guard against electromagnetic and electrostatic noise interference.
E. Wireless Media Connector to be located per Owner’s request. Contractor to ensure all Media Connectors are properly registered and all volume controls are set properly via a field test in every classroom. Ensure power is available for Media Connector.

3.3 INTEGRATING THE TOPCAT WITH OTHER AUDIO SOURCES

The wireless Media Connector must have four audio inputs to allow other audio sources to be wirelessly transmitted and played through the Topcat system. Computers, DVD/VCR’s, TV’s, CD’s, MP3’s etc. may be connected into the Media Connector using appropriate patch cords. The Media Connector must also receive audio back from the Topcat to output the mixed audio signal of both microphone channels and multimedia.
for recording purposes and interface with assistive listening devices. See the systems integration chart below.

END OF SECTION 260501
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SECTION 280500
SECURITY SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This document includes a general description, functional requirements, operational characteristics, and criteria for the Access Control System.
   1. Access Control:
      a. Regulating access through doors.
      b. Visitor assignment.
      c. Surge and tamper protection.
      d. Credential cards and readers.
      e. Monitoring of field-installed devices.
      f. Reporting.

1.2 SYSTEM DESCRIPTION

A. System shall consist of field-installed Lenel OnGuard Controllers, connected by a high-speed electronic data transmission network to Owner’s existing Lenel OnGuard Security Management System.

B. Network(s) connecting PCs and Controllers shall consist of the following:
   1. Local area, IEEE 802.3 Fast Ethernet 10/100, star topology network based on TCP/IP.
   2. Connection of intelligent system controllers to the Lenel OnGuard Security Management System by TCP/IP protocol.

1.3 PERFORMANCE REQUIREMENTS

A. Distributed Processing: System shall be a fully distributed processing system so that information, including time, date, valid codes, access levels, and similar data, is downloaded to Controllers so that each Controller makes access-control decisions for that Location. Do not use intermediate Controllers for access control. If communications to Central Station are lost, all Controllers shall automatically buffer event transactions until communications are restored, at which time buffered events shall be uploaded to the Central Station.

B. System Network Requirements:
   1. Interconnect system components and provide automatic communication of status changes, commands, field-initiated interrupts, and other communications required for proper system operation.
   2. Communication shall not require operator initiation or response, and shall return to normal after partial or total network interruption such as power loss or transient upset.
   3. System shall automatically annunciate communication failures to the operator and identify the communication link that has experienced a partial or total failure.
   4. Communications Controller may be used as an interface between the Central Station display systems and the field device network. Communications Controller shall provide functions required to attain the specified network communications performance.

C. Field equipment shall include Controllers, sensors, and controls. Controllers shall serve as an interface between the Central Station and sensors and controls. Data exchange between the Central Station and the Controllers shall include down-line transmission of commands, software, and databases to Controllers. The up-line data exchange from the Controller to
the Central Station shall include status data such as status reports, and entry-control records. Controllers are classified as alarm-annunciation or entry-control type.

D. Data Line Supervision: System shall initiate an alarm in response to opening, closing, shorting, or grounding of data transmission lines.

E. Door Hardware Interface: Coordinate with Division 8 Sections that specify door hardware required to be monitored or controlled by the security access system. The Controllers in this Section shall have electrical characteristics that match the signal and power requirements of door hardware. Integrate door hardware specified in Division 8 Sections to function with the controls and PC-based software and hardware in this Section. Coordinate with automatically operated doors.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include operating characteristics, furnished specialties, and accessories. Test and evaluation data presented in Product Data shall comply with SIA BIO-01.

B. Shop Drawings:
   1. Wiring Diagrams. Show typical wiring schematics including the following:
      a. Intelligent System Controllers to Door Interface Modules.
      b. Card Reader to Controller.
      c. Typical Locking Hardware Interfaces.
   2. System One-line Drawing.

C. Field quality-control test reports.

D. Installer Qualification Certificates.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70, "National Electrical Code."

C. Supplier Qualifications: Lenel Systems Master Certified Dealer with warehousing facilities within fifty (50) miles of project site.
   1. The supplier shall be a factory authorized local service organization that shall carry a complete stock of parts and provide maintenance for the system and related systems under this contract. Local shall be defined as an area in a 50-mile radius of installed location.
   2. The supplier must locally (50-mile radius of installed location) employee a minimum of three (3) master level or equivalent certified Installers.

D. Installer Qualifications: Lenel Systems Master Certified Installer, within fifty (50) miles of project site, who can demonstrate successful completion of projects of similar size and scope.
   1. Installer must have current master level (or highest achievable) certification on proposed product.
   2. Installer must be within fifty (50) miles of project site and can demonstrate successful completion of projects of similar size and scope.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: System shall be capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:
1. Interior, Controlled Environment: System components, except central-station control unit, installed in temperature-controlled interior environments shall be rated for continuous operation in ambient conditions of 36 to 122 deg F, dry bulb and 20 to 90 percent relative humidity, noncondensing. NEMA 250, Type 1 enclosure.

PART 2 - SECURITY ACCESS CONTROL SYSTEM PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Lenel Systems International

2.2 SECURITY ACCESS SYSTEM

A. General: Examine contract documents and furnish equipment to provide access control at doors shown with card readers. Integrate new equipment with the Owner’s existing access control system. Provide seamless integration of new components. Establish communication with Owner’s existing Lenel Security Management System.

2.3 APPLICATION SOFTWARE

A. System Software: Existing School District Wide System. (Avigilon)
   1. No additional seat licenses required.
   2. Additional Reader Licenses when applicable.

B. Controller Software:
   1. Controllers shall operate as an autonomous intelligent processing unit. Controllers shall make decisions about access control, alarm monitoring, linking functions, and door locking schedules for its operation, independent of other system components. Controllers shall be part of a fully distributed processing control network. The portion of the database associated with a Controller and consisting of parameters, constraints, and the latest value or status of points connected to that Controller, shall be maintained in the Controller.
   2. Functions: The following functions shall be fully implemented and operational within each Controller:
      a. Monitoring inputs.
      b. Controlling outputs.
      c. Automatically reporting alarms to the Central Station.
      d. Reporting of sensor and output status to Central Station on request.
      e. Maintaining real time, automatically updated by the Central Station at least once a day.
      f. Communicating with the Central Station.
      g. Executing Controller resident programs.
      h. Diagnosing.
      i. Downloading and uploading data to and from the Central Station.
   3. Controller Operations at a Location:
      a. Location: Up to 32 Controllers connected to RS-485 communications loop. Globally operating I/O linking and anti-passback functions between Controllers within the same Location without central-station intervention. Linking and anti-passback shall remain fully functional within the same Location even when the Central Station is off line.
      b. In the event of communications failure between the Central Station and a Location, The Controllers at each Location shall be connected to a memory buffer with a capacity to store up to 10,000 events; there shall be no loss of
transactions in system history files until the buffer overflows.
c. Buffered events shall be handled in a first-in-first-out mode of operation.

4. Individual Controller Operation:
   a. Controllers shall transmit alarms, status changes, and other data to the Central Station when communications circuits are operable. If communications are not available, Controllers shall function in a stand-alone mode and operational data, including the status and alarm data normally transmitted to the Central Station, shall be stored for later transmission to the Central Station. Storage capacity for the latest 1024 events shall be provided at each Controller.
   b. Card-reader ports of a Controller shall be custom configurable for at least 8 different card-reader or keypad formats. Multiple reader or keypad formats may be used simultaneously at different Controllers or within the same Controller.
   c. Controllers shall provide a response to card-readers or keypad entries in less than 0.5 seconds, regardless of system size.
   d. Controllers that are reset, or powered up from a non-powered state, shall automatically request a parameter download and reboot to its proper working state. This shall happen without any operator intervention.
   e. Initial Startup: When Controllers are brought on-line, database parameters shall be automatically downloaded to them. After initial download is completed, only database changes shall be downloaded to each Controller.
   f. Failure Mode: On failure for any reason, Controllers shall perform an orderly shutdown and force Controller outputs to a predetermined failure mode state, consistent with the failure modes shown and the associated control device.
   g. Startup after Power Failure: After power is restored, startup software shall initiate self-test diagnostic routines, after which Controllers shall resume normal operation.
   h. Startup after Controller Failure: On failure, if the database and application software are no longer resident, Controllers shall not restart, but shall remain in the failure mode until repaired. If database and application programs are resident, Controllers shall immediately resume operation. If not, software shall be restored automatically from the Central Station.

5. Communications Monitoring:
   a. System shall monitor and report status of RS-485 communications loop of each Location.
   b. Communication status window shall display which Controllers are currently communicating, a total count of missed polls since midnight, and which Controller last missed a poll.
   c. Communication status window shall show the type of CPU, the type of I/O board, and the amount of RAM memory for each Controller.

C. PC-to-Controller Communications:
   1. Central-station communications shall use the following:
      a. TCP/IP LAN network interface cards.
   2. Serial Port Configuration: Each serial port used for communications shall be individually configurable for "direct communications," "modem communications incoming and outgoing," or "modem communications incoming only"; or as an ASCII output port.
   3. Multiport Communications Board: Use if more than two serial ports are needed.
      a. Expandable and modular design. Use a 4-, 8-, or 16-serial port configuration that is expandable to 32 or 64 serial ports.
      b. Connect the first board to an internal PCI bus adapter card.
4. Direct serial, TCP/IP, and dial-up communications shall be alike in the monitoring or control of system, except for the connection that must first be made to a dial-up Location.

5. TCP/IP network interface card shall have an option to set the poll frequency and message response time-out settings.

6. PC-to-Controller and Controller-to-Controller communications (direct, dial-up, or TCP/IP) shall use a polled-communication protocol that checks sum and acknowledges each message. All communications shall be verified and buffered and retransmitted if not acknowledged.

D. Direct Serial or TCP/IP PC-to-Controller Communications:
   1. Communication software on the PC shall supervise the PC-to-Controller communications link.
   2. Loss of communications to any Controller shall result in an alarm at all PCs running the communications software.
   3. When communications are restored, all buffered events shall automatically upload to the PC, and any database changes shall be automatically sent to the Controller.

E. Controller-to-Controller Communications:
   1. Controller-to-Controller Communications: RS-485, 4-wire, point-to-point, regenerative (repeater) communications network methodology.
   2. RS-485 communications signal shall be regenerated at each Controller.

2.4 SURGE AND TAMPER PROTECTION

A. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor-entry connection to components.

B. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station control-unit alarm display shall identify tamper alarms and indicate locations.

2.5 CONTROLLERS

A. Controllers: Intelligent peripheral control unit, complying with UL 294, that stores time, date, valid codes, access levels, and similar data downloaded from the Central Station for controlling its operation.

B. Battery Backup: Sealed lead acid; sized to provide run time during a power outage of 90 minutes, complying with UL 924.

C. Entry-Control Controller:
   1. Function: Provide local entry-control functions including one- and two-way communications with access-control devices such as card readers, electric strikes, electric latch retraction exit devices, door operators, and door operator actuators.
      a. Operate as a stand-alone portal Controller using the downloaded database during periods of communication loss between the Controller and the field-device network.
      b. Accept information generated by the entry-control devices; automatically process this information to determine valid identification of the individual present at the portal:
         1) On authentication of the credentials or information presented, check privileges of the identified individual, allowing only those actions granted as privileges.
         2) Privileges shall include, but not be limited to, time of day control,
day of week control, group control, and visitor escort control.

c. Maintain a date-, time-, and Location-stamped record of each transaction. A transaction is defined as any successful or unsuccessful attempt to gain access through a controlled portal by the presentation of credentials or other identifying information.

2. Inputs:
   a. Data from entry-control devices; use this input to change modes between access and secure.
   b. Database downloads and updates from the Central Station that include enrollment and privilege information.

3. Outputs:
   a. Indicate success or failure of attempts to use entry-control devices and make comparisons of presented information with stored identification information.
   b. Grant or deny entry by sending control signals to portal-control devices.
   c. Maintain a date-, time-, and Location-stamped record of each transaction and transmit transaction records to the Central Station.

4. With power supplies sufficient to power at voltage and frequency required for field devices and portal-control devices.

5. Data Line Problems: For periods of loss of communications with Central Station, or when data transmission is degraded and generating continuous checksum errors, the Controller shall continue to control entry by accepting identifying information, making authentication decisions, checking privileges, and controlling portal-control devices.
   a. Store up to 1000 transactions during periods of communication loss between the Controller and access-control devices for subsequent upload to the Central Station on restoration of communication.

6. Controller Power: NFPA 70, Class II power supply transformer, with 12- or 24-V ac secondary, backup battery and charger.
   a. Backup Battery: Premium, valve-regulated, recombinant-sealed, lead-calcium battery; spill proof; with a full 1-year warranty and a pro rata 19-year warranty. With single-stage, constant-voltage-current, limited battery charger, comply with battery manufacturer's written instructions for battery terminal voltage and charging current recommendations for maximum battery life.
   b. Backup Battery: Valve-regulated, recombinant-sealed, lead-acid battery; spill proof. With single-stage, constant-voltage-current, limited battery charger, comply with battery manufacturer's written instructions for battery terminal voltage and charging current recommendations for maximum battery life.
   c. Backup Power Supply Capacity: 90 minutes of battery supply. Submit battery and charger calculations.
   d. Power Monitoring: Provide manual dynamic battery load test, initiated and monitored at the control center; with automatic disconnection of the Controller when battery voltage drops below Controller limits. Report by using local Controller-mounted LEDs and by communicating status to Central Station. Indicate normal power on and battery charger on trickle charge. Indicate and report the following:
      1) Trouble Alarm: Normal power off load assumed by battery.
      2) Trouble Alarm: Low battery.
      3) Alarm: Power off.

7. Acceptable Products:
   a. Intelligent System Controllers (AC-MER-CONT-2DR)
b. Intelligent Dual Reader Controller (AC-MER-CON-MR51E)
c. Single Reader Interface Modules (AC-MER-CON-MR50)
d. Dual Reader Interface Modules (AC-MER-CON-MR52)

2.6 CARD READERS

A. Power: Card reader shall be powered from its associated Controller, including its standby power source.

B. Response Time: Card reader shall respond to passage requests by generating a signal that is sent to the Controller. Response time shall be 800 ms or less, from the time the card reader finishes reading the credential card until a response signal is generated.

C. Enclosure: Suitable for surface, semi-flush, or pedestal mounting.

D. Display: LED or other type of visual indicator display shall provide visual and audible status indications and user prompts. Indicate power on/off, whether user passage requests have been accepted or rejected, and whether the door is locked or unlocked.

E. Touch Plate and Proximity Readers: Coordinate with drawings and furnish proper card reader for application. Provide with mounting boxes or plates.

F. Acceptable Products:
   1. HID iClass Readers
      a. Exterior/Interior: (AC-HID-READ-ICLASS-SE-RK40)
      b. Interior foyer only: (AC-HID-READ-ICLASS-SE-R40)

2.7 DOOR HARDWARE INTERFACE

A. Exit Device with Electric Latch Retraction: Retract exit device latch momentarily upon presentation of valid credential at reader. Maintained retraction by user-defined time periods for push/pull operation.

B. Exit Device with latch Retraction and Automatic Door Operator:
   1. After Hours Function: Valid credential at exterior reader to momentarily retract exit device latch and enable exterior automatic door actuator.

2.8 POWER SUPPLIES

A. Field Hardware Power Supplies: Power supplies for field equipment shall be specifically designed for the equipment installed. Furnish only filtered and regulated power supplies sized to suit the hardware served. Provide with battery back-up and key locked enclosures.

B. Power Supplies for Locking Hardware: Coordinate with Section 08 – Door Hardware.

PART 3 - EXECUTION

3.1 PREPARATION

A. Comply with recommendations in SIA CP-01.

B. Fill in all data available from Project plans and specifications and publish as Project planning documents for review and approval.
   1. Record setup data for control station.
   2. For each Location, record setup of Controller features and access requirements.
   3. Propose start and stop times for time zones and holidays, and match up access levels for doors.
   4. Set up groups, facility codes, linking, and list inputs and outputs for each Controller.
   5. Assign action message names and compose messages.
   6. Set up alarms. Establish interlocks between alarms, intruder detection, and video
surveillance features.

7. Prepare and install alarm graphic maps.
8. Develop user-defined fields.
9. Discuss badge layout options.
10. Complete system diagnostics and operation verification.

3.2 CABELING

A. Comply with NECA 1, "Good Workmanship in Electrical Contracting."
B. Install cables and wiring according to requirements in Division 27 specifications
   A. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters. Conceal raceway and wiring except in unfinished spaces.
   B. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use NRTL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.
C. Install cables without damaging conductors, shield, or jacket.
D. Boxes and enclosures containing security system components or cabling, and which are easily accessible to employees or to the public, shall be provided with a lock. Boxes above ceiling level in occupied areas of the building shall not be considered to be accessible. Junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public shall be covered with a suitable cover plate and secured with tamperproof screws.
E. Install end-of-line resistors at the field device location and not at the Controller or panel location.

4.2 CABLE APPLICATION

A. Comply with EIA/TIA-569, "Commercial Building Standard for Telecommunications Pathways and Spaces."
B. Cable application requirements are minimum requirements and shall be exceeded if recommended or required by manufacturer of system hardware.
C. RS-485 Cabling: Install at a maximum distance of 4000 feet (1220 m).
D. Card Readers and Keypads:
   1. Install number of conductor pairs recommended by manufacturer for the functions specified.
   2. Unless manufacturer recommends larger conductors, install No. 22 AWG wire if maximum distance from Controller to the reader is 250 feet (75 m), and install No. 18 AWG wire if maximum distance is 500 feet (150 m).
   3. Install minimum No. 18 AWG shielded cable to readers and keypads that draw 50 mA or more.
   4. Install minimum No. 12 AWG stranded wire to electric latch retraction exit devices with a distance not to exceed 150 feet (50 m).
E. Install minimum No. 16 AWG cable from Controller to electrically powered locks. Do not exceed 250 feet (75 m).
F. Install minimum No. 18 AWG ac power wire from transformer to Controller, with a maximum distance of 25 feet (8 m).

4.3 GROUNDING

A. Comply with Division 16 Section "Grounding and Bonding."
B. Comply with IEEE 1100, "Power and Grounding Sensitive Electronic Equipment."
C. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to
minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

D. Bond shields and drain conductors to ground at only one point in each circuit.

E. Signal Ground:
   1. Terminal: Locate in each equipment room and wiring closet; isolate from power system and equipment grounding.
   2. Bus: Mount on wall of main equipment room with standoff insulators.
   3. Backbone Cable: Extend from signal ground bus to signal ground terminal in each equipment room and wiring closet.

4.4 INSTALLATION

A. Install card readers, system controllers, interface modules and ancillary devices.

4.5 IDENTIFICATION

A. In addition to requirements in this Article, comply with applicable requirements in Division 16 Section "Electrical Identification" and with TIA/EIA-606.

B. Use unique, alphanumeric designation for each cable, and label cable and jacks, connectors, and terminals to which it connects with same designation. Use logical and systematic designations for facility's architectural arrangement.

C. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
   1. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the particular device as shown.
   2. Each wire connected to building-mounted devices is not required to be numbered at the device if the color of the wire is consistent with the associated wire connected and numbered within the panel or cabinet.

4.6 STARTUP SERVICE

A. Engage a factory-authorized service representative to supervise and assist with startup service.
   1. Coordinate system startup with Owner.

4.7 PROTECTION

A. Maintain strict security during the installation of equipment and software. Room housing the control station that has been powered up shall be locked and secured.

4.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain security access system. Deliver keys for access panels and power supplies.

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the addition of devices to the existing video surveillance system.

1.3 DEFINITIONS

A. AGC: Automatic gain control.
B. B/W: Black and white.
C. CCD: Charge-coupled device.
D. MPEG: Moving picture experts group.
E. NTSC: National Television System Committee.
F. UPS: Uninterruptible power supply.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated, including dimensions and data on features, performance, electrical characteristics, ratings, and finishes.
B. Shop Drawings: Detail assemblies of standard components that are custom assembled for specific application on this Project.
   1. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes.
   2. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.
   3. UPS: Sizing calculations.
C. Equipment List: Include every piece of equipment by model number, manufacturer, MAC Address, serial number, location, and date of original installation.
D. Manufacturer Seismic Qualification Certification: Submit certification that cameras, camera-supporting equipment, accessories, and components will withstand seismic forces defined in Division 26 Section "Electrical Supports and Seismic Restraints." Include the following:
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
      a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
      b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Field quality-control test reports.

F. Operation and Maintenance Data: For cameras, power supplies, infrared illuminators, monitors, videotape recorders, digital video recorders, video switches, and control-station components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "[Closeout Procedures] [Operation and Maintenance Data]," include the following:
   1. Lists of spare parts and replacement components recommended to be stored at the site for ready access.

G. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NECA 1.

C. Comply with NFPA 70.

D. Electronic data exchange between video surveillance system with an access control system shall comply with SIA TVAC.

E. Supplier Qualifications: Lenel Systems Master Certified Dealer with warehousing facilities within fifty (50) miles of project site.
   1. The supplier shall be a factory authorized local service organization that shall carry a complete stock of parts and provide maintenance for the system and related systems under this contract. Local shall be defined as an area in a 50-mile radius of installed location.
   2. The supplier must locally (50-mile radius of installed location) employee a minimum of three (3) master level or equivalent certified Installers

F. Installer Qualifications: Lenel Systems Master Certified Installer, within fifty (50) miles of project site, who can demonstrate successful completion of projects of similar size and scope.
   1. Installer must have current master level (or highest achievable) certification on proposed product.
   2. Installer must be within fifty (50) miles of project site and can demonstrate successful completion of projects of similar size and scope.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:
   1. Control Station: Rated for continuous operation in ambient temperatures of 60 to 85 deg F (16 to 29 deg C) and a relative humidity of 20 to 80 percent, noncondensing.
   2. Interior, Controlled Environment: System components, except central-station control unit, installed in temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 36 to 122 deg F (2 to 50 deg C) < dry bulb and 20 to 90 percent relative humidity, noncondensing. NEMA 250, Type 1 enclosures.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair
or replace components of cameras, equipment related to camera operation, and control-station equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SYSTEM REQUIREMENTS

A. General: Examine contract documents and furnish equipment to provide video components as indicated on plans and documents. Integrate new equipment and software with the Owner’s existing Video Management System (ExacqVision). Provide seamless integration of new components. Establish communication with Owner’s existing Video Management System (ExacqVision).

B. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor entry connection to components.
   1. Minimum Protection for Power Connections 120 V and More: Auxiliary panel suppressors complying with requirements in Division 26 Section "Transient Voltage Suppression."
   2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections: Comply with requirements in Division 26 Section "Transient Voltage Suppression" as recommended by manufacturer for type of line being protected.

C. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station, control-unit alarm display shall identify tamper alarms and indicate locations.

2.3 APPLICATION SOFTWARE

A. ExacqVision Video Management System
   1. The Digital Video IP Camera License shall enable a single channel of one IP/Network based camera or Analog to IP Video Server channel to integrated into the VMS system.
   2. Approved Product: The Digital Video IP Camera license shall be the Lenel SWS-LNR-CH1.

2.4 IP CAMERA COMPONENTS

A. Approved Manufacturers: Cameras must be an approved product supported by ExacqVision.
   1. Axis
   2. Arecont

B. Cameras: IP addressable camera that captures and sends live video directly over an IP
network such as a LAN, Intranet or the Internet and enables users to view and/or manage
the camera using a standard web browser or Video Management software.

1. Housing: Discreet fixed dome network camera specifically adapted for required
   environments.
2. Polycarbonate base and polycarbonate transparent cover.
3. Tamper-proof mounting on wall, hard or drop ceiling.
4. Imaging: ¼” progressive scan CMOS image sensor
5. Varifocal DC-Iris Lens
6. Motion JPEG, H.264 Compression
7. 12 Mega-pixel Video Resolution
8. Up to 30 frames per second for all resolutions
9. Power: Power over Ethernet (POE) – IEEE 802.3af

C. Approved Cameras:
1. Interior Fixed Dome: Axis P3214-V Mk II
2. Interior Fixed Dome: Axis P3364-LVE
3. Interior: Axis P3707-PE
5. Entryway: 2N IP FORCE

2.5 CAMERA-SUPPORTING EQUIPMENT

A. Manufacturers:
   1. Match manufacturer of camera

B. Minimum Load Rating: Rated for load in excess of the total weight supported times a
   minimum safety factor of two.

C. Mounting Brackets for Fixed Cameras: Type matched to items supported and
   mounting conditions. Include manual pan-and-tilt adjustment.

D. Protective Housings for Fixed and Movable Cameras: Steel enclosures with internal
   camera mounting and connecting provisions that are matched to camera/lens
   combination and mounting and installing arrangement of camera to be housed.
   1. Tamper switch on access cover sounds an alarm signal when unit is opened or
      partially disassembled. Central-control unit shall identify tamper alarms and
      indicate location in alarm display. Tamper switches and central-control unit are
      specified in Division 13 Section "Intrusion Detection."
2. Camera Viewing Window: Lexan window, aligned with camera lens.
4. Alignment Provisions: Camera mounting shall provide for field aiming of
   camera and permit removal and reinstallation of camera lens without disturbing
   camera alignment.
5. Built-in thermostat-activated heater and blower units. Units shall be
   automatically controlled so the environmental limits of the camera equipment
   are not exceeded.
6. With sun shield that does not interfere with normal airflow around the housing.
7. Mounting bracket and hardware for wall or ceiling mounting of the housing. Bracket
   shall be of same material as the housing; mounting hardware shall be
   stainless steel.
8. Finish: Housing and mounting bracket shall be factory finished using
   manufacturer's standard finishing process suitable for the environment.
   Enclosure Rating: NEMA 250, Type 3R.

PART 3 - EXECUTION

3.1 WIRING

A. Wiring Method: Install cables in raceways as indicated. Conceal raceways and wiring
B. Wiring Method: Install cables concealed in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer’s limitations on bending radii. Provide and use lacing bars and distribution spools.

D. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical connectors and terminals according to manufacturer’s published torque-tightening values. If manufacturer’s torque values are not indicated, use those specified in UL 486A and UL 486B.

E. Grounding: Provide independent-signal circuit grounding recommended in writing by manufacturer.

3.2 VIDEO SURVEILLANCE SYSTEM INSTALLATION

A. Install cameras and infrared illuminators level and plumb.

B. Install cameras with 84-inch- (2134-mm-) minimum clear space below cameras and their mountings. Change type of mounting to achieve required clearance.

C. Install power supplies and other auxiliary components at control stations, unless otherwise indicated.

D. Identify system components, wiring, cabling, and terminals according to Division 26 Section “Electrical Identification.”

E. All cameras located in grid ceilings shall have support that spans the grid and has support cable tied to building structure.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation and supervise pretesting, testing, and adjusting of video surveillance equipment.

B. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.

C. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video surveillance equipment for acceptance and operational testing as follows:
   1. Prepare equipment list described in Part 1 "Submittals" Article.
   2. Verify operation of auto-iris lenses.
   3. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.
   4. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Additionally, set zoom to full wide angle and aim camera at an object 50 to 75 feet (17 to 23 m) away. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.
   5. Set and name all preset positions; consult Owner’s personnel.
   7. Connect and verify responses to alarms.
   8. Verify operation of control-station equipment.

D. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10
days' notice of test schedule.

E. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.

F. Remove and replace malfunctioning items and retest as specified above.

G. Record test results for each piece of equipment.

H. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

3.4 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions and to optimize performance of the installed equipment. Tasks shall include, but are not limited to, the following:

1. Check cable connections.
2. Check proper operation of cameras and lenses. Verify operation of auto-iris lenses and adjust back-focus as needed.
3. Adjust all preset positions; consult Owner's personnel.
4. Recommend changes to cameras, lenses, and associated equipment to improve Owner's utilization of video surveillance system.
5. Provide a written report of adjustments and recommendations.

3.5 CLEANING

A. Clean installed items using methods and materials recommended in writing by manufacturer.

B. Clean video surveillance system components, including camera-housing windows, lenses, and monitor screens.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain video surveillance equipment.

1. Train Owner's maintenance personnel on procedures and schedules for troubleshooting, servicing, and maintaining equipment.
2. Demonstrate methods of determining optimum alignment and adjustment of components and settings for system controls.
3. Review equipment list and data in maintenance manuals. Refer to Division 1 Section Operation and Maintenance Data.
4. Conduct a minimum of 8 hours' training as specified in instructions to Owner's employees in Division 1 Section Demonstration and Training."

END OF SECTION 28 23 00
SECTION 28 32 00

VOICE EVACUATION FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
A. This Section includes fire alarm systems.

1.3 DEFINITIONS
A. FACP: Fire alarm control panel.
B. LED: Light-emitting diode.
C. NICET: National Institute for Certification in Engineering Technologies.
D. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

1.4 SYSTEM DESCRIPTION
A. Addressable system; multiplexed signal transmission dedicated to fire alarm service with speaker/strobes. This system shall be capable of handling the entire fire system requirements of the building including, but not limited to fire sprinkler monitoring, magnetic door hold open equipment, HVAC equipment, and speaker/strobes throughout the entire building.

1.5 PERFORMANCE REQUIREMENTS
A. Comply with NFPA 72.
B. Premises protection includes Fully Sprinkled Type Occupancy.
C. Fire alarm signal initiation shall be by one or more of the following devices:
   2. Smoke detectors.
   3. Heat Detectors
   4. Verified automatic alarm operation of smoke detectors.
   5. Automatic sprinkler system water flow.
   6. Fire extinguishing system operation.
   7. Fire standpipe system.
D. Fire alarm signal shall initiate the following actions:
   1. Alarm notification appliances shall operate continuously.
   2. Identify alarm at the FACP and remote annunciators.
   4. Transmit an alarm signal to the remote alarm receiving station.
   5. Activate voice/alarm communication system.
   6. Record events in the system memory with ability to be printed.
E. Supervisory signal initiation shall be by one or more of the following devices or actions:
   1. Operation of a fire-protection system valve tamper.
   2. Operation of any duct detectors or induct detectors.
F. System trouble signal initiation shall be by one or more of the following devices or actions:
   1. Open circuits, shorts and grounds of wiring for initiating device, signaling line, and
notification-appliance circuits.

2. Opening, tampering, or removal of alarm-initiating and supervisory signal-initiating devices.

3. Loss of primary power at the FACP.

4. Ground or a single break in FACP internal circuits.

5. Abnormal ac voltage at the FACP.

6. A break in standby battery circuitry.

7. Failure of battery charging.

8. Abnormal position of any switch at the FACP or annunciator.

9. Fire-pump power failure, including a dead-phase or phase-reversal condition.

10. Low-air-pressure switch operation on a dry-pipe.

G. System Trouble and Supervisory Signal Actions: Annunciate at the FACP and remote annunciators. Record the event in the system memory with ability to be printed.

1.6 SUBMITTALS

Prior to the start of work, the contractor shall provide a complete and comprehensive submittal for review by the engineer. The submittals shall be prepared by a NICET III certified, factory trained personnel. This person shall provide to the engineer of record the proof of NICET certification and proof of factory training if requested. Factory training means that this person has received training at the factory. These are to describe the proposed system and its equipment. Failure to provide a complete submittal shall be grounds for summary rejection of any incomplete submittal documentation. Contractors who provide re-submittal’s, due to prior rejection shall be subject to a re-review fee, should the Engineer elect to do so. The complete submittal shall include, but not be limited to, all of the following material:

A. Power Calculations

1. Battery capacity calculations shall be a minimum of 125% of the calculated requirement.

2. Supervisory power requirements for all equipment.

3. Alarm power requirements for all equipment.

4. Power supply rating justification showing power requirements for each of the system power supplies. Power supplies shall be sized to furnish the total connected load in a worst-case condition plus 25% spare capacity.

5. Voltage-drop calculations for wiring runs demonstrating worst case condition.

B. Complete manufacturers catalog data including supervisory power usage, alarm power usage, physical dimensions, finish and mounting requirements.

C. Complete drawings covering the following shall be submitted by the contractor for the proposed system. Floor plans in a CAD compatible format showing all equipment and raceways, marked for size, conductor count with type and size, showing the percentage of allowable National Electric Code fill used. Floor plans will be prepared at 1/8” scale.

D. A complete proposed system database including a description of all logic strings, control by event programming and point identification labels on a flash drive and in a formatted printed form, as required for offsite editing, shall be submitted for evaluation by the owner.

1. The program shall include all required interactive control functions between the local network systems and the methods for implementing these actions.

E. Provide the address, telephone number, and contact person(s) of the manufacturer’s local service facility for normal and off-hour warranty issues.

F. If the fire alarm system and its equipment are supplied by a manufacturer's distributor, as part of the submittal documentation, the manufacturer shall provide, on its corporate letterhead, a "letter of support". Said "letter of support" shall state that, when in the opinion of the Engineer, the distributor's efforts require back-up and/or assistance, the manufacturer shall provide, at no cost to the Owner, all required technical support during the installation phase and for a one (1) year guarantee period starting on the date of final acceptance by the owner and the authority
having jurisdiction. If said "letter of support" is not submitted, the manufacturer's equipment will be deemed unacceptable and shall be grounds for summary rejection.

G. Provide a fire alarm system function matrix. Matrix shall illustrate alarm output events in association with initiating devices input events. Matrix shall represent a summary of the installed system alarm, supervisory and trouble functions. Include any and all departures, exceptions, variances or substitutions from these specifications and/or drawings at the time of bid. Failure to provide this requirement shall be cause for summary rejection of submittal documents where additional departures are discovered. (See NFPA-72 for minimum matrix requirements)

H. For each system control panel and/or transponder panel, provide panel ampere loading during both normal and alarm modes, with time calculations to substantiate compliance with battery back-up power requirements (battery Ampere-Hour capacity), described elsewhere in these specifications.

I. For each system control panel and/or transponder panel, provide written schedule of active and spare addresses provided on each addressable circuit to substantiate compliance with circuit usage/spare requirements, described elsewhere in these specifications.

J. For each system control panel and system transponder notification appliance circuit provide a written schedule of spare capability in amperes available for future possible use.

K. Provide manufacture’s printed product data, catalog pages and descriptions of any special installation requirements and/or procedures. Drawings depicting any special physical installation requirements and/or procedures. Drawings depicting any special physical installation requirements shall show physical plans, elevations, all dimensions, conduit entry, minimum access clearances and any other details required.

L. Provide shop drawings as follows:
   1. Drawing or catalog page showing actual dimensions of the main FCS.
   2. Drawing(s) or catalog page(s) showing actual dimensions of any additional system control panels, amplifier cabinets and/or battery cabinets.
   3. Drawing or catalog page showing actual dimensions of the remote annunciator(s).
   4. Single line riser diagram showing, all equipment, all connections and number and size of all conductors and conduits.
   5. Provide samples of various items when so requested by the architect/engineer.

M. The fire protection contractor shall provide copies of certification for service technician’s formal training by the system manufacture. As a minimum, certification documents shall indicate training dates, systems qualified, name of individual certified and current status.

N. Product Data: For each type of product indicated within 90 days of notice to proceed.

O. Within 30 days of notice to proceed, the contractor shall submit a programming printout and digital copy of the program to the Engineer for review.

P. Qualification Data: For Installer and fire alarm submittal designer: NICET Level II certification within 30 days of notice to proceed.

Q. Field quality-control test reports: provide test reports 10 days prior to final test requirements.

R. Operation and Maintenance Data: For fire alarm system to include in emergency, operation, and maintenance manuals. Comply with NFPA 72, recommendations for Owner's manual. Include abbreviated operating instructions for mounting at the FACP.

S. Documentation:
   1. Approval and Acceptance: Provide the "Record of Completion" form according to NFPA 72 to Owner, Architect, and authorities having jurisdiction.
   2. Record of Completion Documents: Provide the "Permanent Records" according to NFPA 72 to Owner, Architect, and authorities having jurisdiction. Format of the written sequence of operation shall be the optional input/output matrix.
      a. Hard copies on paper to Owner, Architect, and authorities having jurisdiction.
      b. Electronic media may be provided to Architect.

1.7 QUALITY ASSURANCE
A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
B. Installer Qualifications: Personnel certified by NICET as Fire Alarm Level III.
C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
D. 30 days after award of bid, the contractor shall conduct a meeting with the owner; owner's representative, the Engineer and the architect to discuss compliance of the specifications and drawings.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Initiating Appliances: Quantity equal to 10 percent of amount of each type installed, but not less than 1 unit of each type.
   2. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but not less than 1 unit of each type.
   3. Keys and Tools: One extra set for access to locked and tamper proofed components.
   4. Audible and Visual Notification Appliances: One of each type installed.
   5. Fuses if applicable: Two of each type installed in the system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. FACP, Amplifiers and Equipment:
      a. Silent Knight by Honeywell
      b. Farenhyt by Honeywell
   2. Wire and Cable:
      a. Comtran Corporation.
      b. Helix/HiTemp Cables, Inc.; a Draka USA Company.
      c. Rockbestos-Suprenant Cable Corporation; a Marmon Group Company.
      d. West Penn Wire/CDT; a division of Cable Design Technologies.
   3. Audible and Visual Signals:
      a. System Sensor
      b. Wheelock
      c. Gentex

2.2 FACP

A. General Description:
   1. Modular, power-limited design with electronic modules, UL 864 listed.
   2. Addressable initiation devices that communicate device identity and status.
      a. Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at the FACP.
      b. Temperature sensors shall additionally test for and communicate the sensitivity range of the device.
3. Addressable control circuits for operation of mechanical equipment.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at the FACP and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.
   1. Annunciator and Display: Liquid-crystal type, three line(s) of 80 characters, minimum.
   2. Keypad: Arranged to permit entry and execution of programming, display, and control commands; and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.

C. Circuits:
   1. Signaling Line Circuits: NFPA 72, Class B.
      a. System Layout: Each signaling line circuit shall be loaded no more than 80% capacity.
   2. Notification-Appliance Circuits: NFPA 72, Class B.
   3. Actuation of alarm notification appliances, annunciation, smoke control, shall occur within 10 seconds after the activation of an initiating device.
   4. Electrical monitoring for the integrity of wiring external to the FACP for mechanical equipment shutdown and magnetic door-holding circuits is not required, provided a break in the circuit will cause doors to close and mechanical equipment to shut down.

D. Smoke-Alarm Verification:
   1. Initiate audible and visible indication of an "alarm verification" signal at the FACP.
   2. Activate a listed and approved "alarm verification" sequence at the FACP and the detector.
   3. Sound general alarm if the alarm is verified.
   4. Cancel FACP indication and system reset if the alarm is not verified.

E. Notification-Appliance Circuit: Operation shall sound in a temporal pattern, complying with ANSI S3.41.

F. Power Supply for Supervision Equipment: Supply for audible and visual equipment for supervision of the ac power shall be from a dedicated dc power supply, and power for the dc component shall be from the ac supply.

G. Alarm Silencing, Trouble, and Supervisory Alarm Reset: Manual reset at the FACP and remote annunciators, after initiating devices are restored to normal.
   1. Silencing-switch operation halts alarm operation of notification appliances and activates an "alarm silence" light. Display of identity of the alarm zone or device is retained.
   2. Subsequent alarm signals from other devices or zones reactivate notification appliances until silencing switch is operated again.
   3. When alarm-initiating devices return to normal and system reset switch is operated, notification appliances operate again until alarm silence switch is reset.

H. Walk Test: A test mode to allow one person to test alarm and supervisory features of initiating devices. Enabling of this mode shall require the entry of a password. The FACP and annunciators shall display a test indication while the test is underway. If testing ceases while in walk-test mode, after a preset delay, the system shall automatically return to normal.

I. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and control of changes in those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and make a print-out of the final adjusted values on the system printer.

J. Service Modem: Ports shall be RS-232 for system printer and for connection to a dial-in terminal unit.
   1. The dial-in port shall allow remote access to the FACP for programming changes and
system diagnostic routines. Access by a remote terminal shall be by encrypted password algorithm.

K. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signal, supervisory signal supervisory and digital alarm communicator transmitter shall be powered by the 24-V dc source.
   1. The alarm current draw of the entire fire alarm system shall not exceed 80 percent of the power-supply module rating.
   2. Power supply shall have a dedicated fused safety switch for this connection at the service entrance equipment. Paint the switch box red and identify it with "FIRE ALARM CIRCUIT."

L. Secondary Power: 24-V dc supply system with batteries and automatic battery charger and an automatic transfer switch.
   2. Battery and Charger Capacity: Comply with NFPA 72.

M. Surge Protection:
   1. Install surge protection on normal ac power for the FACP and its accessories. Comply with Division 26 Section "Transient Voltage Suppression" for auxiliary panel suppressors.
   2. Install surge protectors recommended by FACP manufacturer. Install on all system wiring external to the building housing the FACP.

N. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.3 MANUAL FIRE ALARM BOXES

A. Description: UL 38 listed; finished in red with molded, raised-letter operating instructions in contrasting color. Station shall show visible indication of operation. Mounted on recessed outlet box; if indicated as surface mounted, provide manufacturer's surface back box.
   1. Single-action mechanism requiring single action to initiate an alarm, pull-lever type with integral addressable module, arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP.
   2. Station Reset: Key- or wrench-operated switch.
   3. Indoor Protective Shield: Factory-fabricated clear plastic enclosure, hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.

2.4 SYSTEM SMOKE DETECTORS

A. General Description:
   1. UL 268 listed, operating at 24-V dc, nominal.
   2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
   3. Multipurpose type, containing the following:
      a. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
      b. Heat sensor, combination rate-of-rise and fixed temperature.
   4. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection of building wiring.
   5. Self-Restoring: Detectors do not require resetting or readjustment after actuation.
to restore them to normal operation.

6. **Integral Visual-Indicating Light:** LED type. Indicating detector has operated and power-on status.

7. **Where noted on drawings provide a welded wire screen protective cover.**

8. **Remote Control:** Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.
   a. Provide multiple levels of detection sensitivity for each sensor.

**B. Photoelectric Smoke Detectors:**

1. **Sensor:** LED or infrared light source with matching silicon-cell receiver.

2. **Detector Sensitivity:** Between 2.5 and 3.5 percent/foot (0.008 and 0.011 percent/mm) smoke obscuration when tested according to UL 268A.

**C. Duct Smoke Detectors:**

1. **Photoelectric Smoke Detectors:**
   a. **Sensor:** LED or infrared light source with matching silicon-cell receiver.
   b. **Detector Sensitivity:** Between 2.5 and 3.5 percent/foot (0.008 and 0.011 percent/mm) smoke obscuration when tested according to UL 268A.

2. **UL 268A listed, operating at 24-V dc, nominal.**

3. **Integral Addressable Module:** Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

4. **Plug-in Arrangement:** Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. The fixed base shall be designed for mounting directly to the air duct. Provide terminals in the fixed base for connection to building wiring.
   a. **Weatherproof Duct Housing Enclosure:** UL listed for use with the supplied detector. The enclosure shall comply with NEMA 250 requirements for Type 4X.

5. **Self-Restoring:** Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.

6. **Integral Visual-Indicating Light:** LED type. Indicating status. Provide remote status and alarm indicator and test station where indicated.

7. **Remote Control:** Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.

8. **Each sensor shall have multiple levels of detection sensitivity.**

9. **Sampling Tubes:** Design and dimensions as recommended by manufacturer for the specific duct size, air velocity, and installation conditions where applied.

10. **Relay fan shutdown:** Rated to interrupt fan motor-control circuit.

### 2.5 **NOTIFICATION APPLIANCES**

**A. Description:** Equipped for mounting as indicated and with screw terminals for system connections.

1. **Combination Devices:** Factory-integrated audible and visible devices in a single-mounting assembly.

**B. Speakers:** shall be of sufficient number so that an alarm shall be clearly audible to all occupants of the building and/or fire area as required by these specifications. Mounting height shall be 96” to the centerline of the unit above the finished floor. Locations where ceilings prevent the installation at 96” centerline, the centerline of the unit shall be 6” below the ceiling.

**C. Visible Alarm Devices:** Xenon strobe lights listed under UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word “FIRE” is engraved in minimum 1-inch- (25-mm-) high letters on the lens.

1. **Rated Light Output:** as indicated.
2. Strobe Leads: Factory connected to screw terminals.
3. Where called for on plans to have a wire guard, provide and install a welded wire screen guard of appropriate size. Polycarbonate or other transparent protective covers are prohibited.

2.6 SPRINKLER SYSTEM REMOTE INDICATORS
A. Remote status and alarm indicator and test stations, with LED indicating lights. Light is connected to flash when the associated device is in an alarm or trouble mode. Lamp is flush mounted in a single-gang wall plate. A red, laminated, phenolic-resin identification plate at the indicating light identifies, in engraved white letters, device initiating the signal and room where the smoke detector or valve is located. For water-flow switches, the identification plate also designates protected spaces downstream from the water-flow switch.

2.7 MAGNETIC DOOR HOLDERS
A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching door plate.
   1. Electromagnet: Requires no more than 3 W to develop 25-lbf (111-N) holding force.
   2. Wall-Mounted Units: Flush mounted, unless otherwise indicated.
B. Material and Finish: Match door hardware.

2.8 REMOTE ANNUNCIATOR
A. Description: Duplicate annunciator functions of the FACP for alarm, supervisory, and trouble indications. Also, duplicate manual switching functions of the FACP, including acknowledging, silencing, resetting, and testing.
B. Display Type and Functional Performance: Alphanumeric display same as the FACP. Controls with associated LED's permit acknowledging, silencing, resetting, and testing functions for alarm, supervisory, and trouble signals identical to those in the FACP.

2.9 ADDRESSABLE INTERFACE DEVICE
A. Description: Microelectronic monitor module listed for use in providing a system address for listed alarm-initiating devices for wired applications with normally open contacts.
B. Integral Relay: Capable of providing a direct signal to the elevator controller to initiate elevator recall where indicated to a circuit-breaker shunt trip for power shutdown and to release doors.

2.10 DIGITAL ALARM COMMUNICATOR TRANSMITTER
A. Listed and labeled according to UL 632.
B. Functional Performance: Unit receives an alarm, supervisory, or trouble signal from the FACP, and automatically captures one or two telephone lines and dials a preset number for a remote central station. When contact is made with the central station(s), the signal is transmitted. The unit supervises up to two telephone lines. Where supervising 2 lines, if service on either line is interrupted for longer than 45 seconds, the unit initiates a local trouble signal and transmits a signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. When telephone service is restored, unit automatically reports that event to the central station. If service is lost on both telephone lines, the local trouble signal is initiated.
C. Secondary Power: Integral rechargeable battery and automatic charger. Battery capacity is adequate to comply with NFPA 72 requirements.
D. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.
2.11 GUARDS FOR PHYSICAL PROTECTION

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.
   1. Factory fabricated and furnished by manufacturer of the device.
   2. Finish: Paint of color to match the protected device.

2.12 WIRE AND CABLE

A. Wire and cable for fire alarm systems shall be UL listed and labeled as complying with NFPA 70, Article 760.
   B. Signaling Line Circuits: Twisted, shielded pair, not less than No. 18 AWG size as recommended by system manufacturer.
      1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70 Article 760, Classification CI, for power-limited fire alarm signal service. UL listed as Type FPL, and complying with requirements in UL 1424 and in UL 2196 for a 2-hour rating.
      1. Line-Voltage Circuits: No. 12 AWG, minimum.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Smoke or Heat Detector Spacing:
   1. Smooth ceiling spacing shall not exceed [30 feet (9 m)].
   2. Spacing of heat detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas, shall be determined according to Appendix A in NFPA 72.
   3. Spacing of heat detectors shall be determined based on guidelines and recommendations in NFPA 72.
   B. HVAC: Locate detectors not closer than 3 feet (1 m) from air-supply diffuser or return-air opening.
   C. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of the duct.
   D. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.
   E. Audible Alarm-Indicating Devices: Install between 80” and 96” above finished floor, this height is to the visual lens portion of the device, or on ceiling. Install speakers on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.
   F. Visible Alarm-Indicating Devices: Install integral to each alarm speaker if noted.
   G. Device Location-Indicating Lights: Locate in public space near the device they monitor.
   H. FACP: Mount as noted on drawings with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.
   I. Annunciator: Install with top of panel not more than 72 inches (1830 mm) above the finished floor.

3.2 WIRING INSTALLATION

A. Install wiring according to the following:
   1. NECA 1.
   2. TIA/EIA 568-A.
   B. Wiring Method: Install wiring in metal raceway according to Division 26 Section "Raceways and
1. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.

C. Wiring Method:
1. Cables and raceways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
2. Fire-Rated Cables: Use of 2-hour fire-rated fire alarm cables, NFPA 70 Types MI and CI, is not permitted.
3. Signaling Line Circuits: Power-limited fire alarm cables may be installed in the same cable or raceway as signaling line circuits.

D. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

E. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

F. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

G. Wiring to Remote Alarm Transmitting Device: 1-inch (25-mm) conduit between the FACP and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals according to Division 26 Section "Electrical Identification."
B. Install instructions frame in a location visible from the FACP.
C. Paint power-supply disconnect switch red and label "FIRE ALARM CIRCUIT."
D. The location of the branch-circuit overcurrent protective device shall be permanently identified at the fire alarm control unit.

3.4 GROUNDING

A. Ground the FACP and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to the FACP.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
B. Testing Agency: Owner will engage a qualified testing and inspecting agency to witness field tests and inspections and prepare test reports. The contractor shall provide all personnel for this test. There shall be two tests, one prior to the Fire Marshall test and one with the Fire Marshall.
C. Perform the following field tests and inspections and prepare test reports:
1. Before requesting final approval of the installation, submit a written statement
using the form for Record of Completion shown in NFPA 72.

2. Perform each electrical test and visual and mechanical inspection listed in NFPA 72. Certify compliance with test parameters.

3. Visual Inspection: Conduct a visual inspection before any testing. Use as-built drawings and system documentation for the inspection. Identify improperly located, damaged, or nonfunctional equipment, and correct before beginning tests.

4. Testing: Follow procedure and record results complying with requirements in NFPA 72.
   a. Detectors that are outside their marked sensitivity range shall be replaced.

5. Test and Inspection Records: Prepare according to NFPA 72.

D. At no time shall the contractor make changes to the documents without written permission from the Engineer.

3.6 DEMONSTRATION

Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the fire alarm system, appliances, and devices. Refer to Division 1 Section "Closeout Procedures and Demonstration and Training."

END OF SECTION 28 32 00
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**DIVISION 31 - EARTHWORK**

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PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Removing existing vegetation.
   2. Clearing and grubbing.
   3. Removing above- and below-grade site improvements.
   4. Disconnecting, capping or sealing, protecting and abandoning site utilities in place.
   5. Temporary erosion and sedimentation control measures.

B. Related Sections:
   1. Division 01 Sections
   2. Division 31 “Earth Moving”.
   4. Geotechnical Engineering Evaluation and Addenda as prepared by All West Testing & Engineering, File Number: 518-031G.

1.2 DEFINITIONS

A. **Subsoil**: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. **Surface Soil**: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. **Vegetation**: Trees, shrubs, groundcovers, grass, and other plants.

1.3 MATERIAL OWNERSHIP

A. All cleared materials shall become Contractor's property and shall be removed from Project site. Conform to applicable code for disposal of debris.

1.4 SUBMITTALS

A. **Operations & Maintenance Data**: Submit Record Drawings identifying and accurately showing locations of utilities and other subsurface structural, electrical, and mechanical conditions.

1.5 PROJECT CONDITIONS

A. **Traffic**: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. **Salvable Improvements**: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
C. Utility Locator Service: Notify utility locator service for area where Project is located before beginning site clearing operations. Contact locator service at 811 or (208) 342.1585.

D. Do not commence site clearing operations until temporary erosion and sedimentation measures are in place.

E. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist. Refer to Geotechnical Evaluation for Soft Subgrade Construction Approach Recommendations.

F. Dust Control: Per Agency Having Jurisdiction.

1.6 WARRANTY

A. Contractor shall warrant work as provided by the General and Supplementary Conditions and Division 01 Specifications.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 31 Section "Earthmoving"

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 – EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Construction Manager.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of Agencies Having Jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

E. Coordinate with SWPPP documents.

3.3 EXISTING UTILITIES

A. Contractor shall coordinate with Construction Manager to arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.
B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
   1. Arrange with utility companies to shut off indicated utilities.
C. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Construction Manager not less than two (3) days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Construction Manager’s written permission.
D. Excavate for and remove underground utilities indicated to be removed. Backfill & compact excavated utility trenches per specification section 312000.

3.4 CLEARING AND GRUBBING

A. Comply with Geotechnical Engineering Evaluation.
B. Remove trees, shrubs, and other vegetation to permit installation of new construction.
C. Remove obstructions, pipes, ditches, etc. to permit installation of new construction.
D. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
   1. Place fill material in horizontal layers not exceeding a loose depth of 6-Inches and compact each layer to a density equal to adjacent original ground.
   2. All fill material placed must be compacted and tested. Coordinate with Construction Manager for testing.

3.5 TOPSOIL STRIPPING

A. Comply with Geotechnical Engineering Evaluation.
B. Contractor shall remove all organic or disturbed soils beneath proposed pavements, flatwork, floor slabs, structural fills and building foundations.
C. All organic or disturbed soils shall be removed to depths of 1-foot minimum and removed from the site. Coordinate with Section 312000 for excavation depths.
D. Exact removal depths should be determined during grading operations by the Geotechnical Engineer and should be based upon subgrade soil type, composition, and firmness or soil stability.

3.6 REMOVAL OF LEAN CLAY SOILS AND EXISTING ASPHALT SECTION

A. Contractor shall remove all lean clay soils and existing asphalt section beneath proposed buildings, foundations and paved areas to expose competent, native soils. Use of excavated material is prohibited for use as fill and shall be removed from site.
B. Contractor shall anticipate removal depths of 2-FT below existing ground surface. Exact removal depths should be determined during grading operations by the Geotechnical Engineer and should be based upon subgrade soil type, composition, and firmness or soil stability.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut adjacent to line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.

2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

C. If underground storage tanks, underground utilities, wells, or septic systems are discovered during construction activities, they must be decommissioned then removed or abandoned in accordance with governing Federal, State, and local agencies. Excavations developed as a result of such removal must be backfilled with structural fill materials. See section 31 20 00.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 31 10 00
SECTION 31 20 00

EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Excavation and backfilling for slabs-on-grade, walks, pavements and landscape areas.
   2. Excavation and backfilling for building floor slabs, building foundations and structures.
   3. Excavation and backfilling for storm drainage systems.
   4. Excavation and backfilling trenches for utilities and pits for buried utility structures.
   5. Excavation and backfilling trenches where existing utilities are removed or modified.
   6. Temporary erosion and sedimentation control measures.

B. Related Sections:
   1. Division 01 Sections.
   2. Division 03 Section "Cast-in-Place Concrete" for vapor retarder beneath the slab-on-grade.
   3. Division 23, 26 and 27 Sections for installing underground mechanical, electrical and telecommunications utilities and buried mechanical and electrical structures.
   4. Division 31 Section "Site Clearing" for site stripping, grubbing, stripping topsoil, and removal of above- and below-grade improvements and utilities.
   5. Division 32 Section "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
   6. Division 32 Section "Plants" for finish grading in planting areas and tree and shrub pit excavation and planting.
   7. Division 33 Sections for underground site utilities.
   9. Geotechnical Engineering Evaluation and Addenda as prepared by All West Testing & Engineering, File Number: 518-031G.

1.2 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe. Initial backfill shall be Bedding Course.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench. Final Backfill shall be Bedding Course or Granular Structural Fill.

B. Base Course (Crushed Aggregate Base): Aggregate layer placed between the base course and hot-mix asphalt paving or concrete flatwork or cast in place concrete.

C. Subbase Course (Granular Structural Fill): Aggregate layer placed between the subgrade and Base Course.

D. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

E. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

F. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

G. Excavation: Removal of material encountered above subgrade elevations and to lines and
dimensions indicated.

H. Fill: Soil materials used to raise existing grades.
I. Satisfactory Soil: Soil material in compliance with the Geotechnical Engineering Evaluation.
J. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
K. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, base course or topsoil materials.
L. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.3 SUBMITTALS

A. Product Data: For each type of the following manufactured products required:
   1. Geotextiles and warning tapes.
B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
   1. Classification according to ASTM D 2487.
   2. Laboratory compaction curve according to ASTM D 1557 (for rigid structures) or ASTM D 698 (for flexible pavements).
   3. Sieve analysis for all structural fill materials.
C. Operations & Maintenance Data: Submit Materials Testing reports for compaction testing of all subgrades and fill materials.

1.4 QUALITY ASSURANCE

A. Pre-excavation Conference: Conduct conference at Project site.
B. All gravel, base course, subbase, and other imported fill materials other than landscape fill and topsoil shall only be stockpiled in proposed impervious areas. No gravel or rock materials shall be stockpiled or temporarily placed in proposed landscape areas in order to prevent landscape areas from being contaminated with rock materials. If landscape areas become contaminated, the contractor shall restore them to specified requirements at no cost to the Owner.

1.5 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earthwork operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
B. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations. Contact locator service at 811 or 342.1585.
C. Do not commence earthwork operations until temporary erosion- and sedimentation-control measures are in place.
D. Soft Subgrade Conditions: This site consists of native silts and/or clays that are relatively high in moisture content and prone to pumping and rutting from rubber-tired construction equipment. Earth Moving methods which limit destabilizing areas of the site during earth moving activities shall be employed.
E. Construction operations during dry, warm weather conditions will help to limit development of unstable subgrade conditions. Construction during wet weather may not
be possible, depending on the amount of precipitation.
F. SWPPP: Coordinate with SWPPP documents.
G. Dust Control: Per Agency Having Jurisdiction.

1.6 WARRANTY
A. Contractor shall warrant work as provided by the General and Supplementary Conditions and Division 01 Specifications.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS
A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations. Materials shall be in compliance with Geotechnical Engineering Evaluation.
B. Subbase Course (Granular Structural Fill):
   1. 6-Inch minus select, clean, granular soil with no more than 50 percent oversize (greater than 3/4-Inch) material and no more than 12 percent fines (passing No. 200 sieve). Refer to the ISPWC Section 801 for material gradation and requirements.
C. Base Course (Crushed Aggregate Base):
   1. 3/4" maximum size- complying with ISPWC Section 802 – 3/4-inch (Type I) for material gradation and requirements.
   2. Crushed Aggregate Base as defined herein shall be used as Free Draining Granular Mat as indicated by the geotechnical engineering report.
D. Bedding Course: Type I bedding material Per ISPWC Section 305 – in compliance with the following material gradation:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-inch</td>
<td>100</td>
</tr>
<tr>
<td>3/4-inch</td>
<td>80-100</td>
</tr>
<tr>
<td>3/8-inch</td>
<td>20-70</td>
</tr>
<tr>
<td>No. 4</td>
<td>5-20</td>
</tr>
<tr>
<td>No. 8</td>
<td>0-5</td>
</tr>
<tr>
<td>No. 200</td>
<td>0-3</td>
</tr>
</tbody>
</table>

E. Drain Rock: Per ISPWC Section 801 – in compliance with the following material gradation:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-inch</td>
<td>100</td>
</tr>
<tr>
<td>1-inch</td>
<td>25-60</td>
</tr>
<tr>
<td>3/8-inch</td>
<td>0-4</td>
</tr>
<tr>
<td>No. 200</td>
<td>0-2</td>
</tr>
</tbody>
</table>

F. Filter Sand: Per ISPWC Section 801 – in compliance with the following material gradation:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8-inch</td>
<td>100</td>
</tr>
<tr>
<td>No. 4</td>
<td>95-100</td>
</tr>
<tr>
<td>No. 16</td>
<td>45-80</td>
</tr>
<tr>
<td>No. 50</td>
<td>10-30</td>
</tr>
<tr>
<td>No. 100</td>
<td>2-10</td>
</tr>
<tr>
<td>No. 200</td>
<td>0-4</td>
</tr>
</tbody>
</table>

G. Topsoil Material: Refer to Specification Section 329200.
2.2 GEOTEXTILES

A. Drainage Geotextile: TenCate Mirifi 140N, or approved equal. Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications.

2.3 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:
   2. Yellow: Gas, oil, steam, and dangerous materials.
   3. Orange: Telephone and other communications.
   4. Blue: Water systems.
   5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 SITE PREPARATION

A. Refer to Geotechnical Engineering Evaluation for additional information.
B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
C. Protect and maintain erosion and sedimentation controls during earthwork operations.
D. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.
E. The site shall be watered as required to moisture condition the native soils.
F. Notify Architect of unexpected subgrade conditions and discontinue affected work in area until notified to resume work.

3.2 EXCAVATION: GENERAL

A. Refer to Geotechnical Engineering Evaluation for additional information.
B. All excavation depths noted in this section shall be from proposed finish grade. Total excavation depth from existing ground elevation may be greater than depth listed. Coordinate with drawings for more information.
C. Identify required lines, levels, contours and datum.
D. Protect above and below grade utilities which are to remain.
E. Grade top perimeter of excavation to prevent surface water from draining into excavation.
F. Following excavation to subgrade and prior to fill placement; subgrade surfaces shall be proof rolled in the presence of the geotechnical engineer. Correct Soft Subgrade Soil areas as identified and directed by the Geotechnical Engineer. Proof rolling of subgrade soils shall be accomplished using a heavy rubber-tired, fully loaded, tandem-axle dump truck or equivalent.
G. Inspection & compaction testing shall be completed per the Division 01 Specifications.

3.3 EXCAVATION AND BACKFILL AT GEOTECHNICAL TEST PITS & DEMOLISHED UTILITIES

A. Refer to geotechnical engineering evaluation for location and depth of test pits.
B. Refer to demolition plans for location of Excavated Utilities to be removed.
C. Excavate full depth of test pit or utility until undisturbed, native subgrade is encountered.
D. Place Granular Structural Fill to total depth necessary to bring test pit to proposed subgrade elevation. Place in maximum 12-inch loose lifts and compact to a minimum of 95% per ASTM D1557.
E. Surface of compacted structural fill shall be smooth, even surface. Remove ridges and fill depressions.
F. Coordinate placement and grade with Excavation for Structures, Building Slabs, Building Foundations, Concrete Flatwork & Pavements, this section.
G. Inspection & compaction testing shall be completed per the Division 01 Specifications.

3.4 EXCAVATION FOR STRUCTURES, BUILDING SLABS AND BUILDING FOUNDATIONS
A. Excavate to indicated lines, cross sections, elevations and subgrades.
B. All excavation depths noted in this section shall be from proposed finish grade.
C. Existing top soil material must be completely removed from below building slabs and building foundation elements. Coordinate with specification section 311000.
D. Existing lean clay soils and uncontrolled fill materials must be removed from below building foundations and floor slab to expose proper bearing soils. Excavation depth shall be to 3.5-ft below proposed Finish Floor Elevation at building footprint plus 10-ft beyond on all sides. Remove excavated soil material and dispose of off Owner’s property.
E. The exposed subgrade shall be proof-rolled and approved by the Geotechnical Engineer.
F. Repair soft subgrade soil areas as identified and directed by the Geotechnical Engineer.

3.5 EXCAVATION FOR CONCRETE FLATWORK AND PAVEMENTS
A. Excavate to indicated lines, cross sections, elevations and subgrades.
B. All excavation depths noted in this section shall be from proposed finish grade.
C. Existing top soil and uncontrolled fill must be completely removed from below asphalt pavement areas. Excavation depths to 2-ft below existing grade should be anticipated. Remove excavated soil material and dispose of off Owner’s property.
D. The exposed subgrade shall be proof-rolled and approved by the Geotechnical Engineer.
E. Repair soft subgrade soil areas as identified and directed by the Geotechnical Engineer.

3.6 EXCAVATION FOR UTILITY TRENCHES
A. Comply with the requirements of the ISPWC and the Local Agency Having Jurisdiction Standard Specifications.
B. Excavate trenches to indicated gradients, lines, depths and elevations. Utility cover shall be per Division 33 and the Drawings.
C. Excavate trenches to a minimum width of 24” plus pipe or conduit outside diameter. Provide uniform clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
D. Remove excavated soil material and dispose of off Owner’s property.
E. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material, 4 inches deeper elsewhere, to allow for bedding course.

3.7 EXCAVATION FOR LANDSCAPE AREAS
A. Excavate to indicated lines, cross sections, elevations and subgrades.
B. The exposed subgrade shall be visually inspected to confirm it is firm and unyielding.
C. Subgrade upper 6-inches shall be compacted to 90% of ASTM D698.
D. Repair soft subgrade soil areas as identified and directed by the Owner’s Representative.
E. Excavate to 12-in depth for placement of Topsoil at all landscape areas, coordinate with drawings and specification section 329200 and 929300.
F. Remove excavated soil material and dispose of off Owner’s property.

3.8 SUBGRADE INSPECTION

A. Notify Construction Manager when excavations have reached required subgrade elevations.
B. Prior to placement of subbase course and base course material at building and paved areas, the exposed subsoil surface should be proof-rolled under the observation of the Geotechnical Engineer.
C. Cut out soft or otherwise unsuitable areas of subgrade not capable of supporting structural loads. Backfill with Granular Structural Fill and compact to density equal to or greater than requirements for subsequent backfill material. Prior to placing Granular Structural Fill, the geotechnical engineer shall evaluate the over-excavated subgrade to determine if a Geotextile should be placed on the over-excavated subgrade.
D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Construction Manager.

3.9 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Protect as necessary to prevent windblown dust.
   1. Stockpile soil materials away from edge of excavations.
   2. Coordinate stockpile requirements with the requirements of the Agency Having Jurisdiction and acceptable BMP’s.

3.10 BACKFILL - GENERAL

A. Upon approved preparation and compaction of subgrade, placement of Subbase Course and Base Course Fill shall proceed.
B. Place Backfill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
C. Surface of Backfill shall be smooth, even surface. Remove ridges and fill depressions as required to meet finish grades.
D. Coordinate placement with Specification Section 033000 and Civil, Architectural and Structural Drawings.

3.11 GRANULAR STRUCTURAL FILL - GENERAL

A. Soils for use as Granular Structural Fill shall be as defined by this section.
B. Fill materials should be placed in layers not to exceed 12-inches in loose thickness.
C. Granular Structural Fill material should be moisture-conditioned to achieve optimum moisture content prior to compaction.
D. Each layer of fill should be compacted to the following density:
   1. Below Structures and Rigid Pavements: A minimum of 95% of maximum dry density, as determined by ASTM D 1557.
2. **Below Flexible Pavements:** A minimum of 95% of ASTM D1557 or 95% of ASTM D698.

### 3.12 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Backfill utility trenches using Bedding Course or Granular Structural Fill, compacted as specified below. Sufficient backfill should be placed over the utility before compacting with heavy equipment to prevent damage.

D. Subbase Course Fill should be placed and compacted to density equal to or greater than requirements for subsequent backfill material.

E. Place Subbase Course Fill at the following maximum loose depths prior to compaction:
   1. Bedding Course: 6-Inch lifts prior to compaction
   2. Granular Structural Fill: 12-Inch lifts prior to compaction.

F. Place and compact final backfill of satisfactory soil to final subgrade elevation.

G. Install warning tape directly above utilities, 12-inches below finished grade, except 6-inches below subgrade under pavements and slabs.

### 3.13 SUBBASE COURSE FILL

A. Upon approved preparation and observed proof-rolling of subgrade, placement of Subbase Course Fill shall proceed.

B. Place Granular Structural Fill as required to achieve correct subgrade elevation for placement of Base Course fill and indicated surface improvements. Place Subbase Course fill in maximum 12-inch loose lifts and compact as noted below.

C. Surface of Subbase Course Fill shall be smooth, even surface. Remove ridges and fill depressions as required to meet finish grades.

D. Coordinate with Specification Section 033000 and Architectural and Structural Drawings for placement for Building Foundations and Building Floor Slab.

E. Coordinate with Specification Section 321216 and Civil Drawings for placement for Asphalt Paving.

F. Each layer of Base Course fill should be compacted to the following density:
   1. Below Building Foundations, Building Floor Slab, Structures and Rigid Pavements: A minimum of 95% of maximum dry density, as determined by ASTM D 1557.
   2. Below Flexible Pavements: A minimum of 95% of the maximum dry density as determined by ASTM D 698.

### 3.14 BASE COURSE FILL

A. Upon approved placement and compaction of Subbase Course Fill, placement of Base Course Fill shall proceed.

B. Place and compact Base Course material in layers to required elevations. Place in maximum 6-inch loose lifts.

C. Place Base Course materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

D. Surface of Base Course shall be smooth, even surface. Remove ridges and fill depressions as required to meet finish grades.

E. Base Course Fill at Structures, Building Slabs and Building Foundations:
   1. Building Floor Slabs: Place a 4-inch layer of compacted Base Course.
   2. Structures: Compacted depth as shown on the Drawings.

F. Base Course at Pavement, Curbs and Walks:
1. Asphalt Paving: Place a 6-inch layer of compacted Base Course.
2. Concrete Flatwork, Curbs & Walks: Compacted depth as indicated on the drawings.

G. Place Base Course in maximum 6-inch thick loose lifts to bottom of structure, building slab, pavement, curb or walk. Base Course shall be moisture conditioned to within 2 percent of the optimum moisture.

H. Each layer of Base Course fill should be compacted to the following density:
1. Below Structures and Rigid Pavements: A minimum of 95% of maximum dry density, as determined by ASTM D 1557.
2. Below Flexible Pavements: A minimum of 95% of the maximum dry density as determined by ASTM D 698.

3.15 LANDSCAPE FILL

A. Coordinate placement of topsoil with Specification Sections 329200 & 329300.

3.16 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
1. Turf or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus ½-inch.
3. Pavements: Plus or minus ½-inch.

C. Site drainage should be directed away from structural areas, to avoid ponding of waters during storm events.

D. Grading inside Building Lines: Finish subgrade to a tolerance of 1/4 inch when tested with a 10-foot straightedge.

3.17 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Division 1.
B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
E. Testing agency will perform compaction testing at the following locations and frequencies:
1. Pavement, Walks and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 5,000 SF (Building Slab) and every
10,000 SF (paved areas) but in no case fewer than three tests.

2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length, but no fewer than two tests.

3. Trench Backfill: At each compacted initial and final backfill layer (maximum 8” lifts), at least one test for every 100 feet or less of trench length, but no fewer than two tests.

4. Landscape Fill: at each compacted fill and backfill layer, at least one test for every 20,000 SF but in no case fewer than two tests.

5. Geotechnical Test Pits & demolished utilities: one test at each compacted fill layer at each test pit or demolished seepage bed.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; re-compact and retest until specified compaction is obtained.

3.18 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and re-compact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.19 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus unsatisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner’s property.

END OF SECTION 31 20 00
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SECTION 32 12 16

ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Hot-mix asphalt patching
   2. Hot-mix asphalt paving
   3. Pavement-marking paint
   4. Fog Coat

B. Related Sections:
   1. Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.
   2. Division 07 Section "Joint Sealants" for joint sealants and fillers at paving terminations.
   6. Ada County Highway District (ACHD) Standards and Specifications.
   7. Geotechnical Engineering Evaluation and Addenda as prepared by All West Testing & Engineering, File Number: 518-031G.

1.2 DEFINITION

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

1.3 SUBMITTALS

A. Submit under provisions of Division 01 Specifications.
B. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
C. Submit design mix under provisions of Division 01.
D. Sieve analysis for all course and fine aggregate materials.
E. Submit pavement marking product data under provisions of Division 01.
F. Material Certificates: For each paving and striping material, from manufacturer.
G. Material Test Reports: For each paving material.
H. Operations & Maintenance Data: Submit Materials Testing reports for compaction testing of all asphalt paving.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with the Current Edition of the Idaho Standards for Public Works Construction.
C. Obtain materials from same source throughout duration of project.

1.5 HANDLING
A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer’s labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
   1. Tack Coat: Minimum surface temperature of 60 deg F.
   2. Asphalt Single Course: Minimum surface temperature of 40 deg F and rising at time of placement.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, 55 deg F for water-based materials, and not exceeding 95 deg F.

1.7 WARRANTY

A. Contractor shall warrant work as provided by the General and Supplementary Conditions and Division 01 Specifications.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Asphaltic Concrete: Asphalt mix design shall meet the requirements of the ISPWC, Section 810 for Class III Plant Mix.

B. Base Course (crushed aggregate base): Refer to Specification Section 312000.

C. Subbase Course (structural fill): Refer to Specification Section 312000.

D. Asphalt-Aggregate Mixtures: 1/2-inch mix design according to ISPWC Section 803.

E. Comply with requirements of ACHD for all asphalt work in the Right of Way.

2.2 ASPHALT MATERIALS

A. Asphalt Cement and Bituminous Materials per ISPWC Section 805.

B. The Contractor shall provide the Engineer with a Mix Design for approval prior to placement of Bituminous Paving Materials.

C. Plantmix Bituminous Pavement shall be Type 3, unless otherwise specified or approved.

D. Asphalt Tack Coat: per ISPWC Section 806.

E. Asphalt Prime Coat: per ISPWC Section 807.

F. Water: Potable.

G. Comply with requirements of AHJ for all asphalt work in the Right of Way.

2.3 AUXILIARY MATERIALS

A. Sand: AASHTO M 29, Grade Nos. 2 or 3.

B. Joint Sealant: AASHTO M 324, Type II of III.

C. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248; colors complying with FS TT-P-1952.
   1. Color: Per the plans.

D. Glass Beads: AASHTO M 247, Type 1. Roadway pavement markings only.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that Base Course below proposed pavement areas is dry and in suitable condition to begin paving.
B. Proceed with paving only after unsatisfactory conditions have been corrected.
C. Verify that utilities, and other items requiring a cut and installation beneath the asphalt surface have been completed and that asphalt surface has been repaired flush with adjacent asphalt prior to beginning installation.

3.2 PATCHING

A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Re-compact existing unbound-aggregate base course to form new subgrade.
B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.10 gal/sq. yd.
   1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
   2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings.
      Remove spillages and clean affected surfaces.
C. Patching: Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.
D. Comply with requirements of ACHD for all asphalt work in the Right of Way.

3.3 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.
   1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.
B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch.
   1. Clean cracks and joints in existing hot-mix asphalt pavement.
   2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.
   3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

3.4 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared crushed surfacing below proposed pavement areas is ready to receive paving.
B. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.10 gal/sq. yd.
   1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
   2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings.
      Remove spillages and clean affected surfaces.
C. Surface Course: The surface course lift shall be placed as near project substantial completion as possible.
   1. Base course pavement shall be cleaned to remove all debris and dust.
2. Visually inspect base course pavement for mechanical or chemical damage. All areas with chemical damage, i.e. dripped fuels, or mechanical damage shall be identified and marked with paint for review by the Architect. All areas determined to require patching shall be patched per 3.2 of this Section prior to placement of surface course.

3. Apply tack coat to base course prior to placement of surface course at a rate of 0.15 gal/sq. yd.

3.5 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Light Duty Asphalt Paving: Place hot-mix asphalt in single lift to 2.5-Inch compacted thickness.
3. Spread mix at minimum temperature as required by binder temperature/viscosity curve.
4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.6 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to cold joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
3. Offset transverse joints, in successive courses, a minimum of 24 inches.
4. Construct transverse joints at each point where paver ends a day’s work and resumes work at a subsequent time.
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.7 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints
and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
   1. Compaction: 91% - 96% with a minimum average of 92%. Joint density should be at least 90 percent of Rice density.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.8 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
   1. Base Course Asphalt Lift: Plus or minus 1/4-inch.
   2. Surface Course Asphalt Lift: Plus 1/4-inch, no minus.

B. Pavement Surface Smoothness: Comply with ISPWC Section 810. Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
   1. Base Course Asphalt Lift: 1/4 inch.
   2. Surface Course Asphalt Lift: 1/8 inch.
   3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.9 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Apply per ISPWC Section 1104.

C. Protect newly applied pavement-marking paint until it has fully cured.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field inspection and testing will be performed under provisions of Division 1.

C. Take samples and perform tests in accordance with The Asphalt Institute.


E. All paved surfaces shall be flooded with water in the presence of the Engineer to verify that all surfaces completely drain and no low depressed areas exist. A minimum of 48 hours notice shall be given.

F. Excessive rock pockets and/or cold joints (surface irregularities) are not acceptable and shall be corrected in a manner acceptable to the Engineer at no cost to the Owner.
G. Replace and compact hot-mix asphalt where core tests were taken.
H. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.
I. Comply with requirements of ACHD for all asphalt work in the Right of Way.

3.11 PROTECTION

A. Immediately after placement, protect pavement from mechanical and chemical damage until date of Substantial Completion.

3.12 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.
   1. Do not allow milled materials to accumulate on-site.

END OF SECTION 32 12 16
SECTION 32 13 13

CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Site flatwork, sidewalks, curbs, gutters and mow strips.
   2. Bases for light poles, furnishings, walls and signs.
   3. Reinforcing.
   4. Joint Filler and Joint Sealant
   5. Miscellaneous items shown.

1.2 RELATED SECTIONS

A. Division 31 Earth Moving
C. Ada County Highway District Standard Construction Details and Specifications.
D. Geotechnical Engineering Evaluation and Addenda as prepared by All West Testing & Engineering, File Number: 518-031G.

1.3 SUBMITTALS

A. Submit under provisions of Division 01 Specifications.
B. Product Data: For each type of product indicated.
C. Sieve analysis for all course and fine aggregate materials.
D. Shop Drawings: Indicate reinforcing steel sizes, spacing, locations and quantities for reinforcing steel, bending and cutting schedules, splicing, and supporting and spacing devices.
E. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments. Concrete testing data shall have been completed within 12 months of the submittal date.
F. Qualification Data: Ready-mix concrete manufacturer and testing agency.
G. Operations & Maintenance Data: Submit Materials Testing reports for sample and strength testing of all site concrete work.

1.4 QUALITY ASSURANCE

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
B. ACI Publications: Comply with ACI 301 and ACI 316 unless otherwise indicated.

1.5 WARRANTY

A. Contractor shall warrant work as provided by the General and Supplementary Conditions and Division 01 Specifications.

PART 2 - PRODUCTS
2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
   1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

A. Recycled Content: Provide steel reinforcement with an average recycled content of steel so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.


C. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.

D. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M; with ASTM A 615/A 615M, Grade 60 deformed bars.

E. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars; zinc coated (galvanized) after fabrication according to ASTM A 767/A 767M, Class I coating. Cut bars true to length with ends square and free of burrs.

F. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.

G. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

H. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:
   1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
   2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

I. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.

J. Zinc Repair Material: ASTM A 780.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Provide in accordance with ISPWC Division 700. Portland Cement Type I or II.

B. Normal-Weight Aggregates: ASTM C 33, uniformly graded. Provide aggregates from a single source. Refer to ISPWC Section 703 for aggregate requirements.
   2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
   3. Use 1/2 inch maximum sized aggregate and high range water reducer in concrete at all round columns and exposed concrete wall to reduce bug holes and surface imperfections. Sack finishing will not be acceptable to cure surface problems.

C. Water: Potable and complying with ASTM C 94/C 94M.


E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass.
of cementitious material.

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

2.4 CURING MATERIALS

A. Curing Compound: ASTM C 309, Type 1, Class A, water based.

2.5 JOINT MATERIALS

A. Joint Fillers:
   1. 1/2 thick Fiber Joint Filler as manufactured by W.R. Meadows, or approved equal. Provide resilient and non-extruding type pre-molded bituminous-impregnated fiberboard complying with ASTM D1751.
   2. Use with Snap-Cap as manufactured by W.R. Meadows, or approved equal where joint is to be sealed. Coordinate with Drawings for location.
B. Joint Sealant: provide at locations shown on drawings.
   1. Tremco THC-901 – High Performance Multi-Component Polyurethane Sealant, or approved equal. Sealant shall meet or exceed the following specifications:
      b. ASTM C 920, Type M, Grade P, Class 25, Use T, M, & O
   2. Tremco Universal Color Pak or pre-tinted in limestone. Color to match surrounding concrete flatwork.

2.6 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.
   1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
   2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that meet or exceed requirements.
B. Proportion mixtures to provide normal-weight concrete with the following properties:
   2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
   3. Slump Limit: 3 inches, plus or minus 1 inch.
C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
   1. Air Content: 6 percent plus or minus 1.5 percent for 3/4-inch nominal maximum aggregate size.
D. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing admixture in concrete as required for placement and workability.
   2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
E. Cementitious Materials: Limit percentage by weight of cementitious materials other than
Portland cement according to ACI 301 requirements as follows:
1. Fly Ash or Pozzolan: 25 percent.
2. Ground Granulated Blast-Furnace Slag: 50 percent.
3. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or pozzolan not exceeding 25 percent.

2.7 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.
   1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed base course surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
B. Proof-roll prepared base course surface below concrete flatwork, curb and paving to identify soft pockets and areas of excess yielding.
   1. Completely proof-roll base course. Limit vehicle speed to 3 mph.
   2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
   3. Correct soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Division 31 Section "Earth Moving."
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove loose material from compacted base course surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
B. Refer to drawings for location of reinforcement at all utility structures.
C. Coordinate with drawings for reinforcement at building doorways.
D. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
E. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
F. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

G. Zinc-Coated Reinforcement: Use galvanized-steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.

H. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
   1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
   1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
   2. Provide tie bars at sides of paving strips where indicated.
   3. Butt Joints: Use epoxy bonding adhesive at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
   4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
   5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, columns, other fixed objects, new concrete flatwork to old concrete flatwork, and where indicated.
   1. Extend joint fillers full width and depth of joint. No plug or sliver of concrete should extend over, under, through, around, or between sections of the filler board.
   2. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated. Utilize filler board cap at all sealed joints.
   3. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
   4. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
   5. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
   6. Place joint sealant per Manufacturer’s written specifications.
      a. Surfaces must be sound, clean and dry. Apply to surface when temperatures are 40 deg. F or above.
      b. Mix in accordance with written instructions on product packaging.
      c. Ensure joint filler is installed properly.
      d. Excess sealant and smears adjacent to the joint shall be carefully removed in accordance with written instructions.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into
areas as indicated. Construct contraction joints for a depth equal to at least one-third of the concrete thickness, as follows:

1. Grooved Joints: Saw and V-groove joints at locations shown.
2. Contraction Joints shall be constructed at the optimum time to prevent raveling (too early) and cracking (too late). Excessive raveling and chipping of joint edge will be cause for slab replacement.
3. Jointed panels should be as close to square as possible.
4. Contraction joints should be straight and continuous. Align joints of adjacent panels.
5. Align joints in attached curbs with joints in pavement.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/2-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

F. Coordinate with Civil Drawings and Structural Drawings for Doweled Joints at building doorways.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.
B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.
C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
D. Place reinforcing bars at locations shown on drawings.
E. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
F. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.
G. Deposit and spread concrete in a continuous operation between transverse joints.
H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
I. Screed paving surface with a straightedge and strike off.
J. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
K. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.
L. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.
1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.
M. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly
heat water and aggregates before mixing to obtain a concrete mixture
temperature of not less than 50 deg F and not more than 80 deg F at point of
placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents
or chemical accelerators unless otherwise specified and approved in design
mixtures.

N. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather
conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F
at time of placement. Chilled mixing water or chopped ice may be used to control
temperature, provided water equivalent of ice is calculated in total amount of
mixing water. Using liquid nitrogen to cool concrete is Contractor’s option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not
exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete.
Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.
B. Float Finish: Begin the second floating operation when bleed-water sheen has
disappeared and concrete surface has stiffened sufficiently to permit operations. Float
surface with power-driven floats or by hand floating if area is small or inaccessible to
power units. Finish surfaces to true planes. Cut down high spots and fill low spots.
Refloat surface immediately to uniform granular texture.
1. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-
finished concrete surface perpendicular to line of traffic to provide a uniform, fine-
line texture.

3.8 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot
temperatures.
B. Comply with ACI 306.1 for cold-weather protection.
C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or
windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during
finishing operations. Apply according to manufacturer's written instructions after placing,
screeding, and bull floating or darbying concrete but before float finishing.
D. Begin curing after finishing concrete but not before free water has disappeared from
concrete surface.
E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing,
curing compound or a combination of these as follows:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days
with the following materials:
a. Water.
b. Continuous water-fog spray.
c. Absorptive cover, water saturated and kept continuously wet. Cover
   concrete surfaces and edges with 12-inch lap over adjacent absorptive
   covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-
retaining cover, placed in widest practicable width, with sides and ends lapped at
least 12 inches and sealed by waterproof tape or adhesive. Immediately repair
any holes or tears occurring during installation or curing period using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Rec coat areas that have been subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.9 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 and as follows:
1. Elevation: 1/4 inch flatwork
3. Surface: Gap below 10-foot-long, unleveled straightedge not to exceed 1/2 inch.
4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
5. Lateral Alignment and Spacing of Dowels: 1 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
8. Joint Spacing: 3 inches.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
   a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.
   a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.
C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than
D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Concrete paving will be considered defective if it does not pass tests and inspections.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.11 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections. Pressure washing or other method shall be used to remove stains and tire markings if necessary.

E. All concrete paving shall be broom clean at date of Substantial Completion.
PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following types of playground surface systems and accessories:
   1. Loose fill system and accessories

B. Related Sections include the following:
   1. Division 02 Sections
   2. Division 31 Section “Earth Moving” for excavation, filling, and grading work, compacted subgrades and subbase courses, and dewatering.
   3. Division 11 Section “Playground Equipment” for play structures installed only over protective use zones, at appropriate fall heights.

1.2 DEFINITIONS

A. Critical Height: Standard measure of shock attenuation. According to CPSC No. 325, this means “the fall height below which a life-threatening head injury would not be expected to occur.”

B. Fall Height: According to ASTM F 1487, this means “the vertical distance between a designated play surface and the protective surfacing beneath it.” The fall height of playground equipment should not exceed the Critical Height of the protective surfacing beneath it.

C. Use Zone: According to ASTM F 1487, this means “the area beneath and immediately adjacent to a play structure that is designated for unrestricted circulation around the equipment and on whose surface it is predicted that a user would land when falling from or exiting the equipment.”

1.3 SUBMITTALS

A. See Division 1 for submittal procedures.

B. Product Data: For each type of product indicated. Include standard catalog sheets and manufacturer’s specification along with the following:
   1. Statement signed by an official authorized to certify on behalf of the manufacturer of the synthetic safety surfacing attesting that the surfacing meets the requirements of ASTM F 1292-95 for a head-first fall from the highest accessible portion of specified playground equipment. The statement shall provide the name, address, and telephone number of the testing company, the date of the test, and the test results

C. Product Samples: For the following:
   1. Minimum 1-gallon loose fill sealed in a container.

D. Product Certificates: Signed by manufacturers of playground surface systems certifying that protective surfacing furnished comply with requirements.

E. Product Test Reports: From a qualified testing agency indicating playground surface system complies with requirements, based on comprehensive testing of current products.

F. Provide manufacturer’s standard color charts for selection.

G. Provide manufacturer’s warranty information.

H. Operations & Maintenance Data: Submit manufacturer’s written Operations & Maintenance data for all equipment & accessories.
1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing work similar in material, design, and extent to that indicated for this Project and whose work has resulted in installations with a record of successful in-service performance.

B. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

C. Manufactured Safety Surface: For surfaces manufactured for the purpose of playground safety surface, the impact attenuation performance shall be documented by a certificate of compliance.

D. Standards and Guidelines: Provide playground surface systems complying with applicable provisions of the following, unless more stringent provisions are indicated:

E. Source Limitations: Provide secondary materials including adhesives, anchoring materials, filler/sealant material and repair materials of type and from source recommended by manufacturer or primary playground surface system materials.

F. Test Results
   1. Impact Attenuation – ASTM F 1292: Surfacing within playground equipment use zones shall meet or exceed the performance requirements of CPSC, ASTM F 1292 and/or CSA Z614-98 that a surface yield both a peak deceleration of no more than 200 g’s and a Head Injury Criteria (HIC) value of no more than 1,000 for a head-first fall from the highest accessible portion of play equipment being installed as shown on drawings.
   2. Coefficient of Friction – ASTM D2047: All products must meet minimum standard on coefficient of friction of .9-wet, 1.0-dry.
   4. Accessibility of Surface Systems – ASTM F1951: All playground surfacing products must pass testing to ensure wheelchair access under and around playground equipment as required by the American Disabilities Act.
   5. Tear Strength – ASTM D624-00e1 Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic: Tear Resistance must be equal to or greater than 12 pounds per inch.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver manufactured materials in original packages with seals unbroken and bearing manufacturer’s labels indicating brand name and directions for storing.

B. Store manufactured materials in a clean, dry location, protected from the weather and deterioration, and complying with manufacturer's written instructions for minimum and maximum temperature requirements for storage.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply playground surface system materials or components over wet, frozen, or excessively damp substrates if prohibited by manufacturer’s written instructions or warranty requirements.
B. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit playground surface system to be performed according to manufacturer’s written instructions or warranty requirements.

C. Field Measurements: Where playground surface system is indicated to fit to other construction, verify dimensions of other construction by field measurements.

1.7 COORDINATION

A. Coordinate construction of playground surface systems with installation of playground equipment, including accurate use zones and fall heights, specified in “Playground Equipment” drawings.

B. Safety surfacing shall be installed after the playground equipment is installed. The installation shall be coordinated with playground equipment and site element installation.

C. Warranty: Safety surfacing shall maintain required impact attenuation characteristics and be guaranteed against defects in workmanship or material for a period of two years.

1.8 WARRANTY

A. Contractor shall warrant work as provided by the General and Supplementary Conditions and Division 01 Specifications.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Substitutions or equivalent products shall be in accordance with Division 01 Specifications.

2.2 PLAYGROUND SURFACE SYSTEMS

A. Engineered Wood Fiber - EWF

1. Manufactured of size-controlled softwoods and/or hardwoods that average 1-inch to 2-inch in length and contain a maximum of 15% fine particles to aid in knitting.

2. Non-toxic and does not contain paint, chemicals, or additives.

3. Contains minimal bark and is free of twigs, leaf debris, and other organic material

4. Installation per manufacturer’s written installation procedures and details.

5. Product shall comply with ASTM F-1292, ASTM F-1951 AND ASTM F-2075.

6. Available through Recreation Today: 208.442.9350 or www.recreationtodayid.com

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for subgrade and substrate conditions, for compliance with playground surface system manufacturer's requirements, and for other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Finished Grade: Verify that finished elevations of adjacent areas are as indicated on the drawings and that the appropriate subgrade elevation has been established for the particular safety surface to be installed, and that the subsurface has been installed in a true, even plane, and sloped to drain as indicated on drawings. Verify that subsurface irregularities have been corrected.
D. Subsurface: Tolerance of aggregate subsurface shall be within 1/8-inch in 10 feet. Verify that aggregate subsurface has been fully compacted to 95 percent.
E. Drainage: Verify that subsurface drainage has been installed to provide positive drainage.

3.2 PREPARATION

A. Prepare substrates to receive surfacing products according to playground surface system manufacturer’s written instructions.
B. Verify that substrates are sound without high spots, ridges, holes, and depressions.
C. The entire subsurface shall be clean, dry and free from any foreign and loose material.

3.3 INSTALLATION - GENERAL

A. General: Comply with playground surface system manufacturer’s written installation instructions. Install playground surface system over area and in thickness indicated and as required to comply with specified requirements for impact-attenuation performance and, where indicated, for accessibility.

3.4 INSTALLATION - ENGINEERED WOOD FIBER (EWF)

A. Inspect placement of gravel base prior to proceeding.
B. Place geotextile drainage fabric on the gravel base as indicated on the drawings. Secure the fabric in place at all edges and seams. All seams shall overlap a minimum of 12-inches and be taped continuously.
C. Place EWF in 8-inch maximum loose lifts. Rake level and wet the surface.
D. Once the EWF is smooth and wetted, compact with a mechanical compacter.
E. Place second EWF lift, rake level and wet surface. Compact second lift perpendicular to compaction of first lift.
F. Repeat these steps until the required depth of compacted material is achieved.

3.5 CLEANING AND PROTECTION

A. Protection: The synthetic safety surface shall be allowed to fully cure in accordance with manufacturer’s instructions. The surface shall be protected from all traffic during the curing period for 48 hours or as instructed by the manufacturer.
B. Manufacturer Services: For safety surfacing, services of a manufacturer’s representative who is experienced in installation of the playground safety surface shall be provided. The representative shall supervise the installation to ensure that the safety surfacing meets the impact attenuation requirements as specified herein.

END OF SECTION 32 18 16
PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes
   1. Pipe and fittings, sprinkler heads, accessories, and connections to water source.

B. System Description
   1. Repair and modification of existing system.
   2. Automatic underground irrigation system.

C. Related Sections
   1. Division 01 Sections
   2. Division 26 Sections for electrical power materials and installations.
   3. Division 31 Sections for Earth Moving
   4. Division 32 Sections for Turf and Grasses & Plants

1.2 DEFINITIONS

A. Pipe sizes used in this Section are nominal pipe size (NPS) in inches. Tube sizes are Standard size in inches.

B. Pressure Piping Main Line: Piping downstream from supply piping to and including control valves. Piping is under irrigation system pressure. Piping in this category includes backflow preventers.

C. Circuit Piping Lateral Lines: Piping downstream from control valves to irrigation system sprinklers. Piping is under pressure (less than pressure piping) during flow.

D. Control Valve: Automatic (electrically operated) valve for control water flow to irrigation system zone.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Location of Sprinklers and Devices: Design location is approximate. Make minor adjustments necessary to avoid plantings and obstructions such as signs and light standards.

B. Minimum Water Coverage: Not less than:
   1. Turf Areas: 100 percent.
   2. Other Planting Areas: 100 percent.

C. All flow velocities, within the entire irrigation system, shall not exceed 5 feet per second.

1.4 SUBMITTALS

A. Product data including pressure rating, rated capacity, settings, and electrical data of all products to be used for this project including but not limited to all products listed in Part 2 of this specification and shown on the Drawings.

B. Irrigation system record drawings.

C. Irrigation system testing results when applicable, see Part 3 of this Section.

D. Operations & Maintenance Data: Submit manufacturer’s written Operations & Maintenance data for all Irrigation System and Control components.

1.5 QUALITY ASSURANCE
A. Comply with requirements of utility supplying water for prevention of backflow and backspiponage. Comply with appropriated water rights.

B. Installer Qualifications: Engage an experienced Installer with a minimum of five years experience and who has completed irrigation systems similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

C. Listing/Approval Stamp, Label, or Other Marking: On equipment, specialties, and accessories made to specified standards.

D. Listing and Labeling: Equipment, specialties, and accessories that are listed and labeled.
   1. The Terms "Listed" and "Labeled": As defined in "National Electrical Code," Article 100.
   2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

E. Product Options: Irrigation system piping, specialties, and accessories are based on specific types, manufacturers, and models indicated. Components with equal performance characteristics produced by other manufacturers may be considered, provided deviations in dimensions, operation, and other characteristics do not change design concept or intended performance as judged by the Architect. The burden of proof of product equality is on the Contractor. Any substitutions must be approved by the Architect in writing prior to installation per Division 01 Specifications.

1.6 SEQUENCING AND SCHEDULING

A. Contractor shall schedule a pre-construction meeting with the landscape architect in coordination with sections 32 82 00, 32 92 00 & 32 93 00.

B. Coordinate irrigation systems work with landscape work specified and in the Drawings.

1.7 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below. Package them with protective covering for storage and label clearly describing contents. Coordinate with drawings for specific quantities. The quantities below are for each type of product and apply to each school.
   1. (1) Box – Rotor Sprinkler Bodies – Each Type
   2. (1) Rotor Nozzle Tree, Each body – Each Type
   3. (1) Box – Turf Spray Bodies – Each Type
   4. (6) Turf Spray Nozzles – Each Size and type per drawing
   5. (1) Valve Key, Each Type

1.8 IRRIGATION RECORD DRAWINGS

A. Record accurately, on one set of black and white prints of the site plan, all installed work including both pressure and non-pressure lines and pipe sizes.

B. Upon completion of each increment of work, transfer all such information and dimensions to the print. The dimensions shall be recorded in a legible and workmanlike manner. Maintain as-built drawings on site at all times. Make all notes on drawing in pencil (no ball point pen). When the work has been completed, transfer all information from the field record print to a set of reproducible drawings.

C. Dimension from two permanent points of reference (buildings, monuments, sidewalks, curbs, pavements, etc.). Locations shown on as-built drawings shall be kept day to day as the project is being installed. All dimensions noted on drawings shall be 1/8 inch in size (minimum).
D. Show locations and depths of the following items:
   1. Point of connection, including Flow Sensor Assembly
   2. Routing of sprinkler pressure lines
   3. Gate valves
   4. Sprinkler control valves
   5. Quick coupling valves
   6. Routing of control wires, including Flow Sensor Assembly wires
   7. Sprinkler heads
   8. Other related equipment

1.9 WARRANTY

A. Contractor shall warrant work as provided by the General and Supplementary Conditions and Division 01 Specifications.

PART 2 – PRODUCTS

2.1 SUMMARY

A. Substitutions or equivalent products shall be in accordance with Division 01 Specifications.

2.2 PIPE AND ACCESSORIES

A. PVC Pipe & Fittings: Size and type as indicated on the drawings.
   1. Pipe walls shall be uniform, smooth, glossy, and free of interior or exterior extrusion marks; pre-belled or straight to receive solvent-weld couplings; 20 foot standard lengths.
   2. Pipe shall be marked with manufacturer's name, class of pipe, NSF seal, and date/shift of manufacturing run.
   3. PVC Pipe: ASTM D1785, D2241
   4. PVC Fittings: ASTM D2464, D2466
   6. Gasketed Pipe Fittings: Fittings shall be ductile iron, slanted, deep bell, gasket style made in accordance with ASTM A536, Grade 65-45-12 & AWWA C153. All gaskets shall be manufactured of high grade EPDM rubber. All fittings shall have epoxy coating as standard finish. Manufactured by Leemco, Inc., or approved equal.
   7. Thrust Blocks: Refer to Drawings.

2.3 VALVES

A. General: Valves are for general-duty and underground applications. Size as noted on the drawings.
   B. Remote Control Valves: As noted on the drawing.
   C. Quick Coupler Valves: As noted on the drawing. Stabilization as shown on the drawings.
   D. Isolation Valves: Brass, Full Port, Threaded Ends. Valve pressure rating to 200 PSI – Refer to Drawings.

2.4 SPRINKLERS

A. General: Manufacturer’s standard sprinklers designed to provide uniform coverage over entire area of spray shown on drawings. Size and type as noted on the drawings.
   B. Rotor Sprinklers: Rain Bird 5000 Series, Nozzle as noted on Drawings.
   C. Turf Spray Sprinkler: Rain Bird 1800 Series, Nozzle as noted on Drawings.
D. Swing Joints:
   1. Rotor Sprinklers: per drawing; Inlet/Outlet Style as Required.
   2. Spray Sprinkler: Flex tubing; 12” min./18” max. with Spiral Barb Fittings as required.

2.5 AUTOMATIC CONTROL SYSTEM
A. Existing Control system as noted on plans.

2.6 VALVE BOXES AND COVERS
A. Remote Control Valve: Carson Jumbo box and lid with 6-inch extensions as needed, green body with locking green lid. Provide lock down bolt at date of substantial completion.
B. Gate valves, Quick Coupler Valves & Misc.: Carson, green body with locking green lid.

2.7 IRRIGATION SYSTEM ACCESSORIES
A. Valve ID Tags – Christy, or equal.

PART 3 – EXECUTION

3.1 EXAMINATION
A. Investigate and determine available water supply water pressure and flow characteristics.
B. Examine areas and conditions where irrigation system is to be installed. Proceed with installation after unsatisfactory conditions have been corrected.

3.2 INSTALLATION GENERAL
A. Comply with manufacturer’s written installation instructions. Complete field assembly of components where required.
B. Install piping and control wires in sleeves where crossing under sidewalks, roadways, parking lots, playgrounds and other paved areas. Coordinate with other trades to install sleeving prior to paving operations.
C. Storage of Materials: Store all materials in a secure location. Do not allow materials to be exposed to environmental conditions that are harmful to the material, i.e. sun and windblown dust. Cover materials to protect when required.

3.3 PIPE AND ACCESSORIES
A. General: Drawings indicate general location and arrangement of piping system. Install piping as indicated, except where deviations to layout are required. Record all deviations on the Record Drawings.
   1. Install piping free of sags and bends. Deflection angles shall not exceed manufacturer’s recommendations.
   2. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
   3. Install all required fittings for change in direction and connection to components.
   4. Pipe Trench Size:
      a. Minimum Depth: as indicated on the Drawings.
      b. Minimum Width: 3 times pipe diameter.
B. PVC Pipe and Fittings: Install per manufacturer’s written specifications.
   1. Lay piping on solid subbase, uniformly sloped without humps or depressions.
   2. Install piping during dry weather when temperature is above 40 deg F.
   3. Solvent Weld Joints per manufacturer’s written specifications. Allow joints to cure
prior to testing.
4. Gasketed Pipe Fittings: Install per manufacturer’s written specifications. Provide additional thrust blocking where required.
5. Thrust Blocking: At locations shown on drawings.
6. Pipe trenching shall be as indicated on the drawings.
7. Backfill trenches with soil free of large lumps, rocks or debris. Carefully place backfill around and over the pipe in layers not to exceed 6” depth. Water settle each lift of trench backfill.
8. Backfill trenches under areas to be paved per Division 31 and 33 Specification Sections.
9. Contractor shall correct any settling of trenches throughout the warranty period at no cost to the owner.
10. Install unions and valves per manufacturer’s written specifications.

3.4 VALVES

A. Valves: Install underground valves in valve boxes as shown on Drawings.
B. Mainline Isolation Valves: Install with pipe extension to valve box for ease of operation as shown on the drawings. Comply with manufacturer’s written installation instructions.
C. Quick Coupler Valves: Install in valve box per manufacturer’s written instructions. Include stabilization as shown on the drawings.
D. Place 6-inches minimum of gravel below valves for drainage. Maintain 4-inches minimum between bottom of valves and top of gravel where applicable. Valve box shall be free of dirt and debris.

3.5 SPRINKLERS

A. General: Flush all mainline and lateral line piping with full head of water prior to installation of sprinklers.
B. Rotor Sprinklers & Spray Sprinklers: Install per manufacturer’s written specifications.
   1. Install lawn sprinklers at manufacturer's recommended heights in relation to ground surface.
   2. Make all required connections to Swing Joints.
   3. Adjust spray pattern to avoid paved areas and building walls.
   4. Install required nozzles for 100% coverage and optimum performance.

3.6 DRIP IRRIGATION

A. Install per manufacturer’s written specifications and as shown on drawings.
B. Install drip irrigation components below weed barrier fabric. Coordinate with drawings and specification section 32 93 00.

3.7 VALVE BOXES AND COVERS

A. Install per manufacturer’s written specifications and as shown on drawings.
B. Install paving brick at each corner of rectangular boxes and on two sides of round boxes.
C. Install valve box extensions as required. Set valve box lid flush to finish grade.
D. Provide 6-inch depth 3/8-inch gravel in bottom of each box.
E. Install valves aligned and equally spaced as shown on the drawings.
F. Provide and install lockdown bolt at date of substantial completion.

3.8 CONTROL SYSTEM
A. Install controller per manufacturer's written instructions and as shown on the drawings.
   Install in locking vandal proof enclosure.
B. Install all required power connections for all control system components.
C. Install all required valve control wiring for a fully functional system.
D. Install control wiring in same trench with piping. Where wiring requires a trench separate
   from piping, install wiring in conduits. Provide wire connections per manufacturer's
   written specifications.
E. Install decoders as shown on drawings and per manufacturer’s written instructions. Route
   control wire from decoder to valve through conduit as shown on drawings.
F. Install all exposed wiring in rigid conduit as shown on the drawings.

3.9 IRRIGATION SYSTEM ACCESSORIES

A. Valve ID Tags – Install at each control valve as detailed. Valve ID Tag shall be factory labeled
   with valve number.

3.10 EXISTING SYSTEM MODIFICATIONS

A. Investigate existing site conditions as needed to become familiar with the existing system.
B. Provide all necessary modifications to ensure fully functional system at existing irrigation
   areas as noted on the drawings.

3.11 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Division 01 Specifications.
B. Coordinate field inspection and testing with Specification Sections 32 92 00 & 32 93 00.
C. Contractor Performed Testing: The contractor shall perform the following testing and
   provide written confirmation of completed and successful testing to the Architect.
   1. Main Line Pressure Testing: Perform test of piping and valves before back-filling
      trenches. Piping may be tested in sections to expedite work.
      a. Make all necessary provisions for thoroughly bleeding the line of air and
         debris.
      b. Provide all required thrust blocking for testing while trenches remain open.
      c. Before testing, fill the line with water for a period of at least 24 hours.
      d. After valves have been installed, test all live water lines for leaks at a
         pressure of 100 psi for a period of two hours, with all couplings exposed
         and with all pipe sections center-loaded.
      e. Furnish all necessary testing equipment and personnel.
      f. Correct all leaks and retest until successful completion of test.
      g. Pressure loss of less than 3 psi in two hours is acceptable.
      h. Provide written certification of successful test to the architect listing the
         following data: date of test, time of test start, time of test completion,
         pressure loss during testing period, graphic depiction of main line tested,
         name and signature of contractor representative performing test.
D. Landscape Architect Performed Testing:
   1. Installation Inspection: The Contractor shall schedule one site visit with the
      landscape architect to observe the following in-progress work.
      a. Observe installation of main line and lateral line piping systems.
      b. Observe installation of control valve assembly and valve box.
      c. Observe installation of drip tubing assembly.
   2. Sprinkler Coverage Testing: The Contractor shall schedule one site visit with the
      landscape architect to observe the following in-progress work.
      a. Run each zone for the time required to observe coverage of heads.
b. Coverage test to be performed prior to installation of plant material seed or sod.

c. Correct coverage issues indicated by landscape architect.

d. Adjust nozzle spray pattern as required to avoid water spray on building walls, roads or sidewalks.

3.12 CLEANING AND ADJUSTING

A. Flush dirt and debris from piping before installing sprinklers and other devices.

B. Adjust automatic control valves to provide flow rate of rated operating pressure required for each sprinkler circuit.

C. Carefully adjust lawn sprinklers so they will be flush with finish grade after completion of landscape work. Adjust so that sprinklers do not spray on walks, buildings or walls.

D. Adjust settings of controllers and automatic control valves to insure proper watering of all landscaping.

3.13 DEMONSTRATION

A. Provide irrigation system demonstration under provisions of Division 1. Record on DVD video format if requested by Owner.

B. Demonstrate to Owner: that system meets coverage requirements and that automatic control functions properly.

C. Demonstrate to Owner’s maintenance personnel operation of equipment, sprinklers, specialties, and accessories. Review operating and maintenance information including start up and winterization procedures.

END OF SECTION 32 84 00
SECTION 32 92 00

TURF AND GRASSES

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes
1. Topsoil placement
2. Soil Preparation, amendment and fertilization
3. Finish Grading
4. Turf Sodding
5. Sod establishment
6. Turf Maintenance
7. Clean-up

B. Definitions
2. Finish Grade: Elevation of finished surface of planting soil.
3. Planting Soil: Imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.
4. Topsoil: material per specifications section 312000.
5. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

C. Related Sections include the following:
1. Specification Section 311000 Site Clearing.
2. Specification Section 312000 Earth Moving.
3. Specification Section 328400 Planting Irrigation.
4. Specification Section 329300 Plants.
5. Division 01 Specifications.

1.2 REFERENCES

A. FS O-F-241 - Fertilizers, Mixed, Commercial.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.
1. Soil Amendment Fertilizer.
2. Turf Starter Fertilizer.
3. Turf Maintenance Fertilizer.
4. Weed Control Herbicide.
B. Submit sod certification for grass species and location of sod source.
C. Submit compost testing data to confirm product meets specified parameters.
D. Submit topsoil testing data to confirm product meets specified parameters.
E. Sod Establishment Irrigation Schedule.
F. Turf Maintenance Irrigation Schedule.

1.4 QUALITY ASSURANCE

A. Sod:
   1. Minimum age of 12 months, with root development that will support its own weight without tearing, when suspended vertically by holding the upper two corners.
   2. Qualifications: Sod Producer shall be company specializing in sod production and harvesting with minimum five years of experience.

B. Regulatory Requirements
   1. Comply with regulatory agencies for fertilizer and herbicide composition.

C. Installer Qualifications (Individual): In order to qualify for the landscape installation work on this project, the following information must be submitted with the Bid Submittal.
   1. Landscape Installation/Maintenance Supervisor/Manager: This person shall have a minimum of three (3) years experience in handling/maintaining the specified materials, and in sizes specified, in installations/maintenance of similar scope.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division 1.
B. Packaged materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with State and Federal laws, as applicable.
C. Sod
   1. Deliver sod on pallets, in rolls. Protect exposed roots from dehydration.
   2. Do not deliver more sod than can be laid within 24 hours.
D. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.
E. Bulk Materials:
   1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
   2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
   3. Accompany each delivery of bulk materials with appropriate certificates.

1.6 PROJECT/SITE CONDITIONS

A. Do not install plant life when ambient temperatures may drop below 45 degrees F or rise above 90 degrees F.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate work under provisions of Division 1.
B. Coordinate sod placement work with irrigation system work specified and in the Drawings.
C. Irrigation system shall be fully functional, including the control system, prior to installation of any plant material.
1.8 WARRANTY

A. Contractor shall warrant work as provided by the General and Supplementary Conditions and Division 01 Specifications.

PART 2 – PRODUCTS

2.1 PRODUCTS & MATERIALS

A. Substitutions or equivalent products shall be in accordance with Division 01 Specifications.

B. Topsoil Material:
1. Topsoil shall be free of refuse, constituents toxic or otherwise deleterious to plant growth, woody vegetation, stumps or roots, brush, stones, and clay lumps. Sod and herbaceous growth such as grass need not be removed, but shall be thoroughly broken up and mixed with the soil.
2. Grading and Quality Requirements: Topsoil shall conform to the requirements shown below:

a. Topsoil Material Gradation:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-inch</td>
<td>100</td>
</tr>
<tr>
<td>3/8-inch</td>
<td>85-100</td>
</tr>
<tr>
<td>No. 8</td>
<td>50-80</td>
</tr>
<tr>
<td>No. 200</td>
<td>0-20</td>
</tr>
</tbody>
</table>

b. Topsoil Quality:

<table>
<thead>
<tr>
<th>Test</th>
<th>Test Method</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sampling Aggregate</td>
<td>ASTM D 75</td>
<td></td>
</tr>
<tr>
<td>Sieve Analysis</td>
<td>ASTM C 136 &amp; C 117</td>
<td>Table - 2.1</td>
</tr>
<tr>
<td>General Texture</td>
<td>ASTM D 422-63</td>
<td>Sand: &lt; 70%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Silt: &lt; 70%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clay: &lt; 30%</td>
</tr>
<tr>
<td>Organic Content</td>
<td>AASHTO T 194</td>
<td>&gt; 2%</td>
</tr>
<tr>
<td>Soluble Salts</td>
<td>ASTM D 5298-10</td>
<td>&lt; 2</td>
</tr>
<tr>
<td>PH</td>
<td>ASTM E 70</td>
<td>6.5 to 7.5</td>
</tr>
</tbody>
</table>

3. Representative samples from proposed topsoil source shall be tested for all quality items noted in 2.1, B., 2., b. above, by a recognized commercial or governmental agency and copies of the testing results shall be furnished to the landscape architect by the contractor. Coordinate with Submittals, Part 1 of this section.

C. Turf Sod: ASPA Certified Field grown grade; cultivated grass sod; type indicated below; with strong fibrous root system, free of stones, burned or bare spots; containing no more than 5 weeds per 1000 sf. Sod shall be from an established regionally local grower.

1. Sod shall 80/20 Bluegrass/Ryegrass blend

D. Soil Amendment: Compost

1. Compost shall be measured by the cubic yard at the point of loading.
2. Compost shall be a well decomposed, stable, weedfree organic matter source. It shall be derived from agricultural, food, or industrial residuals; biosolids (treated sewage sludge); yard trimmings or source-separated or mixed solid waste. The product shall contain no substances toxic to plants, will possess no objectionable odors and shall not resemble the raw material from which it was derived.
3. Compost shall meet the following parameters:
   a. pH – Acceptable Range: 6.0 – 8.4 (1:5 by weight)
b. Soluble Salts – Acceptable Range: 0-7 mmhos/cm (1:5 by weight)
c. Maturity Indicators:
   1) Ammonia N / Nitrate N Ratio - < 4
   2) Carbon to Nitrogen Ratio < 12
d. Particle size: 98% pass through 1/2-inch screen.
e. Physical contaminants (inert matter): less than 1%
f. Submit lab testing indicating compliance with the parameters above. Lab testing shall also provide the following information: Bulk Density; % Inorganics; % Moisture; Particle Size Distribution, Primary & Secondary Nutrients; Trace Elements; Organic Matter Expressed in Percentage and Pounds per CY.

E. Soil Amendment: Pre-Plant Fertilizer
   1. NPK Fertilizer: Wilbur-Ellis Perfection 16-20-0.
   2. Humic Acid: Live Earth Humate Soil Conditioner.

F. Soil Amendment: Turf Starter Fertilizer

G. Turf maintenance Fertilizer:
   1. NPK Fertilizer: Wilbur-Ellis Perfection 16-16-16 (50% of nitrogen from Duration 90).

H. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.
I. Pre-Emergent Herbicide: Tupersan Herbicide Wettable Powder, Tenacity, or approved equal.
J. Weed Control Herbicide:
   1. Selective Broadleaf Weed Control: 2,4-D Amine Weed Killer.
   2. Broad Spectrum Herbicide: Roundup Pro.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that prepared topsoil is ready to receive the work of this Section.
B. Beginning of installation means acceptance of existing site conditions.
C. All planting areas shall be weed free at the time of seed and sod installation.
D. Irrigation system and irrigation control system shall be fully functional prior to placement of sod.

3.2 LANDSCAPE FILL

A. Refer to Section 312000 for excavation at topsoil areas.
B. Upon approved preparation of subgrade, placement of Landscape Fill shall proceed.
C. Place topsoil at locations indicated on the drawings, at all tree pits and seed/sod areas. Place in maximum 9-inch loose lifts and compact to 87% per ASTM D698.
D. Place topsoil at a minimum compacted depth of 12-inches.
E. Surface of topsoil shall be smooth, even surface. Remove ridges and fill depressions as required to meet finish grades. Leave topsoil areas clean and raked, ready to receive landscaping soil amendments.
F. Coordinate placement and compaction of topsoil with Specification Section 329300.

3.3 SOIL AMENDMENTS

A. Soil Amendments: After approximate finished grades have been established soil shall be conditioned and fertilized in the following manner. Soil amendments shall, at the
following rate, be uniformly spread and cultivated thoroughly by means of mechanical
tiller into the top soil layer; minimum 4 Inch depth and maximum 6 Inch depth.
1. Application Rates:
   a. Soil Amendment: Compost – 1 CY per 1000 SF
   b. Soil Amendment: Humic Acid – 15 lbs per 1000 SF
   c. Soil Amendment: NPK 16-20-0 – 3 lbs per 1000 SF

B. Placement and tilling of soil amendments listed in this section must be completed prior to
   sod placement. Contractor shall photo document installation of all soil amendments and
   mechanical tilling and provide to the architect for review and approval.

3.4 FINISH GRADING
A. Upon completion of soil amendment operations, finish grading operations shall begin.
B. Coordinate with Section 312000, Earth Moving.
C. Grade topsoil to smooth, even surface with loose, uniformly fine texture. Remove ridges
   and fill depressions, as required to meet finish grades. Finish grade of topsoil related to
   adjacent site elements shall be:
1. Sod Areas: 1-inch below top of adjacent pavement, valve box, vault, etc.
D. Remove all roots, weeds, rocks and foreign material on the surface. Coordinate with
   Section 328400 for removal of debris brought to the surface during trenching operations.
E. Prior to placement of sod, topsoil shall be water settled through application of .5-inch of
   precipitation through the irrigation system. Coordinate with section 328400. All areas of
   settlement shall be top dressed with approved topsoil material to provide a smooth, even
   surface. Any settlement of soils after placement of sod shall be corrected by the
   contractor at no cost to the owner. Do not allow erosion or rilling of topsoil.
F. Tolerance: Top of Topsoil – Plus .25-inch, no minus.

3.5 SOD PLACEMENT
A. General:
   1. Topsoil placement, soil amendments placement and tilling, compaction/water
      settling and finish grading shall be completed and approved by the landscape
      architect prior to sod placement.
   2. Do not place sod when ground is too wet or too dry.
   3. Temperature shall be between 45 F and 90 F for a 24 hour period.
   4. Wind shall be less than 20 mph.
B. Turf Sod Placement:
   1. Moisten prepared surface immediately prior to laying sod.
   2. Lay sod immediately after delivery to site to prevent deterioration.
   3. Lay sod tight with no open joints visible, and no overlapping; stagger end joints 12
      inches minimum. Do not stretch or overlap sod pieces.
   4. Lay smooth. Align with adjoining grass areas.
   5. Place top elevation of sod soil layer (not grass blades) ½ inch below adjoining
      edging paving, curbs and sidewalks.
   6. On 3:1 or greater slopes, lay sod perpendicular to slope and secure every row with
      wooden pegs at maximum 2 feet on center. Drive pegs flush with soil portion of
      sod.
C. Soil Amendments Turf Starter: Final operation after sod placement, and prior to irrigation,
   apply to the sod surface. Water into sod with irrigation system.
   1. Application Rates: Turf Starter – Mix #29 15-15-15: 3 lbs per 1000 SF.
D. Placement of Turf Starter fertilizer listed in this section must be completed immediately
   after sod placement. Contractor shall photo document installation of turf starter fertilizer
   and provide to the Architect for review and approval. Contractor shall provide product
receipts for all products specified in this section for review and approval by the landscape architect prior to granting of Substantial Completion.

E. Water sodded areas immediately after installation of turf starter fertilizer.

F. After initial irrigation of sod, allow soil to dry sufficiently for rolling. Roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities. Roller not to exceed 100 lbs.

### 3.6 SOD ESTABLISHMENT

A. General: Starting immediately after sod placement, sod establishment will begin. Irrigation, mowing, weed control and fertilization shall be the responsibility of the contractor as defined herein. Protect sodded area with signs to prevent traffic throughout the establishment period.

B. The establishment period shall have a duration of thirty (30) days.

C. Irrigation:
   1. Contractor shall submit for approval a proposed “Sod Establishment Irrigation Schedule”. This schedule shall include Zone designation, days per week, cycles per day and cycle run time. Include targeted daily and weekly precipitation rates for each zone based on current climatic conditions.
   2. Water shall be applied to moisten the soil to approximately 2-inch depth but avoid overwatering and creating areas of standing water or under watering and creating areas of dry soil.
   3. Contractor shall monitor irrigation daily to identify areas receiving too much or too little precipitation.
   4. Slopes shall be monitored for erosion and corrective action taken immediately.
   5. Once the sod has been mown three times, approximately 4 weeks, the frequency of irrigation shall be reduced and run times increased to provide water deeper into the soil.

D. Mowing:
   1. Mowing shall begin when the grass blades reach a height of approximately 2.5-Inches.
   2. All cutting equipment shall be sharp and mowers shall be adjusted precisely to the proper mowing height.
   3. Mowing heights during the establishment period shall be 2.5-Inch to 3.0-Inch.
   4. Mowing shall occur every 7 days or more often if growth dictates. At no point shall the height of the turf grass be more than 3.0-Inches.
   5. Grass clippings shall be collected and removed from the site.
   6. Coordinate irrigation schedule with mowing schedule. At no time shall mowing occur if soil is wet and rutting may occur.

E. Weed Control: Control growth of weeds throughout establishment period.

F. Upon completion of the establishment period the Turf Maintenance period shall begin.

### 3.7 TURF MAINTENANCE

A. Maintenance shall be according to the following standards. All areas shall be mown, weeded and cultivated at intervals of not more than seven (7) days. Watering, trash and debris removal, mowing, rolling, edging, trimming, fertilization, spraying and pest control, as required, shall be included in the maintenance period. Cleaning of street gutters and sidewalks shall be included. The Contractor shall be responsible for maintaining adequate protection of the area. Damaged areas shall be repaired at the Contractor’s expense. The Contractor shall reseed all spots or areas within the lawn where normal turf growth is not evident.

B. The Turf Maintenance Period shall have a minimum duration of sixty (60) days and
C. Irrigation:
1. Contractor shall submit for approval a proposed “Turf Maintenance Irrigation Schedule”. This schedule shall include Zone designation, days per week, cycles per day and cycle run time. Include targeted daily and weekly precipitation rates for each zone based on current climatic conditions.
2. Water shall be applied to moisten the soil appropriately for the current, seasonal climatic conditions. Avoid overwatering and creating areas of standing water or under watering and creating areas of dry soil.
3. Irrigation shall be monitored weekly to identify areas receiving too much or too little precipitation.
4. Slopes shall be monitored for erosion and corrective action taken immediately.

D. Mowing:
1. Mowing shall occur at intervals of not more than seven (7) days or more often if growth dictates.
2. All cutting equipment shall be sharp and mowers shall be adjusted precisely to the proper mowing height.
3. Mowing heights during the maintenance period shall be 2.5-Inch – At no point shall the height of the turf grass be more than 3.5-inches.
4. Grass clippings shall be collected and removed from the site.
5. Coordinate irrigation schedule with mowing schedule. At no time shall mowing occur if soil is wet and rutting may occur.
6. Edges shall be trimmed as needed for neat appearance.

E. Weed Control:
1. Control growth of weeds throughout maintenance period. Inspect turf areas every seven (7) days for weed growth.
2. Utilize 2,4-D broadleaf weed killer to control weeds in all turf areas.

F. Fertilization – Two required applications:
1. Turf Maintenance Fertilizer (16-16-16) shall be applied at a rate of 3 lbs per 1000 SF, approximately 45 days following placement of sod.
2. Turf Maintenance Fertilizer (16-16-16) shall be applied at a rate of 5 lbs per 1000 SF, approximately 90 days following placement of sod.

G. Continuously maintain the entire project area during the progress of work until the date of Substantial Completion.

3.8 FIELD QUALITY CONTROL

A. Perform field inspections under provisions of Division 01 Specifications.
B. Coordinate field inspections with Specification Sections 328400 & 329300.
C. Contractor Performed Inspections: The contractor shall perform the following applicable inspections and provide written confirmation of completed and successful installation to the Architect.

3.9 CLEANING

A. After all seeding and sodding operations have been completed; remove all trash, excess
soil or rubbish from the property. All scars, ruts or other marks in the ground caused by this work shall be repaired and the ground left in a neat and orderly condition throughout the site. Contractor shall pick up all trash resulting from this work no less frequently than each day before leaving the site. All trash shall be removed completely from the site. The Contractor shall leave the site area broom-clean and shall wash down all paved areas within the Contract area, leaving the premises in a clean condition acceptable to the Architect and Construction Manager.

3.10 PROTECTION

A. Protect sodded areas with warning signs until date of Substantial Completion.

END OF SECTION 32 92 00
SECTION 32 93 00
PLANTS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes
   1. Shrub Planting Pits.
   2. New shrubs and accessories.
   3. Soil amendments and fertilizer.
   4. Landscape bark mulch.
   5. Shrub Establishment.

B. Definitions
   2. Plants: Living shrubs, plants, and ground cover as specified in this Section and indicated on Drawings, and described in ANSI Z60.1.

1.2 REFERENCES

A. ANSI Z60.1 - Nursery Stock.
B. NAA (National Arborist Association) - Pruning Standards for Shade Shrubs.
C. FSO-F-241 - Fertilizers, Mixed, Commercial.

1.3 SUBMITTALS

A. Provide submittals per Division 01 Specifications.
B. Submit list of plant life sources and confirmed availability.
C. Landscape Bark Mulch: 1-gallon zip lock bag with sample name and product material for each type and size of mulch.
D. Landscape Boulders: Representative photographs of boulders at the source location.
E. Product Data: Provide Manufacturer’s (catalog) product information.
   1. Soil Amendments and Fertilizer.
F. Shrub Establishment Irrigation Schedule.
G. Shrub Maintenance Irrigation Schedule.

1.4 QUALITY ASSURANCE

A. Nursery Qualifications: Company specializing in growing and cultivating the plants with
three years experience.

B. Installer Qualifications: Company specializing in installing and planting the plants with three years experience.

C. Maintenance Services: Performed by installer.

D. Regulatory Requirements
   1. Comply with regulatory agencies for fertilizer and herbicide composition.
   2. Plant Materials: Certified by state department of agriculture; Described by ANSI Z60.1; free of disease or hazardous insects.

E. Quality
   1. Plants shall be 100% sound, healthy, vigorous, and free from plant disease, insect pests or their eggs, noxious weeds, and have healthy, normal root systems. Container stock shall be well established and free of excessive root-bound conditions.
   2. Do not prune plants or top shrubs prior to delivery.
   3. Plant materials shall be subject to approval by Architect as to size, health, quality and character. Architect reserves the right to inspect shrubs and shrubs either at place of growth or at site for compliance with requirements.
   4. Bare root shrubs are not acceptable.

F. Measurements
   1. Measure height and spread of specimen plant materials with branches in their normal position as indicated on Drawings or Plant List.
   2. Measure caliper of shrubs 6 inches above surface of ground.
   3. Where caliper or other dimensions of plant materials are omitted from Plant List, plant materials shall be normal stock for type listed.
   4. Plant materials larger than those specified may be supplied with approval of Architect
      a. If complying in all other respects.
      b. If at no additional cost to Owner.
      c. If sizes of roots or balls are increased proportionately.
   5. Shape and Form - Plant materials shall be symmetrical or typical for variety and species and conform to measurements specified in Plant List.
   6. Provide plant materials from a licensed nursery.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division 1.
B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.
C. Protect and maintain plant life until planted.
D. Deliver plant life materials immediately prior to placement. Keep plants moist.

1.6 PROJECT/SITE CONDITIONS

A. Do not install plant life when ambient temperatures may drop below 40 degrees F or rise above 90 degrees F.
B. Do not install plant life when wind velocity exceeds 20 mph.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate work under provisions of Division 1.
B. Install plant life after and coordinate with installation of underground irrigation system piping and watering heads specified in Section 328400.
C. Coordinate plant installation work with irrigation work specified and in the Drawings.
D. Coordinate shrub installation with seeding and sodding installation per 329200.

1.8 WARRANTY

A. Contractor shall warrant work as provided by the General and Supplementary Conditions and Division 01 Specifications.

PART 2 – PRODUCTS

2.1 PRODUCTS & MATERIALS

A. Substitutions or equivalent products shall be in accordance with Division 01 Specifications.
B. Topsoil: Material per Specifications Section 329200.
   1. Depth and volume as required for shrub pits as noted in this section and on the drawings. Provide necessary volume to ensure planter areas are filled to specified finish grade.
C. Shrubs: Species and size identifiable in plant schedule on the Drawings, grown in climatic conditions similar to those in locality of the Work.
D. Soil Amendment Materials
   1. Fertilizer:
      a. Commercial Grade Compost. Refer to Section 329200.
      b. Humic Acid: Live Earth Humate Soil Conditioner.
      c. Wilbur-Ellis Perfection GYPSUM granular.
      d. Planting tablet fertilizer: 21 gram – Agriform.
   2. Water: Clean, fresh, and free of substances or matter which could inhibit vigorous growth of plants.
E. Maintenance Fertilizer: Live Earth Shrub & Shrub 5-10-10.
F. Weed Control Herbicide:
   1. Selective Broadleaf Weed Control: 2,4-D Amine Weed Killer.
   2. Broad Spectrum Herbicide: Roundup Pro.
G. Pre-Emergent Herbicide: Tupersan, Tenacity, or approved equal.

2.2 ACCESSORIES

A. Landscape bark mulch:
   1. 3-inch minimum depth of medium course bark mulch.
B. Landscape Boulders: Size as shown on the Drawings. Basalt material, angular boulders with dark browns, reds, and tan colors. Submit representative photographs of boulders at source for approval prior to delivery to site.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that prepared topsoil is ready to receive work.
B. Verify that required underground utilities are available, in proper location, and ready for use.
C. All planters shall be completely filled with topsoil to within 3-IN of adjacent curb, walk, etc. Topsoil elevation shall be adjusted per mulch type/size. See Drawings.

3.2 SOIL PREPERATION

A. Prior to placement of plants, topsoil shall be water settled through application of .5-inch of
precipitation through the irrigation system. Coordinate with section 328400 & 329200. All areas of settlement shall be top dressed with approved topsoil material to provide a smooth, even surface. Any settlement of soils after placement of plants shall be corrected by the contractor at no cost to the owner.

B. Shrub Pit Backfill Planting Mix: Blend topsoil and soil amendments and fertilizer for shrub pit backfill at the following rates. Blend amendments thoroughly with soil backfill. Coordinate with drawings for size of planting pit. Blend topsoil and amendments with native soil at bottom and edge of pit.
1. Shrub Pits shall be: 2.5’x2.5’x1’ (6 CF)
2. Application Rates:
   a. Humic Acid: 2 lbs per Shrub Pit
   b. Gypsum: 2 lbs per Shrub Pit
   c. Commercial grade compost – 1 cubic feet per Shrub Pit
   d. Planting Tablet Fertilizer – 2 tablets per Shrub Pit

C. Placement and blending of soil amendments listed in this section shall be photo documented by the contractor. Document installation of all soil amendment application and blending and provide to the landscape architect for review and approval.

D. Representative plant material must be delivered to the site for review and approval by the landscape architect prior to installation. Any plant material placed without prior approval is subject to removal at no cost to the owner.

3.3 EXECUTION

A. Place plants for best appearance for review and final orientation by landscape architect.
B. Set plants vertical.
C. After placement cut all string, wires, etc. and remove string, wire and burlap from top and sides of root ball before backfilling.
D. Set plants in pits or beds, partly filled with prepared plant soil mix. Backfill soil mixture in 6 inch layers. Maintain plant materials in vertical position. Add fertilizer tablets in plant pit (at 2/3 full) as per manufacturer’s recommendations.
E. Saturate soil with water when the pit or bed is half full of topsoil and again when full.
F. Installation of Accessories
   1. Apply pre-emergent herbicide to planting areas after completion of planting. Planting areas shall be free of existing weed growth prior to application of herbicide. Apply herbicide in accordance with Manufacturer’s recommendations.
   2. Place Landscape Mulch over landscape planting bed areas. See Drawings for location and depth. Keep mulch 6-inch from base of shrubs and shrubs.

3.4 SHRUB ESTABLISHMENT

A. General: Starting immediately after shrub placement, establishment will begin and continue through the grow-in period. Irrigation and weed control shall be the responsibility of the contractor as defined herein. Protect planter areas with signs to prevent traffic throughout the establishment period.
B. The establishment period shall have a duration of thirty (30) days.
C. Irrigation:
   1. Contractor shall submit for approval a proposed “Shrub Establishment Irrigation Schedule”. This schedule shall include Zone designation, days per week, cycles per day and cycle run time. Include targeted daily and weekly precipitation rates for each zone based on current climatic conditions. Coordinate with sod establishment irrigation schedule.
   2. Water shall be applied to moisten the root ball and the soil adjacent to the root ball. Avoid overwatering and creating areas of standing water.
3. Irrigation shall be monitored daily to identify areas receiving too much or too little precipitation.

D. Weed Control:
   2. Chemical herbicide shall not be used in shrub areas during the establishment period.

E. Upon completion of the establishment period the maintenance period shall begin.

3.5 SHRUB MAINTENANCE

A. Maintenance shall be according to the following standards. All areas shall be weeded and cultivated at intervals of not more than seven (7) days. Watering, trash and debris removal, fertilization, spraying and pest control, as required, shall be included in the maintenance period. Cleaning of street gutters and sidewalks shall be included. The Contractor shall be responsible for maintaining adequate protection of the area. Damaged areas shall be repaired at the Contractor’s expense.

B. The maintenance period shall have a minimum duration of sixty (60) days and continue until the date of Substantial Completion.

C. Irrigation:
   1. Contractor shall submit for approval a proposed “Shrub Maintenance Irrigation Schedule”. This schedule shall include Zone designation, days per week, cycles per day and cycle run time. Include targeted daily and weekly precipitation rates for each zone based on current, seasonal climatic conditions.
   2. Water shall be applied to moisten the soil appropriately for the current, seasonal climatic conditions. Avoid overwatering and creating areas of standing water.
   3. Irrigation shall be monitored weekly to identify areas receiving too much or too little precipitation.

D. Weed Control:
   1. Control growth of weeds throughout maintenance period. Inspect turf areas every seven (7) days for weed growth.
   2. Utilize weed killer and hand pulling to control weeds in all planter and turf areas.

E. Fertilization:
   1. Two applications of Maintenance Fertilizer shall be applied during the maintenance period. Application shall occur at 45 days and 90 days after installation of plant material and prior to the date of Substantial Completion.
   2. Maintenance fertilizer shall be applied at the following rate per manufacturer’s written instructions for root feeding:
      a. Dilute 40:1 with water prior to use.
      b. Shrubs: Apply 2 gallons of diluted product per shrub.
   3. Apply Liquid Humic Acid / water mixture to root ball and area directly adjacent to root ball.

F. Insect and Disease Control: Maintain a reasonable level of control with approved materials.

G. Plant material replacement: Replace dead, dying and missing plants with plants of a size, condition and variety to match plans and as acceptable to the Architect at Contractor’s expense under the provisions Division 01 Specifications.

H. Continuously maintain the entire project area during the progress of work until the date of Substantial Completion.

3.6 FIELD QUALITY CONTROL

A. Perform field inspections under provisions of Division 01 Specifications.
B. Coordinate field inspections with Specification Section 328400 & 329200.

C. Contractor Performed Inspections: The contractor shall perform the following inspections and provide written confirmation of completed and successful installation to the Architect.

1. Shrub Pit Backfill Planting Mix and Shrub Placement: Provide required photographs demonstrating successful placement and blending of specified soil amendments including the placement of shrubs and the backfill of the shrub planting pit.

2. Shrub Maintenance - Fertilization: Provide required photographs demonstrating successful placement of specified maintenance fertilizer.

D. Landscape Architect Performed Inspections:

1. Shrubs – Material & Installation: The Contractor shall schedule one site visit with the landscape architect to inspect representative plant material and the installation of shrubs and shrubs.

3.7 CLEANING

A. After all planting, establishment and maintenance operations have been completed; remove all trash, excess soil or rubbish from the property. All scars, ruts or other marks in the ground caused by this work shall be repaired and the ground left in a neat and orderly condition throughout the site. Contractor shall pick up all trash resulting from this work no less frequently than each day before leaving the site. All trash shall be removed completely from the site. The Contractor shall leave the site area broom-clean and shall wash down all paved areas within the Contract area, leaving the premises in a clean condition acceptable to the Architect and Construction Manager.

3.8 PROTECTION

A. Protect planter areas with warning signs until date of Substantial Completion.

END OF SECTION 32 93 00
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PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes
   1. Water distribution piping and related components outside the building for water service, fire service and irrigation service.
   2. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

1.2 RELATED SECTIONS

A. Division 01 Sections.
B. Division 31 Section "Earth Moving" utility trench excavation, bedding and backfill.

1.3 SUBMITTALS

A. Submit under provisions of Division 01.
B. Product Data: for each type of product indicated.
C. Shop Drawings
   1. Indicate general installation, components, dimensions, coverage, clearances, and methods of installation.
   2. Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.
D. Field Reports: Field quality-control test reports, pressure test reports and disinfection reports.
E. Operations & Maintenance Data: Submit manufacturer’s written Operations & Maintenance data for all components & accessories.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements
   1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
   2. Comply with AHJ Standards for potable-water-service piping, including materials, installation, testing and disinfection.
   3. Piping materials shall bear label, stamp, or other markings of the specified testing agency.
   6. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.
   7. Comply with local plumbing codes.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division 01.
1.6 COORDINATION

A. Coordinate connection to water main with utility company.

1.7 WARRANTY

A. Contractor shall warrant work as provided by the General and Supplementary Conditions and Division 01 Specifications.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Substitutions or equivalent products shall be in accordance with Division 01 Specifications.

2.2 PIPES AND PIPE FITTINGS

A. Per the Drawings, AHJ Supplemental Specifications to the ISPWC, and the ISPWC.

2.3 PIPING SPECIALTIES

A. Per the Drawings, AHJ Supplemental Specifications to the ISPWC, and the ISPWC.

2.4 GATE VALVES

A. Per the Drawings, AHJ Supplemental Specifications to the ISPWC, and the ISPWC.

2.5 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Per the Drawings, AHJ Supplemental Specifications to the ISPWC, and the ISPWC.
B. Indicator Posts: UL 789, FMG-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.

2.6 WATER METERS & METER BOXES/VAULTS

A. Per the Drawings, AHJ Supplemental Specifications to the ISPWC, and the ISPWC.

2.7 FIRE HYDRANTS

A. Per the Drawings, AHJ Supplemental Specifications to the ISPWC, and the ISPWC.
B. Color: Red.

2.8 FIRE DEPARTMENT CONNECTIONS

A. Per the Drawings, AHJ Supplemental Specifications to the ISPWC, and the ISPWC.
B. Fire Department Connections:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      b. Fire End & Croker Corporation.
      c. Guardian Fire Equipment, Inc.
      d. Kidde Fire Fighting.
2. Description: Freestanding, with cast-bronze body, thread inlets according to NFPA 1963 and matching local fire department hose threads, and threaded bottom outlet. Include lugged caps, gaskets, and chains; lugged swivel connection and drop clapper for each hose-connection inlet; 18 inch high brass sleeve; and round escutcheon plate.
   b. Connections: Two NPS 2-1/2 inlets and one NPS 4 outlet.
   c. Height: 24” min, 42” max above finish grade.
   d. Inlet Alignment: Horizontal.
   e. Finish: OSHA safety red.
   f. Escutcheon Plate Marking: "AUTO SPKR."

2.9 TRENCH FILL MATERIALS

A. Bedding: per specification section 312000.
B. Trench backfill: per specification section 312000.

2.10 ACCESSORIES

A. Thrust Blocks: Per the Drawings and ISPWC.
B. Anchorages: Provide anchorages for tees wyes, crosses, plugs, caps, bends, valves, and hydrants. After installation, apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of ferrous anchorages.
   1. Rods: Steel, ASTM A 575.
   2. Rod Couplings: Malleable-iron, ASTM A 197.
   3. Thrust Blocks: Concrete, 2,500 psi.
C. No.12 Direct Burial Locator wire with Dri-splice connectors shall be installed with waterlines. Wire shall extend to surface at all valve boxes/meters and be fastened to the top of the pipe at maximum 10' intervals.
D. Warning Tape: Install per specification section 312000.

PART 3 – EXECUTION

3.1 EXECUTION

A. Per the Drawings, AHJ Supplemental Specifications to the ISPWC, and the ISPWC.
B. Route pipe in straight lines.
C. Install pipe to allow for expansion and contraction without stressing pipe or joints.
D. Install access fitting to permit disinfection of water system.
E. Form and place concrete for thrust blocks at each change of direction of pipe main.
F. Establish elevations of buried piping to ensure not less than 4'-0" of cover and not more than 5'-0" unless otherwise approved in writing by the AHJ.
G. Set valves on solid bearing. Locate valve a minimum of 12" away from hydrant.
H. Center and plumb valve box over valve. Set box cover flush with finished grade.

3.2 DISINFECTION AND TESTING

A. Per the Drawings, AHJ Supplemental Specifications to the ISPWC, and the ISPWC.

END OF SECTION 33 10 00
SECTION 33 30 00
SANITARY SEWERAGE UTILITIES

PART 1 – GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Sanitary sewerage piping, manholes, fittings and accessories.

1.2 RELATED SECTIONS
A. Division 01 Sections.
B. Division 31 Section "Earth Moving" utility trench excavation, bedding and backfill.

1.3 SUBMITTALS
A. Submit under provisions of Division 01.
B. Product Data: Provide data indicating pipe, manholes, fittings, accessories, and fill material.
C. Project Record Documents
   1. Submit documents under provisions of Division 01.
   2. Conform to requirements of ISPWC.
   3. Record location of pipe runs, connections, manholes, cleanouts and invert elevations.
   4. Identify and describe unexpected variations to subsoil conditions or discovery of unchartered utilities.
D. Field Reports: Field quality-control and testing reports.
E. Operations & Maintenance Data: Submit manufacturer’s written Operations & Maintenance data for all components & accessories.

1.4 QUALITY ASSURANCE
A. Regulatory Requirements
   1. Conform to requirements of ISPWC.
B. Utility trench compaction
   1. Per Division 31 Earth Moving.

1.5 PROJECT/SITE CONDITIONS
A. Verify that field measurements and elevations are as indicated.

1.6 SEQUENCING AND SCHEDULING
A. Coordinate work under provisions of Division 01.
B. Coordinate the Work with termination of sanitary sewer connection outside building, and trenching.

1.7 WARRANTY
A. Contractor shall warrant work as provided by the General and Supplementary Conditions and Division 01 Specifications.
PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Substitutions or equivalent products shall be in accordance with Division 01 Specifications.

2.2 MATERIALS

A. Per the Drawings, AHJ Supplemental Specifications to the ISPWC, and the ISPWC.

2.3 COMPONENTS

A. Per the Drawings, AHJ Supplemental Specifications to the ISPWC, and the ISPWC.

2.4 ACCESSORIES

A. Per the Drawings, AHJ Supplemental Specifications to the ISPWC, and the ISPWC.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with structural fill.
B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

3.3 EXECUTION

A. Per the Drawings, AHJ Supplemental Specifications to the ISPWC, and the ISPWC.
B. Bedding
   1. Excavate pipe trench in accordance with Section 312000 for work of this Section.
   2. Place bedding material in accordance with Section 312000 at trench bottom, level materials in continuous layer not exceeding 4 inches compacted depth.
   3. Maintain optimum moisture content of bedding material to attain required compaction density.
C. Pipe
   1. Install pipe, fittings, and accessories in accordance with ASTM D 2321, manufacturer's instructions. Seal joints watertight.
   2. Pipe installation and backfill shall be consistent with the drawings and the ISPWC.
   3. Lay pipe to slope at gradients noted on drawings; with maximum variation from true slope of 1/16 inch in 10 feet.
   4. Install bedding to minimum compacted thickness of 6” above pipe, 4” below pipe and 12” at sides of pipe.
   5. Refer to Section 312000 for trenching and detectable warning tape requirements. Do not displace or damage pipe when compacting.
   6. Connect to building sanitary sewer outlet and collection system.
3.4 TESTING

A. Prior to final acceptance, after all utilities are in and prior to paving, the following testing shall perform testing in the presence of the Engineer.

B. Visual Inspection.
   1. Per AHJ and ISPWC.

C. Air Pressure Testing.
   1. Per AHJ and ISPWC.

D. Pipe Cleaning.
   1. Per AHJ and ISPWC.

E. Deflection Tests for Flexible Pipe.
   1. Per AHJ and ISPWC.

F. Closed Circuit Television (CCTV) Inspection.
   1. Per AHJ and ISPWC.
   2. Test all mains and service lines.

3.5 PROTECTION

A. Protect finished installation under provisions of Division 01.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION 33 30 00
SECTION 33 40 00

STORM DRAINAGE UTILITIES

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Storm drainage piping, fittings, and accessories.
   2. Catch basins, manholes, clean-outs, grates and frames.

1.2 SUBMITTALS

A. Submit under provisions of Division 01
B. Product Data: For each type of product indicated.
C. Shop Drawings:
   1. Catch basins: Include plans, elevations, section, details, frames, covers and grates.
D. Field quality-control reports.
E. Project Record Documents
   1. Submit documents under provisions of Division 01.
   2. Accurately record location of pipe runs, connections, catch basins, cleanouts, and invert elevations each day.
   3. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities each day.
F. Operations & Maintenance Data: Submit manufacturer’s written Operations & Maintenance data for all components & accessories.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Conform to requirements of agency having jurisdiction.
   2. Piping materials shall bear label, stamp, or other markings of the specified testing agency.
B. Comply with ASTM D 2321 and installation of thermoplastic drainage piping.

1.4 WARRANTY

A. Contractor shall warrant work as provided by the General and Supplementary Conditions and Division 01 Specifications.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Substitutions or equivalent products shall be in accordance with Division 01 Specifications.

2.2 PE PIPE AND FITTINGS

A. Corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10: AASHTO M 252M, Type S, with smooth waterway for coupling joints.
2.3 PVC PIPE AND FITTINGS

A. PVC Drain Piping:
   2. Fittings: ASTM D 3034, PVC with bell ends.

2.4 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:
   1. For Concrete Pipes: ASTM C 443, rubber.
   3. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
   4. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Shielded, Flexible Couplings:
   1. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Ring-Type, Flexible Couplings:
   1. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.5 CLEANOUTS

A. Per drawings and details.

2.6 CATCH BASINS

A. Standard Precast Concrete Catch Basins:
   1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
   2. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor
   3. Riser Sections: 4-inch minimum thickness, diameter and lengths to provide depth indicated.
   5. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
   6. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match diameter frame and grate.
   7. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
8. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include flat grate with small square or short-slotted drainage openings.
   a. Grate Free Area: Approximately 50 percent unless otherwise indicated.

2.7 ACCESSORIES

A. Warning Tape: Install per specification section 312000.

PART 3 – EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

D. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

E. Install gravity-flow, nonpressure drainage piping according to the following:
   1. Install piping pitched down in direction of flow.
   2. Install PE corrugated sewer piping according to ASTM D 2321.
   3. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.

3.3 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Install piping so cleanouts open in direction of flow in drainage pipe.
   1. Construct cleanout as specified on drawings.

3.4 CATCH BASIN INSTALLATION

A. Set frames and grates to elevations indicated.

3.5 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.6 CONNECTIONS

A. Connect non-pressure, gravity-flow drainage piping to building storm drains.
3.7 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

3.8 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
   1. Submit separate reports for each system inspection.
   2. Defects requiring correction include the following:
      a. Alignment: Less than full diameter of inside of pipe is visible between structures.
      b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
      c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
      d. Infiltration: Water leakage into piping.
      e. Exfiltration: Water leakage from or around piping.
      f. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
      g. Re-inspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
   1. Do not enclose, cover, or put into service before inspection and approval.
   2. Test completed piping systems according to requirements of authorities having jurisdiction.
   3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
   4. Submit separate report for each test.
   5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
   6. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
      a. Option: Test plastic piping according to ASTM F 1417.
      b. Option: Test concrete piping according to ASTM C 924.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

E. Refer to Division 31 Section "Earth Moving" for trenching compaction.

3.9 CLEANING

A. Clear interior of piping and structures of dirt and other superfluous material as work progresses.

B. Flush piping to remove collected debris. Remove collected debris from all manholes, catch basins and sand and grease traps. Debris shall not enter infiltration facilities.

C. Place plugs in ends of uncompleted pipe at end of day or whenever work stops.

D. After substantial completion, remove temporary filter fabric from catch basin frames.

3.10 PROTECTION
A. Protect finished installation under provisions of Division 01.

END OF SECTION 33 40 00
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