PROJECT MANUAL

VOLUME 2 - Division 01 - 41

Specifications

SOUTHCENTRAL FOUNDATION

PCC II WEST EXPANSION & RENOVATION (SCF22-1068)

4320 DIPLOMACY DRIVE ANCHORAGE, AK 99508

BID DOCUMENTS - ver. 3
02.04.22

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END OF SECTION

SECTION 01 1000
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: SCF PCC II Expansion & Renovation

B. Owner's Name: Southcentral Foundation.

C. Architect's Name: KPB Architects.

D. The Project consists of the Renovation and addition to approximately 30,000 SF of renovation and a 6,000 SF addition to a two story facility. Departments include Audiology, Pharmacy, Traditional Healing, & Pediatrics. of SCF's Primary Care Center - 2 (West).

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00 5200 - Agreement Form.

1.03 WORK BY OWNER

A. Owner will award a contract for supply and/or installation of furnishings, fixtures, & equipment identified in the drawings and specifications as OFCI and OFOI which will commence during the construction phase _____.

B. Items noted NIC (Not in Contract) will be supplied and installed by Owner before Date of Substantial Completion. Some items include:
   1. Movable cabinets.
   2. Furnishings.
   3. Small equipment.
   4. Rugs.
   5. Artwork.

1.04 OWNER OCCUPANCY

A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.

B. Owner intends to occupy the Project upon Substantial Completion.

C. Owner intends to occupy a certain portion of the Project prior to the completion date for the conduct of normal operations.

D. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

E. Schedule the Work to accommodate Owner occupancy.

1.05 CONTRACTOR USE OF SITE AND PREMISES

A. Arrange use of site and premises to allow:
   1. Owner occupancy.
   2. Work by Others.
   3. Work by Owner.
   4. Use of site and premises by the public.

B. Provide access to and from site as required by law and by Owner:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without permit.

1.06 WORK SEQUENCE

A. Construct Work in phases during the construction period (see also drawings):
   1. Phase 1: Pharmacy area.

2. Phase 2: Building addition and adjacent areas (Traditional Healing and Pediatrics ICT area.
3. Phase 3: Audiology and Existing Traditional Healing.

B. Coordinate construction schedule and operations with Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Sum and Contract Time.

C. Change procedures.

D. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

A. Section 00 5000 - Contracting Forms and Supplements: Forms to be used.

B. Section 00 5200 - Agreement Form: Contract Sum, retainages, payment period, monetary values of unit prices.

C. Section 00 7200 - General Conditions: Additional requirements for progress payments, final payment, changes in the Work.

D. Section 00 7300 - Supplementary Conditions: Percentage allowances for Contractor's overhead and profit.

E. Section 01 7800 - Closeout Submittals: Project record documents.

1.03 SCHEDULE OF VALUES

A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.
   1. Each Phase shall have its own AIA G703.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.

C. Forms filled out by hand will not be accepted.

D. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.

C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

D. Forms filled out by hand will not be accepted.

E. For each item, provide a column for listing each of the following:
   1. Item Number.
   2. Description of work.
   3. Scheduled Values.
   4. Previous Applications.
   5. Work in Place and Stored Materials under this Application.
   6. Authorized Change Orders.
   7. Total Completed and Stored to Date of Application.
   8. Percentage of Completion.
   9. Balance to Finish.
   10. Retainage.

F. Execute certification by signature of authorized officer.

G. Submit one electronic and zero hard-copies of each Application for Payment.

H. Include the following with the application:

1. Transmittal letter as specified for submittals in Section 01 3000.
2. Construction progress schedule, revised and current as specified in Section 01 3000.

I. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.05 MODIFICATION PROCEDURES

A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.

B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
2. Promptly execute the change.

C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 8 days.

D. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation. Document any requested substitutions in accordance with Section 01 6000.

E. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.

F. Substantiation of Costs: Provide full information required for evaluation.
1. Provide the following data:
   a. Quantities of products, labor, and equipment.
   b. Taxes, insurance, and bonds.
   c. Overhead and profit.
   d. Justification for any change in Contract Time.
   e. Credit for deletions from Contract, similarly documented.
2. Support each claim for additional costs with additional information:
   a. Origin and date of claim.
   b. Dates and times work was performed, and by whom.
   c. Time records and wage rates paid.
   d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.

G. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

H. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

I. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

J. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2300
ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description of Alternates.

1.02 RELATED REQUIREMENTS

A. Document 00 2113 - Instructions to Bidders: Instructions for preparation of pricing for Alternates.

B. Document 00 4323 - Alternates Form: List of Alternates as supplement to Bid Form.

1.03 ACCEPTANCE OF ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

1.04 SCHEDULE OF ALTERNATES

A. Alternate No. 1 - LIGHTGLASS LIGHT WINDOWS IN INTERIOR TRIBAL DOCTOR ROOMS 138, 140, 142, 144, 146, 148, & 150. INCLUDE ALL ASSOCIATED MATERIALS, LABOR, AND COMPONENTS: see drawings and specifications

B. Alternate No. 2 - PHARMACY CONVEYOR SYSTEM AND ALL APPERTENANCES.:

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

A. Section 00 2113 - Instructions to Bidders: Restrictions on timing of substitution requests.

B. Section 01 3000 - Administrative Requirements: Submittal procedures, coordination.

C. Section 01 6000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
      a. Unavailability.
      b. Regulatory changes.
   2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
   4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   5. Waives claims for additional costs or time extension that may subsequently become apparent.
   6. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. No specific form is required. Contractor's Substitution Request documentation must include the following:
      a. Project Information:
         1) Official project name and number, and any additional required identifiers established in Contract Documents.
         2) Owner's, Architect's, and Contractor's names.
      b. Substitution Request Information:
         1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
         2) Indication of whether the substitution is for cause or convenience.

3) Issue date.
4) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
5) Description of Substitution.
6) Reason why the specified item cannot be provided.
7) Differences between proposed substitution and specified item.
8) Description of how proposed substitution affects other parts of work.

c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
1) Physical characteristics.
2) In-service performance.
3) Expected durability.
4) Visual effect.
5) Sustainable design features.
6) Warranties.
7) Other salient features and requirements.
8) Include, as appropriate or requested, the following types of documentation:
(a) Product Data:
(b) Samples.
(c) Certificates, test, reports or similar qualification data.
(d) Drawings, when required to show impact on adjacent construction elements.

d. Impact of Substitution:
1) Savings to Owner for accepting substitution.
2) Change to Contract Time due to accepting substitution.

D. Limit each request to a single proposed substitution item.
1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Submittal Time Restrictions:
1. Owner will consider requests for substitutions only if submitted at least 10 days prior to the date for receipt of bids.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

B. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
3. Bear the costs engendered by proposed substitution of:
a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.

C. Substitutions will not be considered under one or more of the following circumstances:
1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
2. Without a separate written request.

3.04 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify Contractor in writing of decision to accept or reject request.
   1. Architect's decision following review of proposed substitution will be noted on the submitted form.

3.05 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

END OF SECTION

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.
B. Preconstruction meeting.
C. Progress meetings.
D. Construction progress schedule.
E. Progress photographs.
F. Submittals for review and project closeout.
G. Number of copies of submittals.
H. Requests for Information (RFI) procedures.
I. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Section 01 6000 - Product Requirements: General product requirements.
B. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.

1.03 REFERENCE STANDARDS

A. AIA G716 - Request for Information; 2004.
B. AIA G810 - Transmittal Letter; 2001.

1.04 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 01 7000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
B. Make the following types of submittals to Architect:
    1. Requests for Information (RFI).
    2. Requests for substitution.
    3. Shop drawings, product data, and samples.
    4. Test and inspection reports.
    5. Design data.
    6. Manufacturer's instructions and field reports.
    7. Applications for payment and change order requests.
    8. Progress schedules.
    9. Coordination drawings.
    10. Correction Punch List and Final Correction Punch List for Substantial Completion.
    11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

A. Schedule meeting after Notice of Award.
B. Attendance Required:
    1. Owner.
    2. Architect.
    3. Contractor.
C. Agenda:
    1. Execution of Owner-Contractor Agreement.
    2. Submission of executed bonds and insurance certificates.

3. Distribution of Contract Documents.
4. Submission of list of subcontractors, schedule of values, and progress schedule.
5. Submission of initial Submittal schedule.
6. Designation of personnel representing the parties to Contract and Architect.
7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
8. Scheduling.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.02 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at maximum weekly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required:
1. Contractor.
2. Owner.
3. Architect.
4. Special consultants.
5. Contractor's superintendent.
6. Major subcontractors.

D. Agenda:
1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of RFIs log and status of responses.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.
13. Other business relating to work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 CONSTRUCTION PROGRESS SCHEDULE

A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
1. Include written certification that major contractors have reviewed and accepted proposed schedule.

D. Within 10 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

3.04 PROGRESS PHOTOGRAPHS

A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.

B. Photography Type: Digital; electronic files.

C. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.

D. In addition to periodic, recurring views, take photographs of each of the following events:
   1. Excavations in progress.
   2. Foundations in progress and upon completion.
   3. Structural framing in progress and upon completion.
   4. Enclosure of building, upon completion.

3.05 REQUESTS FOR INFORMATION (RFI)

A. Definition: A request seeking one of the following:
   1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
   2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.

C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
   1. Prepare a separate RFI for each specific item.
      a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
      b. Do not forward requests which solely require internal coordination between subcontractors.
   2. Prepare in a format and with content acceptable to Owner.
      a. Use AIA G716 - Request for Information .
   3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
   1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
   2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
      a. Approval of submittals (use procedures specified elsewhere in this section).
      b. Approval of substitutions (see Section - 01 6000 - Product Requirements)
      c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
      d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
   3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.

E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
   1. Official Project name and number, and any additional required identifiers established in Contract Documents.
   2. Owner's, Architect's, and Contractor's names.

3. Discrete and consecutive RFI number, and descriptive subject/title.
4. Issue date, and requested reply date.
5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
1. Indicate current status of every RFI. Update log promptly and on a regular basis.
2. Note dates of when each request is made, and when a response is received.
3. Highlight items requiring priority or expedited response.
4. Highlight items for which a timely response has not been received to date.

H. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.06 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
1. Format schedule to allow tracking of status of submittals throughout duration of construction.
2. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.07 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
1. Product data.
2. Shop drawings.

3. Samples for selection.
4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.08 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
1. Design data.
2. Certificates.
3. Test reports.
4. Inspection reports.
5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.09 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:
1. Project record documents.
2. Operation and maintenance data.
3. Warranties.
4. Bonds.
5. Other types as indicated.

D. Submit for Owner's benefit during and after project completion.

3.10 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
1. After review, produce duplicates.
2. Retained samples will not be returned to Contractor unless specifically so stated.

3.11 SUBMITTAL PROCEDURES

A. General Requirements:
1. Use a separate transmittal for each item.
2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
3. Transmit using approved form.
a. Use Form AIA G810.
4. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
5. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.

6. Apply Contractor's stamp, signed or initialed certifying that review, approval, 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.
7. Schedule submittals to expedite the Project, and coordinate submission of related items.
   a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
   b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
   c. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 30 days.
8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
9. Provide space for Contractor and Architect review stamps.
10. When revised for resubmission, identify all changes made since previous submission.
11. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
12. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
13. Submittals not requested will not be recognized or processed.

B. Product Data Procedures:
   1. Submit only information required by individual specification sections.
   2. Collect required information into a single submittal.
   3. Do not submit (Material) Safety Data Sheets for materials or products.

C. Shop Drawing Procedures:
   1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
   2. Do not reproduce Contract Documents to create shop drawings.
   3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Samples Procedures:
   1. Transmit related items together as single package.
   2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

3.12 SUBMITTAL REVIEW

A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.

D. Architect's and consultants' actions on items submitted for review:
   1. Authorizing purchasing, fabrication, delivery, and installation:
      a. "NO EXCEPTIONS OBSERVED"
      b. "MAKE CORRECTIONS OBSERVED".
   2. Not Authorizing fabrication, delivery, and installation:
      a. "REVISE AND RESUBMIT"
      b. "REJECT"

E. Architect's and consultants' actions on items submitted for information:
   1. Items for which no action was taken:
      a. "Received" - to notify the Contractor that the submittal has been received for record only.

2. Items for which action was taken:
   a. "Reviewed" - no further action is required from Contractor.

END OF SECTION

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.
B. Quality assurance.
C. References and standards.
D. Testing and inspection agencies and services.
E. Contractor's design-related professional design services.
F. Control of installation.
G. Manufacturers' field services.
H. Defect Assessment.

1.02 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2014).
B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2017.
C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2019.
D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2019.
E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2020.
F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2015.
G. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components; 2016.
H. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2018.

1.03 DEFINITIONS

A. Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.
B. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.
    1. Design Services Types Required:
        a. Construction-Related: Services Contractor needs to provide in order to carry out the Contractor’s sole responsibilities for construction means, methods, techniques, sequences, and procedures.
        b. Design-Related: Design services explicitly required to be performed by another design professional due to highly-technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design.
C. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.04 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Base design on performance and/or design criteria indicated in individual specification sections.

C. Scope of Contractor's Professional Design Services: Provide for the following items of work:
   1. Concrete Mix Design: As described in Section 03 3000 - Cast-in-Place Concrete. No specific designer qualifications are required.
   2. Structural Design of Stairs: As described in Section 05 5100 - Metal Stairs.
   3. Structural Design of Railings: As described in Section 05 5213 - Pipe and Tube Railings.
   4. Structural Design: Include calculations for resisting wind loads, anchor locations, loads at points of attachment to building structure, physical characteristics, resulting dimensional limitations as described in Section 08 4413 - Glazed Aluminum Curtain Walls.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.
   1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
      a. Full name.
      b. Professional licensure information.
      c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.

C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
   1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
   2. Include required product data and shop drawings.
   3. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.

D. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test/inspection.
      h. Date of test/inspection.
      i. Results of test/inspection.
      j. Compliance with Contract Documents.
      k. When requested by Architect, provide interpretation of results.

E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
   1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

F. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications:
   1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
   2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
   3. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

1.07 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.08 TESTING AND INSPECTION AGENCIES AND SERVICES

A. As indicated in individual specification sections, Owner or Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.

B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

C. Contractor Employed Agency:
   1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM E699, ASTM C1021, ASTM C1077, ASTM C1093, ASTM D3740, and _____.
   2. Laboratory: Authorized to operate in the State in which the Project is located.
   3. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 TESTING AND INSPECTION

A. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
   5. Perform additional tests and inspections required by Architect.
   6. Submit reports of all tests/inspections specified.

B. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

C. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
   5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
   6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

D. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

E. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.03 MANUFACTURERS' FIELD SERVICES

A. 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 equipment, and _____ as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.04 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

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

END OF SECTION

SECTION 01 4100
REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY OF REFERENCE STANDARDS

A. Regulatory requirements applicable to this project are the following:

B. 29 CFR 1910 - Occupational Safety and Health Standards; current edition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 4010

CLEAN CONSTRUCTION PROCEDURES

PART 1 - GENERAL

1.1 PURPOSE

2.01 A. TO OUTLINE THE PROCESS FOR SELECTING AND IMPLEMENTING PROPER CONTROLS TO REDUCE RISK AND TO MINIMIZE IMPACT OF CONSTRUCTION OR RENOVATION ACTIVITIES THROUGHOUT SOUTHCENTRAL FOUNDATION (SCF) FACILITIES.

A. 1.2 SCOPE
   1. A. This applies to all direct hire employees, Civil Service and Commissioned Corps Officers working under contractual agreements with Southcentral Foundation (SCF) and volunteers. Individuals and business entities that have entered into contractual agreements with Southcentral Foundation (SCF) are not exempt, unless otherwise stated in their contracts.

B. 1.3 DEFINITIONS
   1. A. Customer-owner: Individuals who seek and receive services at SCF's programs and departments. The following terms may be used by SCF programs and departments in referring to customers:
      a. 1. Patients
      b. 2. Residents
      c. 3. Students
      d. 4. Members
      e. 5. Beneficiaries
      f. 6. Guests
      g. 7. Event Participants
      h. 8. Clients
   2. B. Infection Control Risk Assessment (ICRA) – A risk assessment tool that incorporates the facility's customer-owner population and type of construction work to reduce the risk of infection through phases of facility planning, design, construction, renovation and maintenance.

C. 1.4 PROCEDURE
   1. A. The Clean Construction Procedure with the accompanying Infection Control Risk Assessment (ICRA) Construction Permit will apply to all projects, including small construction and maintenance work.
   2. B. The ICRA will be implemented in the planning phase of each project and will be assessed by the Manager of Facilities or designee, in consultation with the Project Manager, Safety Manager and Quality Assurance (QA) Nurse Manager or designee.
   3. C. The Manager of Facilities or designee will provide updated documentation of the risk assessment throughout planning, design, and construction.
   4. D. Performance Standards
      a. 1. ICRA will be initiated and maintained by the Manager of Facilities or designee, in consultation with the QA Nurse Manager or designee, and Safety Manager at all appropriate construction sites and areas with Infection Control (IC) deficiencies.
      b. 2. Selected ICRA will be monitored by the Manager of Facilities in consultation with the QA Nurse Manager or designee, Safety Manager and Security Officers on weekends and holidays.
      c. 3. The Manager of Facilities or designee, will provide briefings to the affected employees, including construction workers, to inform the staff of the particular ICRA for areas where they work.
   5. E. Manager of Facilities Responsibilities:
      a. 1. The Manager of Facilities in consultation with the QA Nurse Manager or designee and the Safety Manager will select and implement appropriate infection

control measures/actions for existing hazards that violate infection control standards and/or guidelines.

b. 2. The Manager of Facilities or designee will ensure the ICRA measures/actions are maintained and enforced.
   1) a. The Manager of Facilities or designee will consult with the QA Nurse Manager or designee and the Safety Manager for all Type C and Type D projects as defined in this procedure.

c. 3. The Manager of Facilities or designee will ensure that ICRA measures/actions are incorporated into all contractor negotiations and contracts.

d. 4. The Manager of Facilities or designee will ensure that contractors and maintenance employees adhere to the implemented ICRA measures/actions.

e. 5. Contractors are responsible for training their employees and enforcing ICRA measures/actions with their employees.

f. 6. Employees are responsible for adhering to established ICRA measures/actions and for reporting any violations of this procedure to the Manager of Facilities or designee.

6. F. Project Assessment

a. 1. Each project will be assessed for risk during the planning phase by Facilities.
   1) a. The project will be assigned a risk group to include employees from Corporate QA, Facilities, and the affected program and will be matched with a project type that will determine a class of precautions to be implemented.

b. 2. The class of precautions will be determined by using the Type of Work Matrix described in this procedure.

c. 3. Type of Projects (Work)
   1) Type A (Minor) - Inspection and non-invasive projects including, but not limited to:
      (a) a) Removal of ceiling tiles for visual inspection
      (b) b) Painting with no sanding
      (c) c) Wall covering
      (d) d) Electrical trim work
      (e) e) Minor plumbing and
      (f) f) Other activities that do not generate dust
      (g) b. Type B (Maintenance) – Short duration / minimal dust projects which include, but are not limited to:
         (1) a) Setting brackets
         (2) b) Hanging items
         (3) c) Cutting of walls or ceilings where dust migration can be controlled to the immediate work area and the duration is less than one (1) work shift
         (4) d) Cutting of walls or ceilings where dust migration can be controlled and the duration is less than one (1) work shift
      (h) c. Type C (Moderate) – Short duration / minor dust projects, including, but is not limited to:
         (1) a) Sanding
         (2) b) Removal of floor coverings, ceiling tiles, and casework
         (3) c) New wall construction
         (4) d) Minor duct work or electrical work above the ceiling
         (5) e) Major cabling activities
      (i) d. Type D (Major) – Projects that generate dust or require demolition of fixed building components which include, but are not limited to:
         (1) a) Activities which require consecutive work shifts
         (2) b) Require heavy demolition and/or removal of a complete cabling system
         (3) c) New construction

d. 4. Type of Area
1) a. Low Risk:
(a) a) Plant area and other areas not intended for customer-owner use
(b) b) Warehouse
(c) c) Office areas
(d) d) Living quarters at residential treatment programs
(e) e) Food service or kitchen areas
(f) b. Medium Risk:
(1) a) Physical Therapy
(2) b) Radiology
(3) Outpatient Clinics (not including office areas)
(4) Dental Clinics
(5) Pharmacy
(6) Employee Family Center
(g) c. High Risk:
(1) Endoscopy
(2) Laboratory
(h) d. Highest Risk
(1) a) Dental Sterile Processing

e. Risk Group Classifications

RISK GROUP CLASSIFICATION	TYPE A	TYPE B	TYPE C	TYPE D
LOW RISK	I	I/II	II	III/IV
MEDIUM RISK	I	I/II	III	IV
HIGH RISK	I	I/II	III/IV	IV
HIGHEST RISK	I/II	III/IV	III/IV	IV

2.02 NOTE: INFECTION CONTROL APPROVAL WILL BE REQUIRED WHEN THE CONSTRUCTION ACTIVITY AND RISK LEVEL INDICATE THAT CLASS III OR CLASS IV CONTROL PROCEDURES ARE NECESSARY.

A. Infection control measure based on class:

	DURING CONSTRUCTION PROJECT	UPON COMPLETION OF PROJECT
CLASS I	1. EXECUTE WORK BY METHODS TO MINIMIZE RAISING DUST FROM CONSTRUCTION OPERATIONS. 2. IMMEDIATELY REPLACE ANY CEILING TILE DISPLACED FOR VISUAL INSPECTION.	3. CLEAN WORK AREA UPON COMPLETION OF WORK.

CLASS III	4. PROVIDE ACTIVE MEANS TO PREVENT AIR-BORNE DUST FROM DISPERSING INTO ATMOSPHERE. 5. WATER MIST WORK SURFACES TO CONTROL DUST WHILE CUTTING. 6. SEAL UNUSED DOORS WITH TAPE. 7. BLOCK OFF AND SEAL AIR VENTS. 8. REMOVE OR ISOLATE HEATING, VENTILATION, AND AIR CONDITIONING (HVAC) SYSTEM IN AREAS WHERE WORK IS BEING PERFORMED.	2. WIPE WORK SURFACES WITH DISINFECTANT. 3. CONTAIN CONSTRUCTION WASTE BEFORE TRANSPORT IN TIGHTLY COVERED CONTAINERS. 4. WET MOP AND/OR VACUUM WITH HIGH-EFFICIENCY PARTICULATE AIR (HEPA) FILTERED VACUUM BEFORE LEAVING WORK AREA. 5. REMOVE ISOLATION OF HVAC SYSTEM IN AREAS WHERE WORK IS BEING PERFORMED.
CLASS IV	1. REMOVE OR ISOLATE HVAC SYSTEM IN AREA WHERE WORK IS BEING DONE TO PREVENT CONTAMINATION OF DUCT SYSTEM. 2. COMPLETE ALL CRITICAL BARRIERS I.E. SHEETROCK, PLYWOOD, PLASTIC, TO SEAL AREA FROM NON-WORK AREA OR IMPLEMENT CONTROL CUBE METHOD (CART WITH PLASTIC COVERING AND SEALED CONNECTION TO WORK SITE WITH HEPA VACUUM FOR VACUUMING PRIOR TO EXIT) BEFORE CONSTRUCTION BEGINS. 3. MAINTAIN NEGATIVE AIR PRESSURE WITHIN THE WORK SITE UTILIZING HEPA EQUIPPED AIR FILTRATION UNITS. 4. CONTAIN CONSTRUCTION WASTE BEFORE TRANSPORT IN TIGHTLY COVERED CONTAINERS. 5. COVER TRANSPORT RECEPTACLES OR CARTS. TAPE COVERING UNLESS SOLID LID.	6. DO NOT REMOVE BARRIERS FROM WORK AREA UNTIL COMPLETED PROJECT IS INSPECTED BY THE MANAGER OF FACILITIES, SAFETY MANGER AND QA NURSE MANAGER OR DESIGNEE, AND IS THOROUGHLY CLEANED BY HOUSEKEEPING. 7. REMOVE BARRIER MATERIALS CAREFULLY TO MINIMIZE SPREADING OF DIRT AND DEBRIS ASSOCIATED WITH CONSTRUCTION. 8. VACUUM WORK AREA WITH HEPA FILTERED VACUUMS. 9. WET MOP AREA WITH DISINFECTANT. 10. REMOVE ISOLATION OF HVAC SYSTEM IN AREAS WHERE WORK IS BEING PERFORMED.

CLASS IV	11. ISOLATE HVAC SYSTEM IN AREA WHERE WORK IS BEING DONE TO PREVENT CONTAMINATION OF DUCT SYSTEM. 12. COMPLETE ALL CRITICAL BARRIERS I.E. SHEETROCK, PLYWOOD, PLASTIC, TO SEAL AREA FROM NON-WORK AREA OR IMPLEMENT CONTROL CUBE METHOD (CART WITH PLASTIC COVERING AND SEALED CONNECTION TO WORK SITE WITH HEPA VACUUM FOR VACUUMING PRIOR TO EXIT) BEFORE CONSTRUCTION BEGINS. 13. MAINTAIN NEGATIVE AIR PRESSURE WITHIN WORK SITE UTILIZING HEPA EQUIPPED AIR FILTRATION UNITS. 14. SEAL HOLES, PIPES, CONDUITS, AND PUNCTURES APPROPRIATELY. 15. CONSTRUCT ANTEROOM AND REQUIRE ALL PERSONNEL TO PASS THROUGH THIS ROOM SO THEY CAN BE VACUUMED USING A HEPA VACUUM CLEANER BEFORE LEAVING WORK SITE OR THEY CAN WEAR CLOTH OR PAPER COVERALLS THAT ARE REMOVED EACH TIME THEY LEAVE THE WORK SITE. 16. ALL PERSONNEL ENTERING WORK SITE ARE REQUIRED TO WEAR SHOE COVERS. SHOE COVERS MUST BE CHANGED EACH TIME THE WORKER EXITS THE WORK AREA. 17. DO NOT REMOVE BARRIERS FROM THE WORK AREA UNTIL COMPLETED PROJECT IS INSPECTED BY OWNER'S SAFETY DEPARTMENT AND INFECTION CONTROL DEPARTMENT AND THOROUGHLY CLEANED BY OWNER'S ENVIRONMENTAL SERVICES DEPARTMENT.	18. DO NOT REMOVE BARRIERS FROM WORK AREA UNTIL COMPLETED PROJECT IS INSPECTED BY THE MANAGER OF FACILITIES, SAFETY MANAGER AND QA NURSE MANAGER OR DESIGNEE, AND IS THOROUGHLY CLEANED BY ENVIRONMENTAL SERVICES DEPARTMENT. 19. REMOVE BARRIER MATERIAL CAREFULLY TO MINIMIZE SPREADING OF DIRT AND DEBRIS ASSOCIATED WITH CONSTRUCTION. 20. CONTAIN CONSTRUCTION WASTE BEFORE TRANSPORT IN TIGHTLY COVERED CONTAINERS. 21. COVER TRANSPORT RECEPTACLES OR CARTS. TAPE COVERING UNLESS SOLID LID. 22. VACUUM WORK AREA WITH HEPA FILTERED VACUUMS. 23. WET MOP AREA WITH DISINFECTANT. 24. REMOVE ISOLATION OF HVAC SYSTEM IN AREAS WHERE WORK IS BEING PERFORMED.

A. Environmental monitoring:
   1. The Manager of Facilities will conduct field inspections at any time during the life of the project with the assistance of the QA Nurse Manager or designee and Safety Manager.
   2. The Manager of Facilities will monitor air quality throughout project as needed.
      a. Implementation of Infection Control Measures
         1) Temporary construction barriers and closures will be dust-tight.
         2) Removal of debris will be in tightly covered containers.
         3) Adhesive walk-off mats will be placed at all entrances to work site, as needed.
         4) Any dust tracked outside of the barrier will be removed immediately.
         5) Any ceiling access panels opened for investigation beyond sealed areas will be replaced immediately when unattended.
         6) f) Block off all ventilation and return ducts within the construction area.
         7) Method of capping ducts will be dust tight and airflow to those devices will be shut off (either with the direct digital control (DDC) and/or damper).

8) Removal of construction barriers and ceiling protection will be done carefully.
9) i) Vacuum and clean all surfaces free of dust after the removal.
10) j) Housekeeping will be notified to do a follow up cleaning of the area.
11) When access panels are opened in occupied areas requiring protection, for work above ceilings, use a polyethylene enclosure around ladder, sealing off opening.
12) l) The device will be fitted/sealed tightly to the ceiling and floor per manufacturers' instructions.

b. Enforcement of Infection Control Measures
1) The Manager of Facilities, QA Nurse Manager or designee, or Safety Manager may stop the work if this procedure is violated.
(a) Work will not resume until all violations of this procedure are corrected and verified in writing.
(b) The Manager of Facilities will record the following:
(1) Document each violation with photographs and written reports
(2) Extract contractor or department information from the work log
(3) Maintain a record of all infection control violations
(c) Violations of this procedure may affect status as a responsible contractor for bidding future work.
(d) REFERENCES

3. Attachment A.
4. Facility Guidelines Institute, Guidelines for Design and Construction of Healthcare Facilities (2014).
5. Hansen, Wayne (July 2002) "Clean Construction" health Facilities Management.

END OF SECTION

SECTION 01 4010.01

INFECTION CONTROL RISK ASSESSMENT CONSTRCTION PERMIT

PROJECT TITLE: _____ ICRA RATING: _____

1.01 PART I: PROJECT EVALUATION

1.02 REVIEW THE PROJECT USING THE FOLLOWING CRITERIA AND INDICATE WHETHER EACH ITEM IS APPLICABLE BY MARKING THE APPROPRIATE BOX. FOR ANY "YES" RESPONSES, REVIEW THE REQUIRED ACTION UNDER EACH SECTION TO DETERMINE THE REQUIRED ACTIONS/MEASURES TO PROVIDE SUFFICIENT INFECTION CONTROL.

1.03 IN PART II, DOCUMENT SPECIFICALLY HOW THE REQUIRED MEASURES WILL BE IMPLEMENTED FOR THIS PARTICULAR PROJECT.

1.04 IN PART III, LIST THE AREAS AND PERSONNEL AFFECTED BY THE IMPLEMENTED MEASURES FOR THE INFECTION CONTROL RISK ASSESSMENT.

A. UTILITIES			
DOES THE PROJECT HAVE THE POTENTIAL OF AFFECTING ANY OF THE ESSENTIAL SERVICES TO CUSTOMER-OWNERS AND/OR EMPLOYEES?	**YES**		**NO**
• ELECTRICITY			
• WATER			
• HVAC			
• TELEPHONE			
• FIRE ALARM			
• MEDICAL GASES			
• SUCTION			
• DATA SYSTEMS			
REQUIRED ACTIONS: TEMPORARY UTILITIES MAY NEED TO BE PROVIDED TO ESTABLISH EQUAL INFECTION CONTROL MEASURES, VERIFY.			
B. CUSTOMER-OWNERS RELOCATION	**YES**		**NO**
WILL ANY CUSTOMER-OWNERS NEED TO BE RELOCATED DUE TO CONSTRUCTION ACTIVITIES?			
REQUIRED ACTIONS: CUSTOMER-OWNERS RELOCATION WILL NEED TO BE COORDINATED WITH STAFF FROM EACH UNIT TO ASSURE PROPER INFECTION CONTROL MEASURES ARE IMPLEMENTED DURING AND AFTER RELOCATION.			
C. TEMPORARY BARRIERS			
WILL TEMPORARY BARRIERS BE USED TO PROTECT CUSTOMER-OWNERS OR EMPLOYEES FROM AIR-BORNE CONTAMINANTS?	**YES**		**NO**
REQUIRED ACTIONS: TEMPORARY WALLS WILL NEED TO BE CONSTRUCTED WITH ALL SEAMS AND JOINTS PROPERLY SEALED TO PROVIDE PROPER CONTAINMENT OF DUST AND AIR BORNE PATHOGENS.			
D. WATER-BORNE PATHOGENS			
WILL THE DOMESTIC WATER SYSTEM BE IMPACTED IN SUCH A MANNER TO INCREASE THE POTENTIAL FOR WATER BORNE OPPORTUNISTIC PATHOGENS?	**YES**		**NO**

REQUIRED ACTIONS: NECESSARY INFECTION CONTROL MEASURES WILL NEED TO BE IMPLEMENTED FOR ALL SUSCEPTIBLE CUSTOMER-OWNERS.			
E. ISOLATION ROOMS			
WILL ADDITIONAL AIR BORNE INFECTION ISOLATION OR PROTECTIVE ENVIRONMENT ROOMS BE REQUIRED?	**YES**		**NO**
REQUIRED ACTIONS: ADDITIONAL ROOMS WILL NEED TO HAVE HVAC RENOVATIONS PRIOR TO USAGE TO PROVIDE NECESSARY AIR MOVEMENT RELATIONSHIPS.			
F. NOISE AND VIBRATION			
DOES THE PROJECT HAVE THE POTENTIAL TO CAUSE NOISE OR VIBRATION LEVELS THAT WILL ADVERSELY AFFECT CUSTOMER-OWNER CARE?	**YES**		**NO**
REQUIRED ACTIONS: WORK CAUSING EXCESSIVE NOISE AND VIBRATIONS WILL NEED TO BE SCHEDULED WITH STAFF FROM ALL IMPACTED AREAS TO ELIMINATE THE CHANCE OF ADVERSELY AFFECTING CUSTOMER-OWNER CARE.			

1.05 PART II – INFECTION CONTROL ACTIONS/MEASURES SUMMARY

1.06 PROVIDE A LIST/PLAN OF ALL INFECTION CONTROL ACTIONS/MEASURES AS INDICATED AND REQUIRED IN PART I. DESCRIBE IN DETAIL HOW EACH OF THESE MEASURES WILL BE IMPLEMENTED FOR THIS PARTICULAR PROJECT.

1.07

_____
_____
_____
_____
_____

1.08 PART III – PERSONNEL OR AREAS WHERE THESE INFECTION CONTROL ACTIONS/MEASURES WILL BE IMPLEMENTED

1.09 THE FOLLOWING PERSONNEL ARE RESPONSIBLE FOR THE IMPLEMENTATION, MONITORING, AND CONTROL OF ALL OF THE INFECTION CONTROL MEASURED DESCRIBED IN PART II.

1.10 SIGNATURE AND TITLE OF EVALUATOR/CONTRACTOR **PRINT NAME**
DATE

1.11 SIGNATURE OF MANAGER OF FACILITIES **PRINT NAME**
DATE

1.12 SIGNATURE QA NURSE MANAGER **PRINT NAME**
DATE

END OF SECTION

SECTION 01 5000

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary telecommunications services.

B. Temporary sanitary facilities.

C. Temporary Controls: Barriers, enclosures, and fencing.

D. Security requirements.

E. Vehicular access and parking.

F. Waste removal facilities and services.

G. Project identification sign.

H. Field offices.

1.02 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.

1.03 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

C. At end of construction, return facilities to same or better condition as originally found.

1.04 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Provide protection for plants designated to remain. Replace damaged plants.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.05 FENCING

A. Construction: Commercial grade chain link fence.

B. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.06 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.07 INTERIOR ENCLOSURES

A. Provide temporary partitions and ceilings as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.

B. Construction: Framing and reinforced polyethylene sheet materials with closed joints and sealed edges at intersections with existing surfaces:

1.08 SECURITY

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

B. Coordinate with Owner's security program.

1.09 VEHICULAR ACCESS AND PARKING

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

B. Coordinate access and haul routes with governing authorities and Owner.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Provide means of removing mud from vehicle wheels before entering streets.

E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.10 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site periodically.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.11 PROJECT IDENTIFICATION

A. Provide project identification sign of design and construction indicated on drawings.

B. Erect on site at location indicated.

C. No other signs are allowed without Owner permission except those required by law.

1.12 FIELD OFFICES

A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.

B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

C. Locate offices a minimum distance of 30 feet from existing and new structures.

1.13 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

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

D. Restore existing facilities used during construction to original condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Re-use of existing products.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations.

F. Procedures for Owner-supplied products.

G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 01 2500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.

B. Section 01 4000 - Quality Requirements: Product quality monitoring.

C. Section 01 7419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.03 SUBMITTALS

A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
   1. Submit within 15 days after date of Agreement.
   2. For products specified only by reference standards, list applicable reference standards.

B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. See Section 01 4000 - Quality Requirements, for additional source quality control requirements.

C. Use of products having any of the following characteristics is not permitted:

1. Made using or containing CFC's or HCFC's.
2. Containing lead, cadmium, or asbestos.

2.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the 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.

2.04 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 01 2500 - Substitution Procedures.

3.02 OWNER-SUPPLIED PRODUCTS

A. Owner's Responsibilities:
1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
2. Arrange and pay for product delivery to site.
3. On delivery, inspect products jointly with Contractor.
4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
5. Arrange for manufacturers' warranties, inspections, and service.

B. Contractor's Responsibilities:
1. Review Owner reviewed shop drawings, product data, and samples.
2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
3. Handle, store, install and finish products.
4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

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

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

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

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

G. Comply with manufacturer's warranty conditions, if any.

H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

I. Prevent contact with material that may cause corrosion, discoloration, or staining.

J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 7000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition, _____.

C. Pre-installation meetings.

D. Cutting and patching.

E. Surveying for laying out the work.

F. Cleaning and protection.

G. Demonstration and instruction of Owner personnel.

H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

I. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 01 3000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.

C. Section 01 4000 - Quality Requirements: Testing and inspection procedures.

D. Section 01 5000 - Temporary Facilities and Controls: Temporary exterior enclosures.

E. Section 01 5000 - Temporary Facilities and Controls: Temporary interior partitions.

F. Section 01 7419 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.

G. Section 01 7610 - Temporary Protective Coverings: Materials for protection of installed work.

H. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.

I. Section 01 7900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

J. Section 02 4100 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.

K. Section 07 8400 - Firestopping.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Visual qualities of sight exposed elements.
   5. Work of Owner or separate Contractor.

D. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.04 QUALIFICATIONS

A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

1.05 PROJECT CONDITIONS

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
   1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
   2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.

E. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
   1. At All Times: Excessively noisy tools and operations will not be tolerated inside the building at any time of day; excessively noisy includes jackhammers.
   2. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.
   3. Indoors: Limit conduct of especially noisy interior work to 8 am to 5 pm.

F. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.06 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

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

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

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

F. Utilize recognized engineering survey practices.

G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

H. Periodically verify layouts by same means.

I. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
   1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
   2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.

C. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.
   2. Relocate items indicated on drawings.
   3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.

3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
    a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
    b. Provide temporary connections as required to maintain existing systems in service.
4. Verify that abandoned services serve only abandoned facilities.
5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

E. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.

F. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
3. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.

G. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

H. Refinish existing surfaces as indicated:
1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

I. Clean existing systems and equipment.

J. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

K. Do not begin new construction in alterations areas before demolition is complete.

L. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:
1. Complete the work.
2. Fit products together to integrate with other work.
3. Provide openings for penetration of mechanical, electrical, and other services.
4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.
6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-complying work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

G. Restore work with new products in accordance with requirements of Contract Documents.

H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.

J. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.08 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

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

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

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

F. 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.

G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.10 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

D. Verify that wiring and support components for equipment are complete and tested.

E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

F. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 DEMONSTRATION AND INSTRUCTION

A. See Section 01 7900 - Demonstration and Training.

3.12 ADJUSTING

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

3.13 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

E. Clean filters of operating equipment.

F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.

G. Clean site; sweep paved areas, rake clean landscaped surfaces.

H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.14 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Architect and Owner.

B. Accompany Architect on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, 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 Substantial Completion inspection.

E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.15 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01 7419

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.

E. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

PART 3 EXECUTION

2.01 WASTE MANAGEMENT PROCEDURES

A. See Section 01 3000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. See Section 01 5000 for additional requirements related to trash/waste collection and removal facilities and services.

C. See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.

D. See Section 01 7000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

2.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

END OF SECTION

SECTION 01 7610

TEMPORARY PROTECTIVE COVERINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary protective coverings for installed floors, walls, and other surfaces.

1.02 RELATED REQUIREMENTS

A. Section 01 7000 - Execution and Closeout Requirements: Coordination of requirements for materials specified in this section.

PART 2 PRODUCTS

2.01 GENERAL

A. Provide materials that are easily removed without damage to the surfaces covered and with the following characteristics:
   1. Water resistant.
   2. Impact resistant.
   3. Slip resistant.

PART 3 EXECUTION

3.01 PREPARATION

A. Remove dirt and debris from surfaces to be protected.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Trim or overlap sheet materials to fit area to be covered.

C. Roll out and cut rolled materials to fit area to be covered.

D. Tape seams. Avoid taping directly to finished surfaces.

E. Stretch self-adhering film materials to completely cover surface.

F. Install door jamb protection to full height of opening.

3.03 REMOVAL

A. Remove protective coverings prior to Date of Substantial Completion. Reuse or recycle materials if possible.

END OF SECTION

SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project record documents.

B. Operation and maintenance data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 00 7200 - General Conditions and 00 7300 - Supplementary Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.

B. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

C. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.

D. Individual Product Sections: Specific requirements for operation and maintenance data.

E. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
   1. Format: Electronic with bookmarks

B. Operation and Maintenance Data:
   1. Submit two electronic copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed electronic documents within ten days after acceptance.
   3. Submit one hard copy and one electronic of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   4. Submit two sets of revised final documents in final form within 10 days after final inspection.
   5. Format: Electronic with bookmarks

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.

4. Change Orders and other modifications to the Contract.
5. Reviewed shop drawings, product data, and samples.
6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
1. Manufacturer's name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
1. Measured depths of foundations in relation to finish first floor datum.
2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
4. Field changes of dimension and detail.
5. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
1. Description of unit or system, and component parts.
2. Identify function, normal operating characteristics, and limiting conditions.
3. Include performance curves, with engineering data and tests.
4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

D. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

E. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

F. Provide servicing and lubrication schedule, and list of lubricants required.

G. Include manufacturer's printed operation and maintenance instructions.

H. Include sequence of operation by controls manufacturer.

I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

J. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

J. Arrangement of Contents: Organize each volume in parts as follows:
   1. Project Directory.
   2. Table of Contents, of all volumes, and of this volume.
   3. Operation and Maintenance Data: Arranged by system, then by product category.
      a. Source data.
      b. Product data, shop drawings, and other submittals.
      c. Operation and maintenance data.
      d. Field quality control data.
      e. Photocopies of warranties and bonds.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for

items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.

END OF SECTION

SECTION 01 7900
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

A. Demonstration of products and systems to be commissioned and where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance is required for:
   1. All software-operated systems.
   2. HVAC systems and equipment.
   3. Electrical systems and equipment.
   4. Conveying systems.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures; except:
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
   2. Submit one copy to the Commissioning Authority, not to be returned.
   3. Make commissioning submittals on time schedule specified by Commissioning Authority.
   4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2003 preferred.

B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit to Commissioning Authority for review and inclusion in overall training plan.
   2. Submit not less than four weeks prior to start of training.
   3. Revise and resubmit until acceptable.
   4. Provide an overall schedule showing all training sessions.
   5. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.
      f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
      g. Media to be used, such a slides, hand-outs, etc.
      h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
   1. Include applicable portion of O&M manuals.
   2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
   3. Provide one extra copy of each training manual to be included with operation and maintenance data.

D. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
   1. Format: DVD Disc.
   2. Label each disc and container with session identification and date.

1.03 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.

1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

B. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.

C. Demonstration may be combined with Owner personnel training if applicable.

D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.
   2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

A. Commissioning Authority will prepare the Training Plan based on draft plans submitted.

B. Conduct training on-site unless otherwise indicated.

C. Owner will provide classroom and seating at no cost to Contractor.

D. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.

E. Provide training in minimum two hour segments.

F. The Commissioning Authority is responsible for determining that the training was satisfactorily completed and will provide approval forms.

G. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

H. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.

I. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
   4. Provide hands-on training on all operational modes possible and preventive maintenance.

5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
6. Discuss common troubleshooting problems and solutions.
7. Discuss any peculiarities of equipment installation or operation.
8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
9. Review recommended tools and spare parts inventory suggestions of manufacturers.
10. Review spare parts and tools required to be furnished by Contractor.
11. Review spare parts suppliers and sources and procurement procedures.

J. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

SECTION 01 8100
COMMISSIONING

P1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Commissioning Description.
   2. Submittals.
   3. Commissioning Services.
   4. Commissioning Responsibilities.
   5. Commissioning Meetings.
   6. Commissioning Reports.
   7. Test Equipment.
   8. Pre-Functional Verification Check and Startup Procedures.
   9. Functional Performance Test Procedures.
   10. Function Performance Test Methods.
   11. Deficiencies and Test Approvals.

B. Related Sections:
   1. Section 01 33 00 – Submittal Procedures.
   2. Section 23 08 00 - Commissioning of HVAC.
   3. Section 26 08 00 - Electrical Systems Commissioning.

1.02 REFERENCES

A. Associated Air Balance Council:
   1. AABC - AABC Commissioning Guideline.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
   1. ASHRAE Guideline 1.1 - The HVAC Commissioning Process.

C. National Environmental Balancing Bureau:
   1. NEBB - Procedural Standards for Building Systems Commissioning.

1.03 COMMISSIONING DESCRIPTION

A. Commissioning: Systematic process of ensuring systems perform interactively according to design intent and Contracting Officer's operational needs. Commissioning process encompasses and coordinates system documentation, equipment startup, control system calibration, testing and balancing, performance testing and verification of actual performance.

B. Commissioning Intent:
   1. Verify equipment and systems are installed in accordance with manufacturer's instructions, industry accepted minimum standards, and Contract Documents.
   2. Verify equipment and systems receive adequate operational checkout by Contractor.
   3. Verify and document proper performance of equipment and systems.
   4. Verify complete operation and maintenance documentation is delivered to Contracting Officer.

C. Equipment and Systems to be Commissioned:
   1. Refer to Section 23 08 00 for Mechanical Equipment and Systems.
   2. Refer to Section 26 08 00 for Electrical Equipment and Systems.

D. Commissioning does not relieve Contractor of responsibility to provide finished and fully functioning Project.

E. Commissioning Process Overview and General Order of Commissioning Tasks:
   1. Commissioning begins with initial commissioning meeting.
   2. Equipment documentation is submitted to Commissioning Authority during normal submittals along with detailed start-up procedures.

3. The Contractor, equipment and system installers work together to develop the startup plan and the pre-functional verification checklists that are to be completed by the Contractor and installers, during the pre-functional verification check and startup process.
4. Equipment and system installers execute and document pre-functional verification checklists and startup. The Contractor documents that the pre-functional checklists and startup were completed according to approved plans.
5. In general, checkout and performance verification proceeds from simple to complex; from component level to equipment to systems and intersystem levels with pre-functional verification checklists being completed before functional testing.
6. Commissioning Authority develops the specific equipment and system functional test procedures. The Contractor and equipment and system installers review procedures.
7. The equipment and system installers execute functional performance testing procedures under direction of and documented by Commissioning Authority.
8. Items of non-compliance in material, installation or setup are corrected at Contractor's expense and system retested.
9. Commissioning Authority reviews operation and maintenance documentation for adherence to the contract documents.
10. Commissioning is completed before Final Completion.

1.04 COMMISSIONING SUBMITTALS

A. Furnish one copy of the Contractor developed pre-functional verification checklists and startup plan to Commissioning Authority for review and approval within 6 months of contract award. Include the following as minimum:
   1. Manufacturer’s standard startup procedures copied from installation manuals.
   2. Manufacturer’s standard field checkout sheets.
   3. Supplemental procedures and checklists prepared by equipment and system installers to accommodate Project conditions.
   4. Include boxes or lines for recording and documenting checking and inspections of each procedure and summary statement with signature block.

B. Commissioning Authority will review submittals for conformance to the Contract Documents as related to commissioning process for the primary purpose of aiding development of functional testing procedures.

1.05 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Closeout Procedures: Requirements for submittals.

B. Furnish one copy of the Contractor developed pre-functional verification checklists and startup plan to Commissioning Authority for review and approval prior to commissioning. Include the following as minimum:
   1. Manufacturer’s standard startup procedures copied from installation manuals.
   2. Manufacturer’s standard field checkout sheets.
   3. Supplemental procedures and checklists prepared by equipment and system installers to accommodate Project conditions.
   4. Include boxes or lines for recording and documenting checking and inspections of each procedure and summary statement with signature block.

C. Commissioning Authority will review submittals for conformance to the Contract Documents as related to commissioning process for the primary purpose of aiding development of functional testing procedures.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with ASHRAE Guideline 1.1.

1.07 COMMISSIONING RESPONSIBILITIES

A. Responsibilities indicated for Contracting Officer, Architect/Engineer, and Commissioning Authority are provided only to clarify commissioning process.

B. Architect/Engineer Responsibilities:
   1. Perform site observation of each system before system startup.
   2. Review the contractor developed commissioning schedule.
   3. Clarify operation and control of commissioned equipment when specifications, control drawings, or equipment documentation are not sufficient for writing detailed functional performance testing procedures.
   4. Coordinate resolution of design issues affecting system performance identified during commissioning.
   5. Review and approve operation and maintenance manuals.
   6. Review the Contractor developed pre-functional checklists for equipment or systems to be commissioned.
   7. Review the Commissioning Authority developed functional test procedures for equipment or systems to be commissioned.

C. Commissioning Authority Responsibilities:
   1. Basic Responsibilities:
      a. Coordinate, direct, and approve commissioning work.
      b. Develop and coordinate execution of commissioning plan. Revise commissioning plan to suit Project conditions.
      c. Coordinate commissioning work with Contractor for inclusion in Project schedule.
      d. Plan and conduct commissioning meetings.
      e. Request and review commissioning submittals required to perform commissioning tasks.
      f. Review the Contractor developed start-up plan.
      g. Review the Contractor developed pre-functional checklists.
      h. Develop the functional performance test procedures.
      i. Review test and balance execution plan.
      j. Document equipment and systems are installed and perform in accordance with design intent and Contract Documents.
      k. Notify the Architect/Engineer of deficiencies.
      l. Coordinate resolution of deficiency corrections with the contractor.
      m. Review operation and maintenance manuals.
      n. Compile commissioning record and testing data manual.
      o. Provide final commissioning report.
   2. Commissioning Authority may not:
      a. Release, revoke, alter, or enlarge on requirements of Contract Documents.
      b. Approve or accept any portion of the Work.
      c. Assume duties of Contractor or Architect/Engineer.
      d. Stop the Work.

D. Contracting Officer Responsibilities:
   1. Arrange for Contracting Officer's personnel to attend commissioning activities and training sessions according to commissioning plan.
   2. Approve commissioning work completion.

E. Contractor Responsibilities:
   1. Include requirements for commissioning submittal data, operation and maintenance data, commissioning tasks for equipment and systems indicated to be commissioned.
   2. Facilitate coordination of commissioning work by Commissioning Authority.
   3. Schedule and attend commissioning meetings.
   4. Develop a commissioning schedule for completion of the commissioning work, coordinate schedule with commissioning authorities commissioning plan.
   5. Develop equipment start-up and initial start-up plan.
   6. Develop pre-functional verification checklists or each piece of equipment and system to be commissioned.

7. Review the Commissioning Authority developed functional performance test procedures.
8. Require equipment and system installers to review and provide comments on functional test procedures.
9. Cooperate with Commissioning Authority, and provide access to the work.
10. Furnish qualified personnel to assist in completing commissioning.
11. Require manufacturers to review commissioning test procedures for equipment installed by manufacturer.
12. Furnish proprietary test equipment required by manufacturers to complete equipment and system tests.
13. Furnish manufacturer's qualified field representatives as specified in Section 014000 - Quality Requirements and individual specification sections to assist in completing commissioning.
14. Ensure equipment and system installers execute commissioning responsibilities according to Contract Documents and schedule.
15. Prepare operation and maintenance manuals specified in Section 017000 - Execution Requirements. Update original sequences of operation reflecting actual installation.

1.08 COMMISSIONING MEETINGS

A. Section 013100 – Project Management and Coordination.

B. Commissioning Authority will make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.

C. Initial Commissioning Meeting:
   1. Contractor will schedule meeting within 90 days after Notice of Award.
   2. Attendance Required: Commissioning Authority, Architect/Engineer, Contractor, subcontractors, test, adjust and balance agency. Require attendance by installers of the following equipment and systems indicated to be commissioned including:
      a. Mechanical equipment and systems.
      b. Electrical equipment and systems.
      c. Temperature controls equipment and systems.
   3. Agenda:
      a. Designation of personnel representing parties for commissioning activities.
      b. Review commissioning process and responsibilities.
      c. Review commissioning plan development procedures.
      d. Review required commissioning submittals.
      e. Review initial commissioning schedule.

D. Progress Commissioning Meetings:
   1. Progress commissioning meetings will be scheduled as required by the commissioning team.

E. Contractor will record meeting minutes and distribute copies to participants and those affected by decisions made.

1.09 COMMISSIONING REPORTS

A. Commissioning Authority Reports:
   1. Observation reports of specific commissioning activities.
   2. Testing progress and approvals.
   3. Deficiency and deficiency resolution reports.

B. Functional Performance Test Procedures Forms: Develop functional test procedure forms containing the following information:
   1. Project information.
   2. Participating parties.
   3. Unique test identification number, and reference to unique verification checklist and startup documentation identification numbers for piece of equipment.
   4. Equipment identification number.

5. System and or equipment name.
6. Copy of specific sequence of operations or other specified parameters being verified.
7. Required pre-test field measurements.
8. Special cautions, alarm limits, and safety concerns.
9. Specific step-by-step procedures to execute test, in clear, sequential and repeatable format.
10. Acceptance criteria of proper performance with Yes / No check box to allow for marking whether or not proper performance of each part of test was achieved.
11. Section for comments.
12. Signatures and date block for Commissioning Authority.

1.10 SEQUENCING

A. Section 01 10 00 – Summary of Work: Requirements for sequencing.

B. Phase 1A and Phase 1B: Sequence work to complete pre-functional testing and test and balance of all new system installed in Phase 1A and Phase 1B prior to Phase 1A and Phase 1B substantial completion. Provide preliminary O&M's for review prior to commissioning Phase 1A and Phase 1B. O&M's to include test and balance report for Phase 1A and Phase 1B.

C. Phase 2: Sequence work to complete pre-functional testing and test and balance of all systems prior to substantial completion of Phase 2. Complete tests of any equipment not completed at the end of Phase 1A and Phase 1B. Provide complete test and balance report for the entire facility, including all Phase 2, Phase 1A and Phase 1B systems.

D. Sequence work to achieve Functional Completion before Final Completion. Complete the following for each piece of equipment and system indicated to be commissioned to achieve Functional Completion:
1. Complete and sign the pre-functional verification checklists.
2. Submit final approved test and balance report.
3. Complete functional performance testing.
4. Correct identified deficiencies or obtain approval by Contracting Officer to exclude deficiencies from Functional Completion.
5. Submit approved operation and maintenance data manuals.

1.11 SCHEDULING

A. Schedule work to allow adequate time for commissioning activities.

B. Identify commissioning milestones, activities, and durations on Project schedule.
1. Identify the following on the schedule:
a. Pre-functional verification check and startup.
b. Functional performance testing.
c. Operation and maintenance manual submittal.
d. Functional testing.
e. Commissioning completion.

1.12 P2 PRODUCTS - NOT USED

1.13 P3 EXECUTION

1.14 EXAMINATION

A. Verify equipment and systems are installed in accordance with individual specification sections.

B. Verify utility and power connections are complete and services operational.

1.15 PRE-FUNCTIONAL VERIFICATION CHECK AND STARTUP PROCEDURES

A. Verification Check and Startup:
1. Perform pre-functional verification checklists in accordance with the contractors startup plan.
2. Record completion of each procedure. Indicate results of procedure where required.
3. Identify items not completed successfully.

4. Sign and date completed pre-functional verification checklists.
5. Submit complete pre-functional verification checklist to Commissioning Authority.
6. Submit completed start-up plan to Commissioning Authority.

B. Deficiencies and Approvals:
1. Commissioning Authority will review the pre-functional verification checklist and issue deficiency report.
2. The Contractor shall correct deficiencies and resubmit the updated pre-functional verification checklist including a statement indicating corrections made.
3. Repeat process until all pre-functional verification checklists are complete.
4. Costs for incomplete verification check and startup items that later cause deficiencies or delays during functional tests may be charged to party responsible for incomplete item.

1.16 FUNCTIONAL PERFORMANCE TEST PROCEDURES

A. Complete the following before performing functional tests:
1. Pre-Functional verification check and startup.
2. Air and hydronic system balancing report.

B. Notify Commissioning Authority of completion of pre-functional verification check and startup activities.

C. Commissioning Authority will direct, witness, and document results of functional performance tests.

D. Conduct functional performance tests as specified in Section 23 08 00 and 26 80 00.

E. Demonstrate each piece of equipment and system is operating according to documented design intent and Contract Documents.
1. Conduct testing proceeding from components to subsystems, to systems.
2. Bring equipment and systems to condition capable full dynamic operation.
3. Verify performance of individual components and systems.
4. Verify performance of interactions between systems.
5. Identify and correct areas of deficient performance.

F. Operate each piece of equipment and system through each specified mode of operation including seasonal, occupied, unoccupied, warm up, cool down, partial load and full load conditions.
1. Verify each sequence in sequences of operation.
2. Test for proper responses to power failure, freezing, overheating, low oil pressure, no flow, equipment failure, and other abnormal conditions.

1.17 FUNCTIONAL PERFORMANCE TEST METHODS

A. Perform testing and verification by using manual testing or by monitoring performance and analyzing results using control system trend log capabilities or by stand-alone data loggers as specified for each piece of equipment or system.
1. Commissioning Authority may require alternate or additional method, other than specified method.
2. Commissioning Authority will determine test method when method is not specified.

B. Simulated Conditions: Simulating conditions, not by overwritten values, is permitted. Timing tests to use real conditions is encouraged wherever practical.

C. Overwritten Values: Overwriting sensor values to simulate conditions may be used with caution and avoided when possible.

D. Simulated Signals: Using signal generator to create simulated signals to test and calibrate transducers automatic temperature controls is generally recommended over using sensors as signal generators with simulated conditions or overwritten values.

E. Altering Setpoints: Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test specific sequence is acceptable. Reset setpoint after completing test.

F. Indirect Indicators: Using indirect indicators for responses or performance is permitted only after visually and directly verifying and documenting indirect readings through control system representing actual conditions and responses over tested parameter range.

G. Perform each function and test under conditions simulating actual conditions as close as is practically possible.
   1. Provide materials, system modifications, and other things necessary to produce flows, pressures, temperatures, and other responses to execute test according to specified conditions.
   2. At completion of test, return modified equipment and systems to pretest condition.

1.18 DEFICIENCIES AND TEST APPROVALS

A. Deficiencies:
   1. Commissioning Authority will record and report deficiencies.
   2. Minor deficiencies may be corrected during tests at Commissioning Authority's discretion. Deficiency and resolution will be documented.
   3. When deficiency is identified, Commissioning Authority will discuss issue with party executing test.
      a. When party executing test accepts responsibility to correct deficiency:
         1) Commissioning Authority documents deficiency and executing party's response.
         2) Party executing test corrects deficiency, signs statement of correction on deficiency form certifying equipment is ready retesting and submits form to Commissioning Authority.
         3) Commissioning Authority reschedules test and test is repeated until satisfactory performance is achieved.
      b. When party executing test disputes deficiency or responsibility for deficiency:
         1) Commissioning Authority documents deficiency and executing party's response.
         2) Commissioning Authority submits deficiency report to Contractor, and party executing test and party believed to be responsible for deficiency.
         3) Commissioning Authority negotiates resolution with parties involved and refers continuing disputes to Architect/Engineer for resolution in accordance with Contract Documents.
         4) Commissioning Authority documents resolution process.
         5) When resolution is decided, appropriate party corrects deficiency, signs statement of correction on deficiency form certifying equipment is ready for retesting and submits form to Commissioning Authority.
         6) Commissioning Authority reschedules test and test is repeated until satisfactory performance is achieved.

B. Retesting Costs:
   1. When verification check and startup or functional performance test deficiency is discovered requiring rescheduling or retesting:
      a. Contracting Officer will compensate Commissioning Authority for attending and directing additional testing.
      b. Contracting Officer will deduct additional testing compensation from final payment due to Contractor.

C. Provide written report to Commissioning Authority before each scheduled commissioning meeting concerning status of each deficiency. Include explanations of disagreements with resolution proposals for each discrepancy.
   1. Commissioning Authority will retain original deficiency forms until end of Project.

D. Manufacturing Defects: When 10 percent, but not less than 3 identical pieces of equipment or equipment with only small size or capacity differences fail to perform to Contract Document requirements due to manufacturing defect, all identical units may be considered defective by Contracting Officer.

1. Within one week of notice from Contracting Officer, examine all other identical units and record findings. Submit findings to Contracting Officer within two weeks of original notice.
2. Within two weeks of original notification, provide signed and dated, written explanation of problem, cause of defect, and proposed solutions meeting Contract Document requirements. Include equipment submittals supporting solution.
3. Contracting Officer will determine whether replacement or repair of all identical units is required.
4. Install two examples of proposed solution. Contracting Officer will test installations for up to one week, before deciding solution is acceptable.
5. Upon acceptance, replace or repair all identical items, at Contractor's expense. Extend warranty accordingly, when original equipment warranty had begun.
6. Complete repairs or replacements with reasonable speed beginning within one week from when parts can be obtained.

E. Test Approval: Commissioning Authority notes each satisfactorily demonstrated function on functional performance test form.
   1. Commissioning Authority recommends acceptance of each test to Contracting Officer using standard form.
   2. Contracting Officer gives final approval for each test using same form, providing signed copy to Commissioning Authority and Contractor.

END OF SECTION

SECTION 02 4100
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building demolition .

B. Selective demolition of built site elements.

C. Selective demolition of building elements for alteration purposes.

D. Abandonment and removal of existing utilities and utility structures.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.

B. Section 01 1000 - Summary: Sequencing and staging requirements.

C. Section 01 1000 - Summary: Description of items to be salvaged or removed for re-use by Contractor.

D. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

E. Section 01 6000 - Product Requirements: Handling and storage of items removed for salvage and relocation.

F. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

G. Section 31 2323 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SCOPE

A. See drawings

B. Remove other items indicated, for salvage, relocation, and recycling.

C. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as specified in Section 31 2200.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   3. Provide, erect, and maintain temporary barriers and security devices.
   4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   5. Do not close or obstruct roadways or sidewalks without permit.
   6. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
   7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Protect existing structures and other elements that are not to be removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

3.03 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

C. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.

D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. Verify that abandoned services serve only abandoned facilities before removal.
   4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

E. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch as specified for patching new work.

3.05 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 03 3000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.
2. Steel reinforcement bars.
3. Welded-wire reinforcement.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.4 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Aggregates.
3. Admixtures:

    a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
4. Fiber reinforcement.
5. Vapor retarders.
6. Curing materials.

a. Include documentation from color pigment manufacturer, indicating that proposed methods of curing are recommended by color pigment manufacturer.

7. Joint fillers.
8. Repair materials.
9. Each type of steel reinforcement.
10. Bar supports.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.
5. Slump limit.
6. Air content.
7. Nominal maximum aggregate size.
8. Synthetic micro-fiber content.
9. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
10. Include manufacturer's certification that permeability-reducing admixture is compatible with mix design.
11. Intended placement method.
12. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings:

1. Joint Layout: Indicate proposed construction and crack control joints required to construct the structure.

a. Location of all joints is subject to approval of the Architect.

2. Rebar: comply with ACI SP-066.

a. Include placing drawings that detail fabrication, bending, and placement.
b. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, and supports for concrete reinforcement.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:

1. Installer: Include copies of applicable ACI certificates.
2. Ready-mixed concrete manufacturer.
3. Testing agency: Include copies of applicable ACI certificates.

B. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances.

C. Research Reports:

1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
2. For sheet vapor retarder, showing compliance with ICC AC380.

D. Preconstruction Test Reports: For each mix design.

E. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician.

B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.

1. Personnel performing laboratory tests shall be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

D. Field Quality Control Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1. Personnel conducting field tests shall be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301.

B. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
   1. Store reinforcement to avoid contact with earth.

1.8 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.

   1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
   3. Do not use frozen materials or materials containing ice or snow.
   4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
   5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:

   1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
   2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement sheet vapor retarder/termite barrier material and accessories for sheet vapor retarder/ termite barrier and accessories that do not comply with requirements or that fail to resist penetration by termites within specified warranty period.

   1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I/II.

C. Normal-Weight Aggregates: ASTM C33/C33M, coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C260/C260M.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

2.3 FIBER REINFORCEMENT

A. Synthetic Fibrillated Micro-Fiber: Fibrillated polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C1116/C1116M, Type III, 1 to 2-1/4 inches long.

B. Synthetic Macro-Fiber: Synthetic macro-fibers engineered and designed for use in concrete, complying with ASTM C1116/C1116M, Type III, 1 to 2-1/4 inches long.

2.4 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class C: ASTM E1745, Class C; not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.
1. Low-Temperature Flexibility: Pass at minus 15 deg F; ASTM D146/D146M.
2. Puncture Resistance: 224 lbf minimum; ASTM E154/E154M.
3. Water Absorption: 0.1 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D570.

4. Hydrostatic-Head Resistance: 231 feet minimum; ASTM D5385.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.

C. Water: Potable or complying with ASTM C1602/C1602M.

D. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.

E. Clear, Waterborne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

2.6 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, aromatic polyurea with a Type A shore durometer hardness range of 90 to 95 in accordance with ASTM D2240.

C. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:

1. Types I and II, nonload bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.7 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand, as recommended by underlayment manufacturer.

4. Compressive Strength: Not less than 4100 psi at 28 days when tested in accordance with ASTM C109/C109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested in accordance with ASTM C109/C109M.

2.8 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

1. Use water-reducing high-range water-reducing or plasticizing 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.
3. Use water-reducing admixture in pumped concrete, and concrete with a w/cm below 0.50.

2.9 CONCRETE MIXTURES

A. Normal-weight concrete used for footings and foundation walls.

1. Exposure Class: ACI 318, F0, S0, W0, C0.
2. Minimum Compressive Strength: 4500 psi at 28 days.
3. Maximum w/cm: 0.45.
4. Slump Limit: 5 inches, plus or minus 1 inch.
5. Air Content: 6 percent, plus or minus 1 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size.

B. Normal-weight concrete used for concrete slabs on grade.

1. Exposure Class: ACI 318, F0, S0, W0, C0.

2. Minimum Compressive Strength: 4500 psi at 28 days.
3. Maximum w/cm: 0.45.
4. Slump Limit: 5 inches, plus or minus 1 inch.
5. Air Content: Do not exceed 3 percent.

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M, and furnish batch ticket information.

2.11 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60

B. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

C. Fabrication: Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

D. Accessories:
1. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
   a. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice"
2. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.
   a. Finish: Plain

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:

1. Daily access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.4 INSTALLATION OF VAPOR RETARDER

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.

1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
2. Face laps away from exposed direction of concrete pour.
3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
4. Lap joints 6 inches and seal with manufacturer's recommended tape.
5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
7. Protect vapor retarder during placement of reinforcement and concrete.

    a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

3.5 INSTALLATION OF REINFORCING

A. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

B. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.

C. Accurately position, support, and secure reinforcement against displacement.
   1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
   2. Do not tack weld crossing reinforcing bars.

D. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

E. Provide concrete coverage in accordance with ACI 318.

F. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

G. Splices: Lap splices as needed.
   1. Stagger splices in accordance with ACI 318.

H. Install welded-wire reinforcement in longest practicable lengths.
   1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
   2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire.
   3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
   4. Lace overlaps with wire.

3.6 JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete.

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.

   1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
   2. Place joints perpendicular to main reinforcement.

      a. Continue reinforcement across construction joints unless otherwise indicated.
      b. Do not continue reinforcement through sides of strip placements of floors and slabs.
   3. Doweled Joints (Construction Joints): Install dowel bars and support assemblies at joints where indicated on Drawings.
      a. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.
   4. Dowel Plates: Install dowel plates as an alternate to dowel bars at joints where indicated on Drawings.

C. Non-Movement Joints:
   1. Where new slab-on-ground is cast with a block-out for other work, use a bonding agent at locations where fresh concrete is placed against partially hardened concrete surfaces less than 7 days old.

2. Where existing slab-on-ground is cut for placement of under-slab piping or other work, use epoxy-bonding adhesive at locations where fresh concrete is placed against existing or partially hardened concrete surfaces more than 7 days old.

D. Crack Control Joints in Slabs-on-Ground: Form weakened-plane crack control joints, sectioning concrete into areas as indicated. Construct crack control joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form crack control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of crack control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form crack control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

E. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants, specified in Section 07 9200 "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

1. If a section cannot be placed continuously, provide construction joints as indicated.
2. Deposit concrete to avoid segregation.
3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.

a. Do not use vibrators to transport concrete inside forms.
b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Do not place concrete floors and slabs in a checkerboard sequence.
2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Level concrete, cut high areas, and fill low areas.
6. Slope surfaces uniformly to drains where required.
7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
8. Do not further disturb slab surfaces before starting finishing operations.

3.8 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.

a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
b. Remove projections larger than 1 inch.

c. Tie holes do not require patching.
d. Surface Tolerance: ACI 117 Class D.
e. Apply to concrete surfaces not exposed to public view.

B. Rubbed Finish: Apply the following to as cast surface finish to As-Cast surfaces that are exposed to view in the final construction:

1. Grout-Cleaned Rubbed Finish:

a. Clean concrete surfaces after contiguous surfaces are completed and accessible.
b. Do not clean concrete surfaces as Work progresses.
c. Mix 1-part portland cement to 1-1/2 parts fine sand, complying with ASTM C144 or ASTM C404, by volume, with sufficient water to produce a mixture with the consistency of thick paint. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces.
d. Wet concrete surfaces.
e. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap, and keep surface damp by fog spray for at least 36 hours.

C. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.9 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish:

1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.
2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch in one direction.
3. Apply scratch finish to surfaces to receive concrete floor toppings.

C. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
3. Apply float finish to surfaces to receive trowel finish.

D. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.
5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
6. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:

   a. Slabs on Ground:
      1) Specified overall values of flatness, F_F 25; and of levelness, F_L 20; with minimum local values of flatness, F_F 17; and of levelness, F_L 15.

   b. Slabs on Metal Deck:
      1) Specified overall values of flatness, F_F 25; and of levelness, F_L 20; with minimum local values of flatness, F_F 17; and of levelness, F_L 15.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.

1. Coordinate required final finish with Architect before application.
2. Comply with flatness and levelness tolerances.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
2. Coordinate required final finish with Architect before application.

G. Patches and Infills in Existing Slab: Apply finish, curing and treatment that will match and blend with existing adjacent slab on ground.

3.10 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to blend with in-place construction.

3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

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

C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 4 inches high unless otherwise indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support. Reinforce with #4 rebar at 12-inches on-center each direction at the mid-depth of the concrete base.
3. Minimum Compressive Strength: 4500 psi at 28 days.
4. Install #4 dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 12-inch centers around the full perimeter of concrete base and at 36-inches on-center within the interior of the concrete base, embedded 2-inches and epoxied to underlying concrete slab on grade.
5. Prior to pouring concrete, place and secure anchorage devices.

    a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
    b. Cast anchor-bolt insert into bases.
    c. Install anchor bolts to elevations required for proper attachment to supported equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.

1. Cast-in inserts and accessories, as shown on Drawings.
2. Screed, tamp, and trowel finish concrete surfaces.

3.11 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:
1. If forms remain during curing period, moist cure after loosening forms.
2. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:

    a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.

b. Continuous Sprinkling: Maintain concrete surface continuously wet.
c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

1) Recoat areas subject to heavy rainfall within three hours after initial application.
2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:

1. Begin curing immediately after finishing concrete.
2. Interior Concrete Floors:

a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:

1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

a) Lap edges and ends of absorptive cover not less than 12-inches.
b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.

a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
b) Cure for not less than seven days.

3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

a) Water.
b) Continuous water-fog spray.

b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:

1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

   a) Lap edges and ends of absorptive cover not less than 12 inches.
   b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.

   a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
   b) Cure for not less than seven days.

3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

   a) Water.
   b) Continuous water-fog spray.

c. Floors to Receive Curing Compound:

   1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
   2) Recoat areas subjected to heavy rainfall within three hours after initial application.
   3) Maintain continuity of coating, and repair damage during curing period.
   4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

d. Floors to Receive Curing and Sealing Compound:

   1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
   2) Recoat areas subjected to heavy rainfall within three hours after initial application.
   3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.12 TOLERANCES

A. Conform to ACI 117.

3.13 JOINT FILLING

A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month.
2. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints.

D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

A. Defective Concrete:

1. Repair and patch defective areas when approved by Architect.
2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.

a. Limit cut depth to 3/4 inch.
b. Make edges of cuts perpendicular to concrete surface.
c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
d. Fill and compact with patching mortar before bonding agent has dried.
e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.

a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
b. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.

    a. Correct low and high areas.
    b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
3. After concrete has cured at least 14 days, correct high areas by grinding.
4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.

    a. Finish repaired areas to blend into adjacent concrete.

5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.

    a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
    b. Feather edges to match adjacent floor elevations.

6. Correct other low areas scheduled to remain exposed with repair topping.

    a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
    b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

7. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.

    a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
    b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
    c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
    d. Place, compact, and finish to blend with adjacent finished concrete.
    e. Cure in same manner as adjacent concrete.

8. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.

a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
b. Dampen cleaned concrete surfaces and apply bonding agent.
c. Place patching mortar before bonding agent has dried.
d. Compact patching mortar and finish to match adjacent concrete.
e. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

A. Special Inspections: No concrete special inspections are needed.

B. Testing Agency: Contractor will engage a qualified testing agency to perform tests and to submit reports.

1. Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
2. Testing agency shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
3. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

a. Test reports shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:

1) Project name.
2) Name of testing agency.
3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
4) Name of concrete manufacturer.
5) Date and time of inspection, sampling, and field testing.
6) Date and time of concrete placement.
7) Location in Work of concrete represented by samples.
8) Date and time sample was obtained.
9) Truck and batch ticket numbers.
10) Design compressive strength at 28 days.
11) Concrete mixture designation, proportions, and materials.
12) Field test results.
13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.

14) Type of fracture and compressive break strengths at seven days and 28 days.

C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

   a. When frequency of testing provides 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 C143/C143M:

   a. 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.
   b. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete.

   a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

4. Compression Test Specimens: ASTM C31/C31M:

   a. Cast and laboratory-cure three sets of two standard cylinder for each composite sample.
   b. Cast and field-cure three sets of two standard cylinders for each composite sample.

5. Compressive-Strength Tests: ASTM C39/C39M.

   a. Test one set of two laboratory-cured cylinders at seven days and one set of two cylinders at 28 days.

      1) Maintain one set of two laboratory-cured cylinders for follow-up testing, if needed.

   b. Test one set of two field-cured specimens at seven days and one set of two cylinders at 28 days.

      1) Maintain one set of two laboratory-cured cylinders for followup testing, if needed.

c. A compressive-strength test shall be the average compressive strength from a set of similarly cured cylinders obtained from same composite sample and tested at age indicated.

6. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
7. Strength of each concrete mixture will be satisfactory if every average of any two consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
8. 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.
9. Additional Tests:

   a. Testing 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.
   b. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.

      1) Acceptance criteria for concrete strength shall be in accordance with ACI 301 section 1.6.6.3.

10. Additional testing, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
11. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

E. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 24 hours of completion of floor finishing and promptly report test results to Architect.

3.16 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION 03 3000

SECTION 03 0516

UNDERSLAB VAPOR BARRIER - STEGO

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2018a.

B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products.

PART 2 PRODUCTS

2.01 MATERIALS

A. Underslab Vapor Barrier:
   1. Water Vapor Permeance: Not more than 0.010 perms, maximum.
   2. Thickness: 15 mils.
   3. Basis of Design:
      a. Stego Industries LLC; Stego Wrap Vapor Barrier (15-mil): www.stegoindustries.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

B. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, etc., for sealing seams and penetrations in vapor barrier.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.

B. Install vapor barrier under interior slabs on grade; lap sheet over footings and seal to foundation walls.

C. Lap joints minimum 6 inches.

D. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.

E. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.

F. Repair damaged vapor retarder before covering with other materials.

END OF SECTION

SECTION 03 4500

PRECAST ARCHITECTURAL CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Architectural precast concrete wall panels.

B. Architectural precast concrete accessories.

C. Supports, anchors, and attachments.

D. Grouting under panels.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing perimeter and intermediate joints.

1.03 REFERENCE STANDARDS

A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2018).

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

E. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

F. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts; 2015.

G. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts (Metric); 2007 (Reapproved 2013).

H. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2020.

I. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2018a.

J. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012.

K. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.

L. ASTM C150/C150M - Standard Specification for Portland Cement; 2020.

M. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

N. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete; 2017a.

O. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2019.

P. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.

Q. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020.

R. PCI MNL-117 - Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products; 2013.

S. PCI MNL-120 - PCI Design Handbook - Precast and Prestressed Concrete; 2017.

T. PCI MNL-122 - Architectural Precast Concrete; 2007.

U. PCI MNL-123 - Design and Typical Details of Connections for Precast and Prestressed Concrete; 1988.

V. PCI MNL-135 - Tolerance Manual for Precast and Prestressed Concrete Construction; 2000.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's information on accessory products, including pigments, admixtures, inserts, plates, etc.

C. Shop Drawings: Indicate layout, unit locations, configuration, unit identification marks, reinforcement, connection details, support items, location of lifting devices, dimensions, openings, and relationship to adjacent materials.
   1. Include details of mix designs.
   2. Include structural design calculations.

D. Samples: Submit two samples, 12" by 12" inch in size, illustrating surface finish, color and texture.

E. Maintenance Data: Indicate surface cleaning instructions.

1.05 QUALITY ASSURANCE

A. Design Engineer Qualifications: Design precast concrete units under direct supervision of a Professional Structural Engineer experienced in design of precast concrete and licensed in the State in which the Project is located.

B. Fabricator Qualifications:
   1. Firm having at least 5 years of experience in production of precast concrete of the type required.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Handling: Lift and support precast units only from support points.

B. Blocking and Lateral Support During Transport and Storage: Use materials that are clean, non-staining, and non-harmful to exposed surfaces. Provide temporary lateral support to prevent bowing and warping.

C. Protect units to prevent staining, chipping, or spalling of concrete.

PART 2 PRODUCTS

2.01 PRECAST UNITS, GENERAL

A. Precast Architectural Concrete Units: Comply with PCI MNL-120, PCI MNL-122, PCI MNL-123, PCI MNL-135, and ACI 318.
   1. Design Loads: Static loads, anticipated dynamic loading, including positive and negative wind loads, thermal movement loads, and erection forces as defined by applicable code.
   2. Calculate structural properties of units in accordance with ACI 318.
   3. Accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
   4. Provide connections that accommodate building movement and thermal movement and adjust to misalignment of structure without unit distortion or damage.

B. Finish Type A: Ensure exposed-to-view finish surfaces of precast units are uniform in color and appearance.

2.02 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 40 (40,000 psi).
   1. Deformed billet-steel bars.

B. Steel Welded Wire Reinforcement (WWR): Plain type, ASTM A1064/A1064M.
   1. Form: Flat Sheets.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.

B. Other Cementitious Materials:
   1. Fly Ash or Natural Pozzolans: Comply with ASTM C618.

C. Fine and Coarse Structural Aggregates: ASTM C33/C33M.

D. Lightweight Structural Aggregate: ASTM C330/C330M.

E. Surface Finish Aggregate: Complying with sample in office of Architect.

F. Color Additives: Pure, concentrated mineral pigments specifically intended for mixing into concrete and complying with ASTM C979/C979M.
   1. Concentration: Base dosage rates on weight of Portland cement, fly ash, silica fume, and other cementitious materials but not aggregate or sand.
   2. Color(s): As selected by Architect from manufacturer's full range.

G. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

H. Fiber Reinforcement: Synthetic fiber shown to be resistant to long-term deterioration when exposed to moisture and alkalis; 1/2 inch length.

I. Air Entrainment Admixture: ASTM C260/C260M.

J. Grout:
   1. Non-shrink, non-metallic, minimum 10,000 psi, 28 day strength.

2.04 REVEAL AND ACCENT STRIPS

A. Galvanized C-shape plates

B. Profile(s): As indicated on drawings.

2.05 SUPPORT DEVICES

A. Connecting and Support Devices; Anchors and Inserts: ASTM A36/A36M steel; hot-dip galvanized in accordance with ASTM A153/A153M.
   1. Clean surfaces of rust, scale, grease, and foreign matter.
   2. Galvanize after fabrication in accordance with requirements of ASTM A123/A123M.

B. Bolts, Nuts, and Washers: ASTM A307 heavy hex bolts, Type A, hot-dip galvanized, with matching ASTM A563 (ASTM A563M) nuts and matching washers.

2.06 FABRICATION

A. Fabricate in compliance with PCI MNL-117 and PCI MNL-135.

B. Use rigid molds, constructed to maintain precast unit uniform in shape, size, and finish.

C. Maintain consistent quality during manufacture.

D. Fabricate connecting devices, plates, angles, items fit to steel framing members, inserts, bolts, and accessories. Fabricate to permit initial placement and final attachment.

E. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.

F. Minor patching in plant is acceptable, providing structural adequacy and appearance of units is not impaired.

2.07 FABRICATION TOLERANCES

A. Comply with PCI MNL-117 and PCI MNL-135.

2.08 ACCESSORIES

A. Bearing Pads: High density plastic; Shore A Durometer ____; 1/8 inch thick, smooth both sides.

2.09 SOURCE QUALITY CONTROL

A. Provide testing and analysis of concrete mix.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building structure, anchors, devices, and openings are ready to receive work of this section.

3.02 PREPARATION

A. Provide for erection procedures and induced loads during erection. Maintain temporary bracing in place until final support is provided.

3.03 ERECTION

A. Erect units without damage to shape or finish. Replace or repair damaged panels.

B. Erect units level and plumb within allowable tolerances.

C. Align and maintain uniform horizontal and vertical joints as erection progresses.

D. When units require adjustment beyond design or tolerance criteria, discontinue affected work; advise Architect.

E. Weld units in place. Perform welding in accordance with AWS D1.1/D1.1M.

F. Provide non-combustible shields during welding operations.

G. Touch-up field welds and scratched or damaged primed painted surfaces.

H. Exposed Joint Dimension: 1/2 inch. Adjust units so that joint dimensions are within tolerances.

3.04 TOLERANCES

A. Erect members level and plumb within allowable tolerances. Comply with PCI MNL-135, except as specifically amended below.
   1. Plan Location from Building Grid Datum: Plus or minus 3/8 in.
   2. Top Elevation from Nominal Top Elevation: Plus or minus 3/8 inch.
   3. Maximum Plumb Variation Over Height of Structure or 100 ft (whichever is less): Plus or minus 1/2 inch.
   4. Exposed Joint Dimension: Plus or minus 3/16 inch.
   5. Maximum Jog in Alignment of Matching Faces or Edges: Plus or minus 1/8 inch.
   6. Differential Bowing or Camber as Erected Between Similar Adjacent Members: Plus or minus 3/16 inch.

3.05 CLEANING

A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

END OF SECTION

SECTION 05 5000
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel items.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

C. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2014 (Amended 2015).

D. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020.

E. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata.

F. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

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. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

1.05 QUALITY ASSURANCE

A. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Plates: ASTM A283/A283M.

C. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

D. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

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

2.03 FABRICATED ITEMS

A. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; prime paint finish.

B. Door Frames for coiling and roll-up doors: Tube sections; prime paint finish.

2.04 FINISHES - STEEL

A. Prime paint steel items.

B. Prime Painting: One coat.

2.05 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Obtain approval prior to site cutting or making adjustments not scheduled.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 5100
METAL STAIRS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stairs with concrete treads.

B. Stairs with grating treads.

C. Prefabricated stairs.

D. Structural steel stair framing and supports.

E. Handrails and guards.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete fill in stair pans.

B. Section 03 3000 - Cast-in-Place Concrete: Placement of metal anchors in concrete.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2020.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2021.

E. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2020.

G. ASTM A1011/A1011M - 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; 2018a.

H. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2019, with Editorial Revision (2020).

I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

J. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2014 (Amended 2015).

K. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020.

L. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

M. SSPC-SP 2 - Hand Tool Cleaning; 2018.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide _____.

C. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

2. Include the design engineer's seal and signature on each sheet of shop drawings.

D. Design Data: As required by authorities having jurisdiction.

E. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

F. Designer's Qualification Statement.

1.05 QUALITY ASSURANCE

A. (Stair S1) Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and dated no more than 12 months before start of scheduled welding work.

C. Fabricator Qualifications:
1. A company specializing in manufacturing products specified in this section, with not less than ten years of experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Prefabricated Metal Stairs (Roof Stair):
1. UpnOvr.
2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
1. Regulatory Requirements: Provide stairs and railings that comply with most stringent requirements of local, state, and federal regulations; where requirements of Contract Documents exceed those of regulations, comply with Contract Documents.
2. Handrails: Comply with applicable accessibility requirements of ADA Standards.
3. Dimensions: As indicated on drawings.
4. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
5. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
6. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:
1. Architectural: All joints as inconspicuous as possible, whether welded or mechanical.
a. Welded Joints: Continuously welded and ground smooth and flush.
b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.
c. Exposed Edges and Corners: Eased to small uniform radius.
d. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for highest quality gloss finish.
2. Commercial: Exposed joints as inconspicuous as possible, whether welded or mechanical; underside of stair not covered by soffit IS considered exposed to view.
a. Welded Joints: Intermittently welded on back side, filled with body putty, and sanded smooth and flush.
b. Welds Exposed to View: Ground smooth and flush.
c. Mechanical Joints: Butted tight, flush, and hairline.
d. Bolts Exposed to View: Countersunk flat or oval head bolts; no exposed nuts.
e. Exposed Edges and Corners: Eased to small uniform radius.
f. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for satin or matte finish.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.03 METAL STAIRS WITH CONCRETE TREADS

A. Jointing and Finish Quality Level: Architectural, as defined above.

B. Risers: Match existing on Stair S1.
   1. Closed at Stair S2.

C. Treads: Metal pan with field-installed concrete fill.
   1. Concrete Depth: 1-1/2 inches, minimum.
   2. Tread Pan Material: Steel sheet.
   3. Tread Pan Thickness: As required by design; 14 gauge, 0.075 inch minimum.
   4. Pan Anchorage to Stringers: Welded to carrier angles welded to stringers.
   5. Concrete Reinforcement: Welded wire mesh.
   6. Concrete Finish: For resilient floor covering.

D. Risers: Same material and thickness as tread pans.
   1. Nosing Depth: Not more than 1-1/2 inch overhang.
   2. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch wide.

E. Stringers: As indicated for Stair S2.
   1. Stringer Depth (Stair S1): Match existing
   2. End Closure: Sheet steel of same thickness as risers welded across ends.

F. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.

G. Railings: Steel pipe railings.
   1. East Stair: Stainless steel pipe railings.

H. Finish: Shop- or factory-prime painted.

I. Under Side of Stair: Exposed to view, to be finished same as specified for other exposed to view surfaces.

2.04 PREFABRICATED STAIRS

A. Prefabricated Stair (Roof): Welded unit, factory fabricated to greatest degree practical and in the largest components possible.
   1. Materials: Manufacturer's standard steel tubes, plates, bars, shapes, sheets, wire and mesh that comply with requirements of MATERIALS article of this section.
      a. Rails: Manufacturer's standard rails.
         1) Guardrails: 42 inches high.
         2) Handrails: 30 inches to 38 inches high.
      b. Finish: Hot-dipped galvanizing; comply with ASTM A153/A153M.
   2. Manufacturers:
      a. UPNOVR: Crossover with Pplatform Ladder.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.05 HANDRAILS AND GUARDS

A. Wall-Mounted Rails: Round pipe or tube rails unless otherwise indicated.
   1. Outside Diameter: 1-1/2" inch, minimum, to 1-1/2 inches, maximum.

B. Guards:
   1. Top Rails: Round pipe or tube rails unless otherwise indicated.
      a. Outside Diameter: 1-1/2 inch, minimum, to 1-1/2 inches, maximum.
   2. Infill at Pipe Railings: Pipe or tube rails sloped parallel to stair.
      a. Outside Diameter: 1-1/4 inch.

b. Material: Steel pipe or tube, round.
c. Vertical Spacing: Maximum 5 inches on center.
d. Jointing: Welded and ground smooth and flush.

3. End and Intermediate Posts: 1-1/2".
   a. Horizontal Spacing: As indicated on drawings.
   b. Mounting: Welded to top surface of stringer.
4. Handrails (Stair S2):
   a. Outside diameter: 1-1/2"
   b. Material: Stainless Steel

2.06 MATERIALS

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.

C. Stainless Steel Pipe: ASTM A312, ASTM A554, ASME SA312/A554

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
   1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
   2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).

F. Concrete Fill: See Section 03 3000.

2.07 ACCESSORIES

A. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.

B. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

C. Shop and Touch-Up Primer: SSPC-Paint 15, and comply with VOC limitations of authorities having jurisdiction.

2.08 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime Painting: Use specified shop- and touch-up primer.
   1. Preparation of Steel: In accordance with SSPC-SP 2, Hand Tool Cleaning.
   2. Number of Coats: One.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.

B. Supply items required to be cast into concrete with setting templates.

3.03 INSTALLATION

A. Install components 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. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.

D. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

E. Obtain approval prior to site cutting or creating adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

3.05 SCHEDULES

A. Stair S1: Concrete-filled pan treads and landings, with primed finish. Match existing stringer and railing shapes to greatest extent possible. Structural Engineering of stair extension shall be by the Contractor.

B. Stair S2: Concrete-filled pan treads and landings, with primed finish. Stainless Steel railing system. Structural Engineering included in Contract Documents.

END OF SECTION

SECTION 05 1200

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Structural steel.
2. Shear stud connectors.
3. Shrinkage-resistant grout.

B. Related Requirements:
1. Section 05 3100 "Steel Decking" for field installation of shear stud connectors through deck.
2. Section 05 5000 "Metal Fabrications" for and other steel items not defined as structural steel.

1.3 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

B. Seismic-Load-Resisting System: Elements of structural-steel frame resisting seismic load including columns, beams, drag struts, diaphragms and braces and their connections.

C. Protected Zone: Structural members or portions of structural members indicated as "protected zone" on Drawings. Connections of structural and nonstructural elements to protected zones are limited.

D. Demand-Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the seismic-load-resisting system and which are indicated as "demand critical" on Drawings.

1.4 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Shear stud connectors.
4. Anchor rods.
5. Threaded rods.
6. Shop primer.
7. Shrinkage-resistant grout.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment Drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned high-strength bolted connections.
5. Identify members and connections of the seismic-load-resisting system.
6. Indicate locations and dimensions of protected zones.
7. Identify demand-critical welds.
8. Identify members not to be shop primed.

C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide in accordance with AWS D1.1/D1.1M for each welded joint whether prequalified or qualified by testing, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand-critical welds.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and fabricator.

B. Welding certificates.

C. Mill test reports for structural-steel materials, including chemical and physical properties.

D. Product Test Reports: For the following:

1. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
2. Tension-control, high-strength, bolt-nut-washer assemblies.
3. Shear stud connectors.

E. Source quality-control reports.

F. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).
   1. Alternatively, either:
      a. Shop may be certified by the Municipality of Anchorage as a Fabricator, or
      b. Contractor shall provide and pay for Special Inspection in the shop.

B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.

C. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

   1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

   1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

   1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
   2. Clean and relubricate bolts and nuts that become dry or rusty before use.
   3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A992/A992M.

B. Channels, Angles-Shapes: ASTM A36/A36M.

C. Plate and Bar: ASTM A36/A36M.

D. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade C structural tubing.

E. Pipe: ASTM A53, Grade B

F. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS AND CONNECTORS

A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.

B. Shear Stud Connectors: ASTM A108, AISI C-1015 through C-1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

2.3 RODS

A. Unheaded Anchor Rods: ASTM F1554, Grade 36.

1. Configuration: Straight.
2. Nuts: ASTM A563 heavy-hex carbon steel.
3. Plate Washers: ASTM A36/A36M carbon steel.
4. Washers: ASTM F436, Type 1, hardened carbon steel.
5. Finish: Plain.

B. SLRS Unheaded Anchor Rods: ASTM F1554, Grade 105.

1. Configuration: Straight.
2. Nuts: ASTM A563 heavy-hex carbon steel.
3. Plate Washers: ASTM A36/A36M carbon steel.
4. Washers: ASTM F436, Type 1, hardened carbon steel.
5. Finish: Plain.

2.4 PRIMER

A. Steel Primer:
1. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

2.5 SHRINKAGE-RESISTANT GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 1.

F. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using automatic end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.7 SHOP CONNECTIONS

A. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

2.8 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces of high-strength bolted, slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces unless indicated to be painted.

6. Corrosion-resisting (weathering) steel surfaces.
7. Surfaces enclosed in interior construction.

B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:

1. SSPC-SP 2.
2. SSPC-SP 3.
3. SSPC-SP 7 (WAB)/NACE WAB-4.
4. SSPC-SP 14 (WAB)/NACE WAB-8.
5. SSPC-SP 11.
6. SSPC-SP 6 (WAB)/NACE WAB-3.
7. SSPC-SP 10 (WAB)/NACE WAB-2.
8. SSPC-SP 5 (WAB)/NACE WAB-1.
9. SSPC-SP 8.

C. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated on Drawings.

1. Do not remove temporary shoring supporting composite deck construction and structural-steel framing until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.

B. Baseplates: Clean concrete bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.

C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.

1. Joint Type: Pretensioned.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

C. Install prefabricated building columns to comply with ANSI/AISC 360, manufacturer's written recommendations, and requirements of testing and inspecting agency that apply to the fire-resistance rating indicated.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

1. Bolted Connections: Inspect and test bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.

a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1) Liquid Penetrant Inspection: ASTM E165/E165M.
2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
3) Ultrasonic Inspection: ASTM E164.
4) Radiographic Inspection: ASTM E94/E94M.

3.6 PROTECTION

A. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing, and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

B. Touchup Priming: Cleaning and touchup priming are specified in Section 09 9600 "High-Performance Coatings."

END OF SECTION 05 1200

SECTION 05 5213
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior stair railings and guardrails.

1.02 RELATED REQUIREMENTS

A. Section 05 5100 - Metal Stairs: Handrails other than those specified in this section.

B. Section 09 9123 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2020.

B. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2021.

C. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2009 (Reapproved 2015).

D. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2013, with Editorial Revision.

E. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2014 (Amended 2015).

F. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020.

G. AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel; 2017.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated within the previous 12 months.

D. Fabricator's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

B. Fabricator Qualifications:
   1. A company specializing in manufacturing products specified in this section, with not less than five years of experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Stainless Steel Cable Railing System::
   1. Viva Railings: Circa.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Metal Cable Infill:
   1. Viva Railings: Circa.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.

B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935.

C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935.

D. Dimensions: See drawings for configurations and heights.
   1. Top Rails and Wall Rails: 1-1/2 inches diameter, round.
   2. Intermediate Rails: 1-1/2 inches diameter, round.
   3. Posts: 1-1/2 inches diameter, round.

E. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.

F. Provide slip-on non-weld mechanical fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

G. Welded and Brazed Joints: Make visible joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.
   1. Ease exposed edges to a small uniform radius.
   2. Welded Joints:
      a. Stainless Steel: Perform welding in accordance with AWS D1.6/D1.6M.

2.03 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A500/A500M, Grade B cold-formed structural tubing.

B. Steel Pipe: ASTM A53/A53M, Grade B Schedule 80, black finish.

C. Stainless Steel Pipe: ASTM A312, ASTM A554, ASME SA312/A554

D. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

E. Exposed Fasteners: No exposed bolts or screws.

2.04 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

D. Welded Joints:
   1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
   2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
   3. 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.

E. Weld connections that cannot be shop welded due to size limitations.
   1. Weld in accordance with AWS D1.1/D1.1M.
   2. Match shop welding and bolting.

3. Clean welds, bolted connections, and abraded areas.
4. Touch up shop primer and factory-applied finishes.
5. Repair galvanizing with galvanizing repair paint per ASTM A780/A780M.

PART 3 EXECUTION

3.01 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, for installation as work of other sections.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Anchor railings securely to structure.

D. Field weld anchors as indicated on drawings. Touch-up welds with primer. Grind welds smooth.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

3.04 SCHEDULE

A. Exterior Railings: Stainless Steel Cable Railing System.

END OF SECTION

SECTION 05 3100

STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Roof deck.
2. Composite floor deck.

B. Related Requirements:

1. Section 03 3000 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
2. Section 05 1200 "Structural Steel Framing" for shop- and field-welded shear connectors.
3. Section 05 5000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Evaluation Reports: For steel deck, from ICC-ES.

D. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

2.2 ROOF DECK

A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, zinc coating.
2. Deck Profile: As indicated.
3. Profile Depth: As indicated.
4. Design Uncoated-Steel Thickness: As indicated.
5. Span Condition: Triple span or more.
6. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.3 COMPOSITE FLOOR DECK

A. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G90 zinc coating.
2. Profile Depth: As indicated.
3. Design Uncoated-Steel Thickness: As indicated.
4. Span Condition: Triple span or more.

2.4 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, [**0.0598 inch**] [**0.0747 inch**] thick, with factory-punched hole of 3/8-inch minimum diameter.

J. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

K. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch-wide flanges and sloped recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.

L. Galvanizing Repair Paint: ASTM A 780/A 780M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners or other alternate fastening method may be used in lieu of welding to fasten deck.
   1. Submit Alternate Calculations and Drawings, stamped by an Alaska-registered Civil or Structural Engineer for approval prior to ordering.
   2. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:

   1. Weld Diameter: 7/8 inch, nominal.
   2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds as indicated.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding 12-inches, and as follows:

   1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
   2. Fasten with a minimum of 1-1/2-inch-long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

   1. End Joints: Lapped 2 inches minimum or butted at Contractor's option.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 12 inches apart with at least one fastener at each corner.

1. Install reinforcing channels or zees in ribs to span between supports and mechanically fasten.

E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: 7/8 inch, nominal.
2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches apart, but not more than 18 inches apart.
3. Weld Spacing: Space and locate welds as indicated.
4. Weld Washers: Install weld washers at each weld location where recommended by SDI or Manufacturer.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 36 inches, and as follows:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
2. Mechanically clinch or button punch.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped or butted at Contractor's option.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.5 SPECIAL INSPECTION

A. Owner will engage a qualified special inspection agency to perform inspections.

B. Field welds will be subject to special inspection.

C. Special Inspector to prepare inspection reports and submit to Contractor and Architect.

3.6 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.

1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 09 9113 "Exterior Painting" and Section 09 9123 "Interior Painting."

END OF SECTION 05 3100

SECTION 05 4000

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Load-bearing wall framing.
2. Exterior non-load-bearing wall framing.

B. Related Requirements:
1. Section 09 2116 "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies, with height limitations.
2. Section 09 2216 "Non-Structural Metal Framing" for standard, interior non-load-bearing, metal-stud framing, with height limitations and ceiling-suspension assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

B. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.

1. Steel sheet.
2. Vertical deflection clips.
3. Horizontal drift deflection clips
4. Miscellaneous structural clips and accessories.

PART 2 - PRODUCTS

2.1 COLD-FORMED STEEL FRAMING MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:

1. Grade: ST33H
2. Coating: G60

B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: 50, Class 1
2. Coating: G60

2.2 LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As indicated
2. Flange Width: 1-5/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

1. Minimum Base-Metal Thickness: To match metal studs
2. Flange Width: 1-1/4 inches.

C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As Indicated.
2. Flange Width: 1-5/8 inches.

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As Indicated
2. Flange Width: 1-5/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: To match metal studs
2. Flange Width: 1-1/4 inches.

C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

D. Deflection Track: Manufacturer's deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1 inch plus the design gap.
3. Vertical Slots in Flanges: length o accommodate design gap

2.4 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers and knee braces.
9. Hole-reinforcing plates.
10. Backer plates.

2.5 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

2.6 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780/A 780M.

B. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C 1107/C 1107M, and with a fluid consistency and 30-minute working time.

C. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.

D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

2.7 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel framing members by screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator.
   a. Wire tying of framing members is not permitted.
   b. Screws shall penetrate joined members by no fewer than three exposed screw threads.

4. Fasten other materials to cold-formed steel framing by bolting, pneumatic pin fastening, or screw fastening.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.

C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that required to obtain fire-resistance ratings indicated. Protect remaining fire-resistive materials from damage.

C. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw or bolt wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed steel framing members by screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
    a. Locate mechanical fasteners and comply with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

H. Install insulation, specified in Section 07 2100 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.4 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

B. Squarely seat studs against top and bottom tracks, with gap not exceeding 1/8 inch between the end of wall-framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls to abutting structure.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame. Fasten jamb members together to uniformly distribute loads.
2. Install tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced vertically 48 inches. Fasten at each stud intersection.

1. Channel Bridging: Cold-rolled steel channel, mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.
2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges, and secure solid blocking to stud webs or flanges.
3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

J. Install steel sheet diagonal bracing straps to both stud flanges; terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

L. Shearwalls: Where indicated on Drawings, exterior load bearing metal stud walls are also shearwalls. Secure fire treated wall sheathing to exterior of shearwalls.
1. Fire Treated Wall Sheathing: 1/2" APA-approved FRT or Fire-Rated plywood or OSB
   a. Minimum of 30-minute Class A Flame-Spread rating
2. Fasteners: #8 countersunk self-drilling screws at 6-inches on-center
3. Holddowns: Provide a holddown per Drawings at both ends of all shearwalls.
4. Sill Fastening: Secure sill to existing metal deck with two #8 screws at each high flute.

3.5 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:

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

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install deflection tracks and anchor to building structure.
2. Connect vertical deflection clips to floor/roof edge angle and anchor to building structure.
3. Connect drift clips to cold-formed steel framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated but not more than 48 inches apart. Fasten at each stud intersection.

1. Channel Bridging: Cold-rolled steel channel, mechanically fastened to webs of punched studs.
2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Top Bridging for Deflection Track: Install row of horizontal bridging within 18 inches of deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.

1. Install solid blocking at 96-inch centers.

G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.6 ERECTION TOLERANCES

A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.7 SPECIAL INSPECTION

A. Owner will engage a qualified independent special inspection agency to perform special inspections and prepare reports.

B. Inspection agency will report test results promptly and in writing to Contractor and Architect.

C. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.

D. Additional inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 4000

SECTION 06 1000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rough opening framing for doors, windows, and roof openings.
B. Sheathing.
C. Roof-mounted curbs.
D. Roofing nailers.
E. Preservative treated wood materials.
F. Communications and electrical room mounting boards.
G. Concealed wood blocking, nailers, and supports.
H. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

A. Section 07 2600 - Vapor Retarders: Vapor retarder over sheathing.
B. Section 07 6200 - Sheet Metal Flashing and Trim: Sill flashings.
C. Section 09 2116 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021.
B. AWPA U1 - Use Category System: User Specification for Treated Wood; 2018.
C. PS 1 - Structural Plywood; 2009 (Revised 2019).
D. PS 20 - American Softwood Lumber Standard; 2020.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
   2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Sizes: Nominal sizes as indicated on drawings, S4S.
B. Moisture Content: S-dry or MC19.
C. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

A. Wall Sheathing: Plywood, PS 1, Grade C-D, Exposure I.
   1. Fire Treated: Firepro, flame-block, 30-minute.
   2. Thickness: 1/2".

B. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.04 ACCESSORIES

A. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.

B. Sill Flashing: See Section 07 6200.

C. Vapor Retarder: See Section 07 2600.

2.05 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

PART 3 EXECUTION

3.01 PREPARATION

A. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to authorities having jurisdiction may be used in lieu of solid wood blocking.

C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

F. Provide the following specific nonstructural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Grab bars.
   5. Towel and bath accessories.
   6. Wall-mounted door stops.

7. Chalkboards and marker boards.
8. Wall paneling and trim.
9. Joints of rigid wall coverings that occur between studs.

3.04 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

B. Provide wood curb at each roof opening except where prefabricated curbs are specified and where specifically indicated otherwise; form corners by alternating lapping side members.

3.05 INSTALLATION OF CONSTRUCTION PANELS

A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.

B. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.

3.06 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

END OF SECTION

SECTION 06 2000
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

1.02 REFERENCE STANDARDS

A. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2017, with Errata (2019).

D. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2016.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

C. Samples: Submit two samples of Base, full size, illustrating finish.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.

B. Protect from moisture damage.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Interior Woodwork Items:
   1. Moldings, Bases, Casings, and Miscellaneous Trim: Clear Oak; prepare for staining.

2.02 LUMBER MATERIALS

A. Hardwood Lumber: Oak species, quarter sawn, maximum moisture content of 6 percent; with vertical grain, clear grade.

2.03 SHEET MATERIALS

A. Hardwood Plywood: Face species as indicated, rift cut, book matched, veneer core; HPVA HP-1, Front Face Grade AA, Back Face Grade 1, glue type as recommended for application.

2.04 FASTENINGS

A. Adhesive for factory-fabricated units: Manufacturer's recommended adhesive for application.

2.05 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Plastic Edge Trim: Extruded flat shaped; smooth finish; self locking serrated tongue; of width to match component thickness; _____ color.

C. Safety Glass: ASTM C1048, fully tempered; clear; 1/8 inch thick, minimum.

D. Primer: Alkyd primer sealer.

E. Wood Filler: Solvent base, tinted to match surface finish color.

F. (CG3) 1/4" Millwork Post Outside Corner trim elements:
   1. Where indicated on A700 series drawings.
   2. Manufacturer: Fry Reglet.
   3. Depth: As shown on drawings.
   4. Material: extruded aluminum alloy 6063 T5.
   5. Finish: Clear anodized.

2.06 SITE FINISHING MATERIALS

A. Stain and Varnish Materials: Comply with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

2.07 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

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

2.08 SHOP FINISHING

A. Apply wood filler in exposed nail and screw indentations.

B. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 1, Lacquer, Nitrocellulose.
      b. Sheen: Flat.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

3.02 INSTALLATION

A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.03 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 6100

CAST POLYMER FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cast plastic Suspended Partition, Glazing.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate dimensions, thicknesses, required clearances, tolerances, materials, colors, finishes, fabrication details, field jointing, adjacent construction, design load parameters, methods of support, integration of plumbing components, and anchorages.

C. Samples: Submit two samples representative of _____, ____x____ inch in size, illustrating color, texture, and finish.

D. Manufacturer's Installation Instructions: Indicate preparation of opening required, rough-in sizes; tolerances for item placement, temporary bracing of components, and _____.

E. Maintenance Data: Indicate list of approved cleaning materials and procedures required; list of substances that are harmful to the component materials.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the site in original packages, containers or bundles bearing brand name and identification. Protect from damage by retaining shipping protection in place until installation.

B. Store products under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight. Protect from moisture damage.

C. Handle products to prevent damage to edges, ends, or surfaces.

1.04 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. 3Form:

2.02 MATERIALS

A. (ACR-1) Cast Polymer: Varia
   1. Color, Inerlayer and Pattern to be selected from manufactured full range.

B. (ACR-2) Frameless Top and Bottom Channel Partition: Veria Ecoresin

2.03 FINISH

A. ACR1:
   1. Thickness: 3/8"
   2. Color: Hush Gesso2.
   3. Finish: F01, Sandstone each side.

B. ACR2:
   1. Color: TBD
   2. Finish TBD

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joint preparation and affected dimensions are acceptable.

B. Do not begin installation until substrates have been properly prepared.

C. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Provide anchoring devices for installation .

3.03 INSTALLATION

A. Install components in accordance with approved shop drawings and manufacturer's instructions.

B. Align work plumb and level.

3.04 CLEANING

A. Clean and polish surfaces in accordance with manufacturer's instructions.

3.05 PROTECTION

A. Do not permit construction near unprotected surfaces.

END OF SECTION

SECTION 06 8316
FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass reinforced plastic panels.

1.02 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010 (Reapproved 2018).

B. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of Barcol Impressor; 2013a.

C. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.

D. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels; 2017.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fiberglass Reinforced Plastic Panels:
   1. Marlite, Inc; Standard: www.marlite.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PANEL SYSTEMS

A. Wall Panels:
   1. Panel Size: 4 by 8 feet.
   2. Panel Thickness: 0.10 inch.
   3. Surface Design: Embossed.
   4. Color: White.
   5. Attachment Method: Adhesive only, sealant joints, no trim.

2.03 MATERIALS

A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
   1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. Scratch Resistance: Barcol hardness score greater than 35, when tested in accordance with ASTM D2583.
   4. Impact Strength: Greater than 6 ft lb force per inch, when tested in accordance with ASTM D256.

B. Sealant: Type recommended by panel manufacturer; white.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and substrate flatness before starting work.

B. Verify that substrate conditions are ready to receive the work of this section.

3.02 INSTALLATION - WALLS

A. Install panels in accordance with manufacturer's instructions.

B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.

C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.

D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.

E. Install panels with manufacturer's recommended gap for panel field and corner joints.

F. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.

G. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION

SECTION 07 0553

FIRE AND SMOKE ASSEMBLY IDENTIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Identification markings for fire and smoke rated partitions, and fire rated walls.

1.02 REFERENCE STANDARDS

A. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Schedule: Completely define scope of proposed marking, and indicate location of affected walls and partitions, and number of markings.

C. Samples: Submit two samples of each type of marking proposed for use, of size similar to that required for project, illustrating font, wording, and method of application.

1.04 FIELD CONDITIONS

A. Do not install painted markings when ambient temperature is lower than recommended by coating manufacturer.

PART 2 PRODUCTS

2.01 FIRE AND SMOKE ASSEMBLY IDENTIFICATION

A. Regulatory Requirements: Comply with "Marking and Identification" requirements of "Fire-Resistance Ratings and Fire Tests" chapter of ICC (IBC).

PART 3 EXECUTION

3.01 INSTALLATION

A. Locate markings as required by ICC (IBC).

B. Install neatly, with horizontal edges level.

C. Protect from damage until Date of Substantial Completion; repair or replace damaged markings.

END OF SECTION

SECTION 07 1300
SHEET WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet Waterproofing:
   1. Self-adhered modified bituminous sheet membrane.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete substrate.

B. Section 07 2100 - Thermal Insulation: Insulation used for protective cover.

1.03 REFERENCE STANDARDS

A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016, with Editorial Revision (2021).

B. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting; 2018.

C. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds; 1998 (Reapproved 2017).

D. ASTM D1876 - Standard Test Method for Peel Resistance of Adhesives (T-Peel Test); 2008, with Editorial Revision (2015).

E. ASTM D5295/D5295M - Standard Guide for Preparation of Concrete Surfaces for Adhered (Bonded) Membrane Waterproofing Systems; 2018.

F. NRCA (WM) - The NRCA Waterproofing Manual; 2005.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for membrane.

C. Manufacturer's Installation Instructions: Indicate special procedures.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until liquid or mastic accessories have cured.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water, except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.

PART 2 PRODUCTS

2.01 WATERPROOFING APPLICATIONS

A. Self-Adhered Modified Bituminous Sheet Membrane:
   1. Location: Foundation walls.
   2. Cover with Rigid Insulation.

2.02 MEMBRANE MATERIALS

A. Self-Adhered Modified Bituminous Sheet Membrane:
   1. Thickness: 95 mil, 0.095 inch, minimum.
   2. Sheet Width: 36 inches, minimum.
   3. Tensile Strength:

a. Film: 5,000 psi, minimum, measured in accordance with ASTM D882 and at grip-separation rate of 2 inches per minute.
b. Membrane: 325 psi, minimum, measured in accordance with ASTM D412 Method A, using die C and at spindle-separation rate of 2 inches per minute.

4. Peel Strength: 7 lb per inch, minimum, when tested in accordance with ASTM D903.
5. Lap Adhesion Strength: 5 lb per inch, minimum, when tested in accordance with ASTM D1876.
6. Adhesives, Sealants, Tapes, and Accessories: As recommended by membrane manufacturer.
7. Products:
   a. Carlisle Coatings & Waterproofing Inc; MiraDRI 860/861: www.carlisleccw.com/#sle.
   b. Substitutions: See Section 01 6000 - Product Requirements.

2.03 ACCESSORIES

A. Seaming Materials: As recommended by membrane manufacturer.

B. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrates and waterproofing materials.

C. Protection Board: Rigid insulation, see Section 07 2100.

D. Self-Adhered Flashing: Composite membrane with top layer consisting of ketone ethylene ester (KEE) reinforced membrane and backed by bottom layer of synthetic butyl adhesive covered with release paper.
   1. Width: 24 inches, nominal.
   2. Color: White.

E. Termination Bars: Aluminum; compatible with membrane and adhesives.

F. Adhesives: As recommended by membrane manufacturer.

G. Thinner and Cleaner: As recommended by adhesive manufacturer, compatible with sheet membrane.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions are acceptable prior to starting this work.

B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.

C. Verify items that penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

A. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions.

B. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.

C. Fill nonmoving joints and cracks with a filler compatible with waterproofing materials.

D. Concrete Surfaces for Adhesive Bonding: Prepare concrete substrate in accordance with ASTM D5295/D5295M.
   1. Remove substances that inhibit adhesion including form release agents, curing compounds admixtures, laitance, moisture, dust, dirt, grease and oil.
   2. Repair surface defects including honeycombs, fins, tie holes, bug holes, sharp offsets, rutted cracks, ragged corners, deviations in surface plane, spalling and delaminations, as described in the reference standard.
   3. Remove and replace areas of defective concrete; see Section 03 3000.
   4. Prepare concrete for adhesive bonded waterproofing using mechanical or chemical methods described in the referenced standard.

5. Test concrete surfaces as described in referenced standards, and verify surfaces are ready to receive adhesive bonded waterproofing membrane system.

3.03 INSTALLATION - MEMBRANE

A. Install membrane waterproofing in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

B. Roll out membrane, and minimize wrinkles and bubbles.

C. Self-Adhering Membrane: Remove release paper layer, and roll out onto substrate with a mechanical roller to provide full contact bond.

D. Overlap edges and ends, minimum 3 inches, seal permanently waterproof by method recommended by manufacturer, and apply uniform bead of sealant to joint edge.

E. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.

F. Weather lap joints on sloped substrate in direction of drainage, and seal joints and seams.

G. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.

H. Seal membrane and flashings to adjoining surfaces.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Owner will provide testing services, and Contractor will provide temporary construction and materials for testing.

END OF SECTION

SECTION 07 2100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at perimeter foundation wall, over roof deck, and exterior wall behind rain screen wall finish.

B. Batt insulation and vapor retarder in exterior parapet construction.

1.02 RELATED REQUIREMENTS

A. Section 07 2500 - Weather Barriers

B. Section 07 2600 - Vapor Retarders: Separate vapor retarder materials.

C. Section 075323 - EPDM Thermoset Single-Ply Roofing

1.03 REFERENCE STANDARDS

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2019.

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021.

D. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C; 2019a.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

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

C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.05 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.

B. Insulation Over Metal Stud Framed Walls, Continuous: Extruded polystyrene (XPS) board.

C. Insulation in Metal Framed Soffit: Batt insulation with separate vapor retarder.

D. Insulation Over Roof Deck: Extruded polystyrene (XPS) board.

2.02 FOAM BOARD INSULATION MATERIALS

A. Expanded Polystyrene (EPS) Board Insulation: Complies with ASTM C578.
   1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   3. Board Size: 48 inch by 96 inch.
   4. Board Thickness: 2 inch.
   5. Board Edges: Square.
   6. Type and Compressive Resistance: Type XI, 5 psi (35 kPa), minimum.
   7. Type and Water Absorption: Type XI, 4.0 percent by volume, maximum, by total immersion.
   8. Products:

a. InsulFoam LLC; InsulFoam _____: www.insulfoam.com/#sle.

2.03 BATT INSULATION MATERIALS

A. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
   1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
   4. Thickness: 6 & 10" inch.
   5. Products:
      a. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ACCESSORIES

A. Sheet Vapor Retarder: See Section 07 2600.

B. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
   1. Application: Sealing of interior circular penetrations, such as pipes or cables.
   2. Width: Are required for application.
   3. Products:
      a. SIGA Cover Inc; SIGA-Rissan: www.siga.swiss/global_en/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

C. Pultruded Cladding Support Clips (FG, girt):
   1. Manufacturer: Strongwell.
      a. Product: Strongirt.

D. Flashing Tape: Special reinforced film with high performance adhesive.
   1. Application: Window and door opening flashing tape.
   2. Width: As required for application.

E. Sill Plate Sealer: Closed-cell foam tape with rubberized adhesive membrane; bridges gap between foundation structure and sill plate or skirt board.
   1. Width: 3-1/2 inches.
   2. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 30 days of weather exposure.
   3. Products:
      a. Protecto Wrap Company; Triple Guard Energy Sill Sealer: www.protectowrap.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

F. Tape joints of rigid insulation in accordance with roofing and insulation manufacturers' instructions.

G. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Adhere a 6 inches wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.
   1. Tape seal joints.

B. Install boards horizontally on foundation perimeter.
   1. Place boards to maximize adhesive contact.

2. Install in running bond pattern.
3. Butt edges and ends tightly to adjacent boards and to protrusions.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION AT EXTERIOR WALLS

A. Apply adhesive to back of boards:

B. Install boards horizontally on walls.
1. Place boards to maximize adhesive contact.
2. Butt edges and ends tightly to adjacent boards and protrusions.
3. Install tightly between pultruded cladding support girts.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

D. Install pultruded FRP Cladding supports horizontally @ nominally 2'-0" o.c. (max).

E. Fit rigid insulation boards tightly between pultruded supports.

F. Tape insulation board joints.

3.04 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over face of member

F. Tape seal tears or cuts in vapor retarder.

G. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane; tape seal in place.

3.05 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

3.06 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 2500
WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water-resistive barriers.

1.02 RELATED REQUIREMENTS

A. Section 07 6200 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

1.03 DEFINITIONS

A. Weather Barriers: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.

B. Water-Resistive Barrier: A material behind an exterior wall covering that is intended to resist liquid water that has penetrated behind the exterior covering from further intruding into the exterior wall assembly.

1.04 REFERENCE STANDARDS

A. ASTM D779 - Standard Test Method for Determining the Water Vapor Resistance of Sheet Materials in Contact with Liquid Water by the Dry Indicator Method; 2016.

B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2020.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on material characteristics.

C. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

1.06 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.01 WATER-RESISTIVE BARRIER MATERIALS

A. Weather Barrier:
   1. Self-adhered, water resistive vapor permeable air barrier sheet membrane.
      a. Water Resistance: At least 120 minutes when tested in accordance with ASTM D779.
      b. Products:
         1) Vaproshield: Wrapshield SA, self-adhered.
         2) Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACCESSORIES

A. Sealants, Tapes, and Accessories Used for Sealing Water-Resistive Barrier and Adjacent Substrates: As indicated or complying with water-resistive barrier manufacturer's installation instructions.

B. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrates and weather barrier materials.
   1. Application: Apply at 30 to 40 mil, 0.030 to 0.040 inch nominal thickness.
   2. Color: Green.

C. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.
   1. Width: 4 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions comply with requirements of this section.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's installation instructions.

B. Weather Barriers: Install continuous weather barrier over surfaces indicated, with sheets lapped to shed water.

C. Self-Adhered Sheets:
   1. Prepare substrate in accordance with sheet manufacturer's installation instructions; fill and tape joints in substrate and between dissimilar materials.
   2. Lap sheets shingle-fashion to shed water and seal laps airtight.
   3. Upon placement of sheets, firmly press onto substrate with resilient hand roller; ensure that laps are firmly adhered with no gaps or fishmouths.
   4. Use same material, or other material approved by sheet manufacturer, to seal sheets to adjacent substrates, and as flashing.
   5. At expansion joints, provide transition to joint assemblies approved by sheet manufacturer.

D. Openings and Penetrations in Exterior Weather Barriers:
   1. Install flashing over sills, covering entire sill framing member, and extend at least 5 inches onto water-resistive barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
   2. At openings filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
   3. At openings filled with non-flanged frames, seal water-resistive barrier to each side of framing at opening using flashing at least 9 inches wide, and covering entire depth of framing.
   4. At head of openings, install flashing under water-resistive barrier extending at least 2 inches beyond face of jambs; seal water-resistive barrier to flashing.
   5. At interior face of openings, seal gaps between window and door frames and rough framing using appropriate joint sealant over backer rod.
   6. Service and Other Penetrations: Form flashing around penetrating items and seal to surface of water-resistive barrier.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

3.05 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 07 2600
VAPOR RETARDERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vapor retarders.

1.02 RELATED REQUIREMENTS

A. Section 07 2100 - Thermal Insulation: Vapor retarder installed in conjunction with rigid insulation.

1.03 DEFINITIONS

A. Vapor Retarder: Airtight barrier made of material that is relatively water vapor impermeable, to degree specified, with seams and joints sealed to adjacent surfaces.

B. Vapor Retarder Class: A measure of a material or assembly's ability to limit the amount of moisture that passes through that material or assembly. Vapor retarder class is defined using Procedure A, Desiccant Method at 73 degrees F and 50 percent Relative Humidity (RH), in accordance with ASTM E96/E96M and ICC (IBC)-2018, as follows:
   1. Class I: 0.1 perm or less.
   2. Class II: Greater than 0.1 perm to 1.0 perm.
   3. Class III: Greater than 1.0 perm to 10 perms.
   4. Vapor Permeable: 5 perms or greater.

1.04 REFERENCE STANDARDS

A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016, with Editorial Revision (2021).

B. ASTM D751 - Standard Test Methods for Coated Fabrics; 2019.

C. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds; 1998 (Reapproved 2017).

D. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2020.

E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

F. ICC (IBC)-2018 - International Building Code; 2018.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

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

1.06 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.01 VAPOR RETARDER MATERIALS

A. Vapor Retarder Sheet: ASTM D1970/D1970M.
   1. Type: Rubberized asphalt bonded to thermoplastic sheet, self-adhesive.
   2. Thickness: 40 mil, 0.040 inch, nominal.
   3. Sheet Width: 36 inches.
   4. Water Vapor Permeance: 0.05 perm, maximum, when tested in accordance with ASTM E96/E96M.
   5. Seam and Perimeter Tape: As recommended by sheet manufacturer.
   6. Products:
      a. Henry Company; Blueskin SA: www.henry.com/#sle.

b. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Vapor Retarder and Adjacent Substrates: As indicated, complying with vapor retarder manufacturer's installation instructions.

B. Sealant for Cracks and Joints in Substrates: Resilient elastomeric joint sealant compatible with substrates and vapor retarder materials.
   1. Application: Apply at 30 to 40 mil, 0.030 to 0.040 inch, nominal thickness.
   2. Elongation: 1,300 percent, measured in accordance with ASTM D412.
   3. Peel Adhesion: 28 lb/inch, minimum, when tested in accordance with ASTM D903.
   4. Hydrostatic Head Pressure: Resists head pressure of 57 feet, maximum, when tested in accordance with ASTM D751.

C. Primer: Liquid applied polymer.
   1. Color: Green.

D. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M; slip resistance requirement waived if not installed on roof.
   1. Width: 4 inches.
   2. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 30 days of weather exposure.
   3. Products:
      a. As recommended by manufacturer.
      b. Substitutions: See Section 01 6000 - Product Requirements.

E. Thinners and Cleaners: As recommended by vapor retarder manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions comply with requirements of this section.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's installation instructions.

B. Vapor Retarders: Install continuous airtight barrier over surfaces indicated, with sealed seams and sealed joints to adjacent surfaces.

C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.

D. Self-Adhered Sheets:
   1. Prepare substrate in accordance with sheet manufacturer's installation instructions; fill and tape joints in substrate and between dissimilar materials.
   2. Lap sheets shingle fashion to shed water and seal laps airtight.
   3. Once sheets are in place, press firmly into substrate with resilient hand roller; ensure that laps are firmly adhered with no gaps or fishmouths.
   4. Use same material, or other material approved by sheet manufacturer, to seal sheets to adjacent substrates, and as flashing.
   5. At expansion joints, provide transition to joint assemblies approved by sheet manufacturer.

E. Openings and Penetrations in Exterior Vapor Retarders:
   1. Install flashing over sills, covering entire sill framing member, and extend at least 5 inches onto vapor retarder and at least 6 inches up jambs; mechanically fasten stretched edges.

2. At openings with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
3. At openings with non-flanged frames, seal vapor retarder to each side of framing at opening using flashing at least 9 inches wide, and covering entire depth of framing.
4. At head of openings, install flashing under vapor retarder extending at least 2 inches beyond face of jambs; seal vapor retarder to flashing.
5. At interior face of openings, seal gaps between window/door frame and rough framing using appropriate joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating items and seal to surface of vapor retarder.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Do not cover installed vapor retarders until required inspections have been completed.

3.05 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 07 4213.19

INSULATED METAL WALL PANELS - KINGSPAN

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Factory-assembled, insulated metal panels for walls, with trim, and accessory components.

1.02 RELATED REQUIREMENTS

A. Section 05 1200 - Structural Steel Framing: Structural steel building frame.

B. Section 05 4000 - Cold-Formed Metal Framing: Metal framing members supporting insulated metal wall panels.

C. Section 07 2100 - Thermal Insulation. Pultruded RFP Cladding Attachment Support System.

D. Section 07 2500 - Weather Barriers.

E. Section 07 6200 - Sheet Metal Flashing and Trim.

F. Section 07 9200 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

1.03 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2017.

B. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation; 2021.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

D. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates; 2016.

E. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films; 2007 (Reapproved 2015).

F. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate panel profiles, layout, exterior sheet gauge, interior sheet gauge, joints, dimensions, construction details, and methods of anchorage.

C. Selection Samples: For each finish product specified, submit at least two sample color chips representing manufacturer's full range of available colors, sheen, and texture; 3 by 5 inch minimum.

D. Verification Samples: For each finish product specified, submit at least two samples, 12 inch square minimum, and representing actual product in color and texture.

E. Design Data: Provide calculations verifying panels will withstand design wind loads indicated without detrimental effects or exceeding deflection criteria.

F. Manufacturer's Instructions: Indicate special handling criteria, installation sequence, and cleaning procedures.

G. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material above ground with weather protection to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Finish Warranty: Standard form in which manufacturer agrees to repair or replace metal panels that evidence deterioration of fluoropolymer finish. Deterioration includes flaking or peeling from approved primed metal substrate, chalk over 8 when tested in accordance with ASTM D4214, Method A, and color fading over 5 delta units on panels when tested in accordance with ASTM D2244.

C. Thermal Warranty: Standard form in which manufacturer agrees to repair or replace panels that exhibit greater than 10 percent reduction from published R-value (RSI-value) at time of manufacture, as measured in compliance with ASTM C518 within specified warranty period.
   1. Warranty Period: Thirty years from Date of Substantial Completion, or 30 years and three months from date of shipment from manufacturer's plant, whichever occurs first.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Kingspan Insulated Panels; Benchmark Designwall 4000: www.kingspan.com/#sle.

B. Kingspan Insulated Panels: KarrierPanel.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PANEL SYSTEM

A. Metal Panel System: Factory-assembled metal panel system, with trim, related flashings and accessory components.
   1. Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
   2. Accommodate tolerances of building structural framing.
   3. Provide continuity of thermal barrier at building enclosure elements in conjunction with thermal insulating materials; see Section 07 2100.

2.03 PERFORMANCE REQUIREMENTS

A. Thermal Performance: Provide thermal resistance through entire system; R-value of _____ degrees F hr sq ft/Btu, minimum.

B. Structural Performance: Design and size to withstand dead loads and wind loads caused by positive and negative wind pressure acting normal to plane of panel.
   1. Verify structural performance in accordance with ASTM E330/E330M, using test pressure 1.5 times design wind pressure, with 10 seconds duration of maximum load.
   2. Design wind loads: Perstructural drawings.

C. Movement: Accommodate movement caused by following items without damage to system, components, or deterioration of seals:
   1. Normal movement between system components.
   2. Seasonal temperature cycling.
   3. Deflection of structural support framing.

2.04 PANELS AND TRIM

A. Wall Panels: Factory-assembled, foamed-in-place, insulated metal panels with exterior and interior sheet metal skins; panels interlock at edges.
   1. Panel Width and Orientation: As indicated on drawings.
   2. Exterior Panel Face Profile: Flat.
   3. Panel Thickness: 4 inches.
   4. Exterior Sheet: Stainless steel, 24 gauge, 0.0250 inch minimum thickness; Smooth.
   5. Horizontal Joints Between Panels: 1/8 inch wide joint reveal.
   6. Vertical Joints Between Panels: 1/8-inch reveals.
      a. Gasket Color: Standard black gasket.

7. Sealant at Exposed Joints (Horizontal Panel Applications): Elastomeric polyurethane sealant complying with ASTM C920.
8. Fabricate panels in longest practicable lengths.
9. Exterior Face of Panel Paint Finish: Two-coat, polyvinylidene fluoride (PVDF) 1.0 mil, 0.001 inch system; 0.2 mil, 0.0002 inch primer with 0.8 mil, 0.0008 inch Kynar 500 (70 percent) SOLID color coat.
    a. Color: As selected from manufacturer's current insulated wall panel color chart.

B. Trim, Closure Pieces, Caps, Flashings, Infills, and External Corners: Same material, thickness, and finish as exterior face of insulated metal panel; brake formed to required profiles; fabricated in longest practicable lengths.

2.05 FOAMED-IN-PLACE INSULATION

A. Hybrid polyisocyanurate foamed-in-place core, ASTM C591 Type IV, CFC and HCFC free, Halogenated Flame Retardant (HFR) free, compliant with Montreal Protocol and Clean Air Act, with the following minimum physical properties.
1. Thermal Resistance of Insulated Panel: Nominal R-value of 8.0 per inch thickness when tested in accordance with ASTM C518 at 75 degree F mean temperature; nominal R-value of 9.0 per inch thickness when tested at 35 degrees F.
2. Manufacturer: Kingspan Insulated Panels; QuadCore.
    a. Substitutions: See Section 01 6000 - Product Requirements.

2.06 ACCESSORIES

A. Fasteners: Manufacturer's standard corrosion-resistant type to suit application; hot-dip galvanized steel with soft neoprene washers. Where exposed fasteners are required, provide cap color to match exterior panel.

B. Clips: Manufacturer’s standard stainless steel clips with PVC or neoprene sealing pads adhered to underside of clips; designed to prevent water infiltration around fastener penetrations.

C. Concealed Sealants: Noncuring butyl sealant or tape sealant; type as recommended by panel manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that structural framing is ready to receive panel system.

3.02 INSTALLATION

A. Install panel system on walls in accordance with manufacturer's instructions.

B. Install panels plumb, level, and true-to-line with dimensions and layout indicated on approved shop drawings.

C. Permanently fasten panel system to structural supports; aligned, level, and plumb, within specified tolerances.

D. Locate panel joints over supports.

E. Use concealed fasteners unless otherwise indicated by Architect.

F. Seal and place gaskets to prevent weather penetration, and maintain neat appearance.

G. Install trim and trim fasteners as indicated on approved shop drawings.

3.03 TOLERANCES

A. Maximum Offset from True Alignment between Adjacent Members Butting or in Line: 1/16 inch.

3.04 REPAIR

A. Touch-up, repair, or replace metal panels and trim that have been damaged.

3.05 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

3.06 CLEANING

A. Remove protective film from metal panels immediately after installation.

B. Clean and wash prefinished surfaces of metal panels with mild soap and water; rinse with clean water.

C. Clear metal panel weep holes and drainage channels of obstructions, dirt, and sealant.

3.07 SCHEDULES

A. KarrierPanel: Soffit location

B. Benchmark: West Stair

END OF SECTION

SECTION 07 4430

CERAMIC WALL PANEL SYSTEM

SECTION INCLUDES

1.01 CERAMIC WALL PANEL SYSTEMS OF THE FOLLOWING TYPES:

A. Plank System (KeraTwin).
   1. Profile System (KeraShape) - Sunscreens.

1.02 RELATED SECTIONS

A. Section 05 4000 - Cold Formed Metal Framing: Secondary support framing supporting metal wall panels.

B. Section 07 2100 – Thermal Insulation.

C. Section 07 2500 – Weather Barriers.

D. Section 07600 - Metal Flashing and Trim.

1.03 REFERENCES

A. Deutsches Institut fur Normung (DIN):
   1. DIN EN 14411 – Ceramic Tiles – Definition, classification, characteristics, assessment, and verification of constancy of performance and marking.

1.04 SUBMITTALS

A. Submit under provisions of Section 01 3000.

B. Product Data:
   1. Manufacturer's data sheets on each product to be used.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Typical installation methods.

C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

D. Shop Drawings: Include elevations of layout, details of materials, construction and finish. Include relationship with adjacent construction.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.

B. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

C. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect’s review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.
   1. Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
   2. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
   3. Retain mock-up during construction as a standard for comparison with completed work.
   4. Do not alter or remove mock-up until work is completed or removal is authorized.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store and handle in strict compliance with manufacturer's written instructions and recommendations.

B. Protect from damage due to weather, excessive temperature, and construction operations.

1.07 PROJECT CONDITIONS

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

1.08 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's standard limited warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Deutsche Steinzeug America, Inc./AGROB BUCHTAL which is located at: 367 Curie Dr.; Alpharetta, GA 30005; Toll Free Tel: 800-584-5501; Tel: 770-442-5500; Fax: 770-442-5502; Email: <_____ >; Web: www.agrob-buchtal.de/en.

B. Substitutions: Not permitted.

2.02 CERAMIC WALL PLANK SYSTEM

A. Panel Basis of Design: KeraTwin; as manufactured by Deutsche Steinzeug America, Inc./AGROB BUCHTAL.
   1. Standards Compliance: DIN EN 14411, group All-a.
   2. Plank Thickness: 20 mm (0.79 inches).
   3. Weight: 32 kg/sq.m (0.045 psi).
   4. Surface Profile: TBD
   5. Plank Height: As indicated on drawings for proper coursing.
   6. Plank Length: As indicated in drawings.
   7. Finish: To be selected by Architect.
      a. Color: To be selected by Architect.
   8. Special Shapes:
      a. Mitre-cut panels for corners.

B. Fastening System:
   1. KeraTwin K20: TBD.

2.03 CERAMIC WALL PROFILE SYSTEM

A. Panel Basis of Design: KeraShape; as manufactured by Deutsche Steinzeug America, Inc./AGROB BUCHTAL.
   1. Profile: Rectangular: As indicated on drawings.
   2. Length: As indicated in drawings.
   3. Finish: To be selected by Architect.
      a. Color: To be selected by Architect.

B. Fastening System:
   1. Horizontal laying.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly constructed and prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, approved submittals and in proper relationship with adjacent construction.
   1. Install in configuration as indicated on the Drawings.
   2. Set panels aligned, level, and plumb.
   3. Maintain consistent joint widths.
   4. Replace damaged or defaced panels prior to Substantial Completion.

3.04 CLEANING AND PROTECTION

A. Clean products in accordance with the manufacturer’s recommendations.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07 5323

EPDM THERMOSET SINGLE-PLY ROOFING - CARLISLE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Adhered roof system with ethylene propylene diene monomer (EPDM) roofing membrane.

B. Vapor retarder.

C. Deck sheathing.

D. Flashings.

1.02 RELATED REQUIREMENTS

A. Section 05 3100 - Steel Decking.

B. Section 06 1000 - Rough Carpentry: Wood nailers and curbs.

C. Section 07 2100 - Thermal Insulation

D. Section 07 6200 - Sheet Metal Flashing and Trim: Counterflashing.

E. Section 07 7200 - Roof Accessories: Roof-mounted units; prefabricated curbs.

1.03 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2019.

C. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.

D. ASTM D4637/D4637M - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane; 2015.

E. NRCA (RM) - The NRCA Roofing Manual; 2019.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.
   1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's written information listed below.
   1. Product data indicating membrane materials, flashing materials, insulation, vapor retarder, and fasteners.

C. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, and paver layout.

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

E. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.

F. Warranty:
   1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
   2. Submit installer's certification that installation complies with all warranty conditions for the waterproof membrane.

G. Manufacturer's Qualification Statement.

H. Installer's Qualification Statement.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of this section:
   1. With minimum five years experience.
   2. Approved by membrane manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.

B. Protect products in weather protected environment, clear of ground and moisture.

C. Protect foam insulation from direct exposure to sunlight.

D. Keep Safety Data Sheets (SDS) at the project site at all times during transportation, storage, and installation of materials.

E. Comply with requirements from Owner to prevent overloading or disturbance of the structure when loading materials onto the roof.

1.08 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather. Refer to manufacturer's written instructions.

B. Do not apply roofing membrane when ambient temperature is below 40 degrees F or above 90 degrees F.

C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

D. Do not expose materials vulnerable to water in quantities greater than can be weatherproofed the same day.

E. Proceed with work so new roofing materials are not subject to construction traffic as work progresses.

F. Do not allow grease, oil, fats, or other contaminants to come into direct contact with membrane.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Material Warranty: Provide membrane manufacturer's warranty agreeing to replace material that shows manufacturing defects within 10 years after installation.

C. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
   1. Warranty Term: 20 years.
   2. For repair and replacement include costs of both material and labor in warranty.
   3. Exceptions NOT Permitted:
      a. Damage due to wind of speed greater than 56 mph but less than 90 mph.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Carlisle SynTec

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ROOFING APPLICATIONS

A. EPDM Membrane Roofing: One ply membrane, fully adhered, over insulation.

B. Roofing Assembly Performance Requirements and Design Criteria:
   1. Wind Uplift:
      a. Designed to withstand wind uplift forces calculated with ASCE 7-16.
   2. Insulation Thermal Resistance (R-Value): Provide R=30 Minimum..
   3. Drainage: No standing water within 48 hours after precipitation.

2.03 ROOFING MEMBRANE AND ASSOCIATED MATERIALS

A. Single Source Responsibility: Provide and install products from single source.

B. Base Sheet: Manufacturer's standard, smooth-surfaced, torch-grade, SBS base ply, reinforced with non-woven polyester mat and saturated with asphaltic bitumen and SBS elastomers.
   1. Product:
      a. Carlisle SureMB 90 Modified Base Sheet.
      b. Carlisle SureMB 120TG Base Sheet.

C. Membrane:
   1. Material: Ethylene propylene diene monomer (EPDM); ASTM D4637/D4637M, Type I (externally reinforced with fabric).
   2. Thickness: 90 mil, 0.090 inch, minimum.
   3. Color: White on Black.

D. Seaming Materials: As recommended by membrane manufacturer.

E. Vapor Retarder: Material approved by roof manufacturer; compatible with roofing and insulation materials.
   1. Fire-retardant adhesive.

F. Flexible Flashing Material: Same material as membrane.

G. Base Flashing: Provide waterproof, fully adhered base flashing system at all penetrations, plane transitions, and terminations.

2.04 DECK SHEATHING AND COVER BOARDS

A. Deck Sheathing and Cover Board: Glass mat faced gypsum panels, ASTM C1177/C1177M, fire resistant type, 1/2 inch thick.
   1. Product:
      a. GP Dens-Deck Prime, distributed by Carlisle.

2.05 INSULATION

A. Expanded Polystyrene (EPS) Board Insulation: Complies with ASTM C578 with drainage channels on one face.
   1. Tapered Board: Slope as indicated; minimum thickness 1/2 inch; fabricate of fewest layers possible.
   2. Type and Compressive Resistance: Type XI, 5 psi (35 kPa), minimum.
   3. Product:
      a. InsulFoam

2.06 ACCESSORIES

A. Prefabricated Flashing Accessories:
   1. Corners and Seams: Same material as membrane, in manufacturer's standard thicknesses.
   2. Penetrations: Same material as membrane, with manufacturer's standard cut-outs, rigid inserts, clamping rings, and flanges.
   3. Sealant Pockets: Same material as membrane, with manufacturer's standard accessories, in manufacturer's standard configuration.
   4. Sure-Seal Pressure-Sensitive Reinforced Universal Securement Strip (RUSS):

B. Insulation Adhesive: Two component polyurethane, expanding foam.

C. Insulation Joint Tape: Glass fiber reinforced type as recommended by insulation manufacturer, compatible with roofing materials; 6 inches wide; self adhering.

D. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.

E. Membrane Adhesive: As recommended by membrane manufacturer.

F. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.

G. Sealants: As recommended by membrane manufacturer.

H. Cleaner: Manufacturer's standard, clear, solvent-based cleaner.

I. Primer: Manufacturer's recommended product.

J. Edgings and Terminations: Manufacturer's standard edge and termination accessories.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.02 PREPARATION, GENERAL

A. Clean substrate thoroughly prior to roof application.

3.03 METAL DECK PREPARATION

A. Mechanically fasten sheathing to roof deck, in accordance with roofing manufacturer's instructions.
   1. Over entire roof area, fasten sheathing using six fasteners with washers per sheathing board.

3.04 INSTALLATION - GENERAL

A. Perform work in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

B. Do not apply roofing membrane during unsuitable weather.

C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.

D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

3.05 INSULATION APPLICATION

A. Apply vapor retarder to deck surface with adhesive in accordance with manufacturer's instructions.
   1. Extend vapor retarder under cant strips and blocking to deck edge.
   2. Install flexible flashing from vapor retarder to air seal material of wall construction, lap and seal to provide continuity of the air barrier plane.

B. Ensure vapor retarder is clean and dry, continuous, and ready for application of insulation.

C. Attachment of Insulation:
   1. Mechanically fasten insulation to deck in accordance with roofing manufacturer's instructions.

D. Lay subsequent layers of insulation with joints staggered minimum 6 inches from joints of preceding layer.

E. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.

F. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.

G. Lay boards with edges in moderate contact without forcing, and gap between boards no greater than 1/4 inch. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

H. Tape joints of insulation in accordance with roofing and insulation manufacturers' instructions.

I. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 24 inches.

J. Do not apply more insulation than can be completely waterproofed in the same day.

3.06 MEMBRANE APPLICATION

A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

B. Shingle joints on sloped substrate in direction of drainage.

C. Fully Adhered Application: Apply adhesive at manufacturer's recommended rate. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.

D. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches. Seal permanently waterproof.

E. At intersections with vertical surfaces:
   1. Extend membrane over cant strips and up a minimum of 4 inches onto vertical surfaces.
   2. Fully adhere flexible flashing over membrane and up to nailing strips.

F. Coordinate installation of roof drains and sumps and related flashings, locate field splices away from low areas and roof drains, and lap upslope sheet over downslope sheet.

G. Install walkway pads at areas of concentrated traffic as indicated on drawings, and space pad joints to permit drainage.

H. Daily Seal: Install daily seal per manufacturers instructions at the end of each work day. Prevent infiltration of water at incomplete flashings, terminations, and at unfinished membrane edges.

3.07 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field quality control and inspection.

B. Require site attendance of roofing material manufacturers daily during installation of this work.

3.08 CLEANING

A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

B. Remove bituminous markings from finished surfaces.

C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.

D. Repair or replace defaced or damaged finishes caused by work of this section.

3.09 PROTECTION

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings and counterflashings.

B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood nailers for sheet metal work.

B. Section 06 1000 - Rough Carpentry: Field fabricated roof curbs.

C. Section 07 7100 - Roof Specialties: Manufactured copings, flashings, and expansion joint covers.

D. Section 07 5323 - EPDM Thermoset Single-Ply Roofing.

1.03 REFERENCE STANDARDS

A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

C. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

E. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).

F. CDA A4050 - Copper in Architecture - Handbook; current edition.

G. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples: Submit two samples, ___ by ___ inches in size, illustrating metal finish color.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal.

B. Pre-Finished Aluminum: ASTM B209/B209M; 20 gauge, 0.032 inch thick; plain finish shop pre-coated with silicone modified polyester coating.

1. Silicone Modified Polyester Coating: Pigmented organic powder coating, AAMA 2603; baked enamel finish system.
2. Color: As selected by Architect from manufacturer's full colors.

2.02 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.

F. Fabricate flashings to allow toe to extend 2 inches over roofing _____. Return and brake edges.

2.03 EXTERIOR PENETRATION FLASHING PANELS

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

2.04 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Primer: Zinc chromate type.

C. Concealed Sealants: Non-curing butyl sealant.

D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color as selected by Architect.

E. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.03 INSTALLATION

A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..

B. Apply plastic cement compound between metal flashings and felt flashings.

C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Exterior Flashing Receivers: Install in accordance with manufacturer's recommendations, and in proper relationship with adjacent construction, and as follows:

E. Seal metal joints watertight.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

SECTION 07 7200
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof curbs.

B. Roof penetrations mounting curbs.

C. Non-penetrating pedestals.

1.02 RELATED REQUIREMENTS

A. Section 07 6200 - Sheet Metal Flashing and Trim: Roof accessory items fabricated from sheet metal.

B. Section 07 5323 - EPDM Thermoset Single-Ply Roofing.

C. Section 07 7123 - Manufactured Gutters and Downspouts.

1.03 REFERENCE STANDARDS

A. 29 CFR 1910.23 - Ladders; current edition.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

D. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.

C. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.

D. Warranty Documentation:
   1. Submit manufacturer warranty.
   2. Ensure that forms have been completed in Owner's name and registered with manufacturer.
   3. Submit documentation that roof accessories are acceptable to roofing manufacturer, and do not limit the roofing warranty.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 ROOF CURBS

A. Manufacturers:

1. AES Industries Inc; _____: www.aescurb.com/#sle.
2. The Pate Company; _____: www.patecurbs.com/#sle.
3. MKT Metal Manufacturing; _____: www.mktduct.com/#sle.
4. Roof Products & Systems (RPS); _____: www.rpscurbs.com/#sle.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Roof Curbs Mounting Assemblies: Factory fabricated hollow sheet metal construction, internally reinforced, and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.
   1. Roof Curb Mounting Substrate: Curb substrate consists of standing seam metal roof panel system.
   2. Sheet Metal Material:
      a. Aluminum: 0.080 inch minimum thickness, with 3003 alloy, and H14 temper.
         1) Finish: Mill finish.
         2) Color: As selected by Architect from manufacturer's standard line of colors.
   3. Fabricate curb bottom and mounting flanges for installation directly on metal roof panel system to match slope and configuration of system.
      a. Extend side flange to next adjacent roof panel seam and comply with seam configurations and seal connection, providing at least 6 inch clearance between curb and metal roof panel flange allowing water to properly flow past curb.
      b. Where side of curb aligns with metal roof panel flange, attach fasteners on upper slope of flange to curb connection allowing water to flow past below fasteners, and seal connection.
      c. Maintain at least 12 inch clearance from curb, and lap upper curb flange on underside of down sloping metal roof panel, and seal connection.
      d. Lap lower curb flange overtop of down sloping metal roof panel and seal connection.
   4. Provide layouts and configurations indicated on drawings.

C. Equipment Rail Curbs: Straight curbs on each side of equipment, with top of curbs horizontal and level with each other for equipment mounting.
   1. Height Above Finished Roof Surface: 8 inches, minimum.

D. Equipment Support: Straight curbs on each side of equipment, with top of curbs parallel with metal roofing system and each other for equipment mounting.

E. Pipe, Duct, or Conduit Mounting Curbs: Vertical posts, minimum 8 inches square unless otherwise indicated.
   1. Height Above Roof Deck: 14 inches, minimum.

2.02 NON-PENETRATING ROOFTOP SUPPORTS/ASSEMBLIES

A. Non-Penetrating Rooftop Support/Assemblies: Manufacturer-engineered and factory-fabricated, with pedestal bases that rest on top of roofing membrane, and not requiring any attachment to roof structure and not penetrating roofing assembly.
   1. Design Loadings and Configurations: As required by applicable codes.
   2. Height: Provide minimum clearance of 6 inches under supported items to top of roofing.
   3. Support Spacing and Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
   4. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
   5. Hardware, Bolts, Nuts, and Washers: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A153/A153M.

B. Pipe Supports: Provide attachment fixtures complying with MSS SP-58 and as indicated.
   1. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.

C. Non-Penetrating Pedestals: Steel pedestals with square, round, or rectangular bases.

1. Bases: High density polypropylene.
2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
3. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 8400
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

1.02 RELATED REQUIREMENTS

A. Section 01 7000 - Execution and Closeout Requirements: Cutting and patching.

B. Section 07 0553 - Fire and Smoke Assembly Identification.

C. Section 09 2116 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2020.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

C. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems; 2020a.

D. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2020a.

E. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus; 2020.

F. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2013 (Reapproved 2017).

G. ITS (DIR) - Directory of Listed Products; current edition.

H. FM (AG) - FM Approval Guide; current edition.

I. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.

J. UL (DIR) - Online Certifications Directory; Current Edition.

K. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

1.05 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
   1. Listing in UL (FRD) will be considered as constituting an acceptable test report.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Verification of minimum three years experience installing work of this type.

2. Licensed by local authorities having jurisdiction (AHJ).

1.06 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Firestopping Manufacturers:
   1. 3M Fire Protection Products; _____: www.3m.com/firestop/#sle.
   2. Hilti, Inc; _____: www.us.hilti.com/#sle.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Firestopping Materials: Any materials meeting requirements.

B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

C. Fire Ratings: Refer to drawings for required systems and ratings.

2.03 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.
   1. Where floor assembly is not required to have a fire rating, provide systems that have been tested to show L Rating as indicated.

B. Head-of-Wall (HW) Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of wall assembly.

C. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
   1. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

2.04 FIRESTOPPING FOR PERIMETER CONTAINMENT

2.05 FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS

A. Blank Openings:
   1. 2 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.
   2. 1 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.

B. Penetrations By:
   1. Uninsulated Metallic Pipe, Conduit, and Tubing:
      a. 2 Hour Construction: UL System W-L-1054; Hilti FS-ONE MAX Intumescent Firestop Sealant.
      b. 2 Hour Construction: UL System W-L-1164; Hilti FS-ONE MAX Intumescent Firestop Sealant.
      c. 1 Hour Construction: UL System W-L-1054; Hilti FS-ONE MAX Intumescent Firestop Sealant.
      d. 1 Hour Construction: UL System W-L-1164; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   2. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
      a. 2 Hour Construction: UL System W-L-2078; Hilti CP 643N/644 Firestop Collar.
      b. 2 Hour Construction: UL System W-L-2128; Hilti FS-ONE MAX Intumescent Firestop Sealant.
      c. 1 Hour Construction: UL System W-L-2078; Hilti CP 643N/644 Firestop Collar.

d. 1 Hour Construction: UL System W-L-2128; Hilti FS-ONE MAX Intumescent Firestop Sealant.

3. Electrical Cables Not In Conduit:
   a. 2 Hour Construction: UL System W-L-3065; Hilti FS-ONE MAX Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CD 601S Elastomeric Firestop Sealant, or CP 618 Firestop Putty Stick.
   b. 2 Hour Construction: UL System W-L-3395; Hilti CP653 Speed Sleeve.
   c. 2 Hour Construction: UL System W-L-3395; Hilti CFS-SL SK Firestop Sleeve Kit.
   d. 2 Hour Construction: UL System W-L-3395; Hilti CFS-SL SK Firestop Sleeve Kit with Hilti CFS-SL GP Gangplate.
   e. 2 Hour Construction: UL System W-L-3414; Hilti CFS-D Firestop Cable Disc.
   f. 1 Hour Construction: UL System W-L-3065; Hilti FS-ONE MAX Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CD 601S Elastomeric Firestop Sealant, or CP 618 Firestop Putty Stick.
   g. 1 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.
   h. 1 Hour Construction: UL System W-L-3393; Hilti CFS-SL RK Retrofit Sleeve Kit for Existing Cables.
   i. 1 Hour Construction: UL System W-L-3414; Hilti CFS-D Firestop Cable Disc.
4. Insulated Pipes:
   a. 2 Hour Construction: UL System W-L-5028; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   b. 2 Hour Construction: UL System W-L-5029; Hilti FS-ONE Intumescent Firestop Sealant.
   c. 1 Hour Construction: UL System W-L-5028; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   d. 1 Hour Construction: UL System W-L-5029; Hilti FS-ONE Intumescent Firestop Sealant.
5. HVAC Ducts, Insulated:
   a. 2 Hour Construction: UL System W-L-7156; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   b. 1 Hour Construction: UL System W-L-7156; Hilti FS-ONE MAX Intumescent Firestop Sealant.

2.06 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.
   1. Fire Ratings: Use system that is listed by UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

B. Firestopping Between Top of Partition Wall and Roof Slab: Fiber firestopping with smoke seal coating; UL Design No. ____, F Rating 1 hour, provide at locations as indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authorities having jurisdiction.

C. Install labeling required by code.

3.04 FIELD QUALITY CONTROL

A. Independent Testing Agency: Inspection agency employed and paid by Owner, will examine penetration firestopping in accordance with ASTM E2174 and ASTM E2393.

B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.05 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.06 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 9200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 2500 - Weather Barriers: Sealants required in conjunction with water-resistive barriers.

B. Section 07 2600 - Vapor Retarders: Sealants required in conjunction with vapor retarders.

C. Section 07 8400 - Firestopping: Firestopping sealants.

D. Section 08 7100 - Door Hardware: Setting exterior door thresholds in sealant.

E. Section 08 8000 - Glazing: Glazing sealants and accessories.

F. Section 09 2116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

G. Section 09 2216 - Non-Structural Metal Framing: Sealing between framing and adjacent construction in acoustical and sound-rated walls and ceilings.

H. Section 09 3000 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.03 REFERENCE STANDARDS

A. ASTM C834 - Standard Specification for Latex Sealants; 2017.

B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2018.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

E. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2018.

F. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2018.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.

C. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

1.05 QUALITY ASSURANCE

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
   1. Dow; _____: www.dow.com/#sle.
   2. Henry Company; _____: www.henry.com/#sle.
   3. Sherwin-Williams Company; _____: www.sherwin-williams.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, and other frames and adjacent construction.
      b. Joints between different exposed materials.
      c. Other joints indicated below.
   2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, and other frames and adjacent construction.
      b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
      c. Other joints indicated below.
   3. Do not seal the following types of joints.
      a. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
      b. Joints where installation of sealant is specified in another section.
      c. Joints between suspended panel ceilings/grid and walls.

B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.

C. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
   1. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
   2. In Sound-Rated Assemblies: Acrylic emulsion latex sealant.

D. Interior Wet Areas: Bathrooms and restrooms; fixtures in wet areas include plumbing fixtures and countertops.

E. Sound-Rated Assemblies: Walls and ceilings identified as "STC-rated", "sound-rated", or "acoustical".

2.03 NONSAG JOINT SEALANTS

A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Non-Staining to Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
   2. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   3. Color: Match adjacent finished surfaces.
   4. Manufacturers:
      a. Dow; DOWSIL 756 SMS Building Sealant: www.dow.com/#sle.
      b. Dow; DOWSIL 791 Silicone Weatherproofing Sealant: www.dow.com/#sle.

B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
   1. Color: White.

2. Manufacturers:
   a. Sika Corporation; Sikasil GP: www.usa.sika.com/#sle.
   b. Substitutions: See Section 01 6000 - Product Requirements.

C. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus ____ percent, minimum.
   2. Color: Match adjacent finished surfaces.
   3. Manufacturers:
      a. Sika Corporation; Sikaflex-15 LM: www.usa.sika.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

D. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
   1. Color: To be selected by Architect from manufacturer's standard range.
   2. Manufacturers:
      a. Sherwin-Williams Company; 850A Acrylic Latex Caulk: www.sherwin-williams.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
   1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.
   2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
   3. Open Cell: 40 to 50 percent larger in diameter than joint width.
   4. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Perform acoustical sealant application work in accordance with ASTM C919.

D. Install bond breaker backing tape where backer rod cannot be used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

END OF SECTION

SECTION 08 0670

DOOR HARDWARE SCHEDULE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section references specification sections relating to commercial door hardware for the following:
   1. Swinging doors.
   2. Sliding Doors.
   3. Other doors to the extent indicated.

B. Commercial door hardware includes, but is not necessarily limited to, the following:
   1. Mechanical door hardware.
   2. Electromechanical and access control door hardware.
   3. Electromechanical and access control door hardware power supplies, back-ups and surge protection.
   4. Automatic operators.
   5. Cylinders specified for doors in other sections.

C. Related Sections:
   1. Division 01 Section “Closeout Procedures”.
   2. Division 08 Section “Interior Sliding Wood Door Assemblies”.
   3. Division 08 Section “Integrated Door Opening Assemblies”.
   4. Division 08 Section “All-Glass Entrances”.
   5. Division 08 Section “Door Hardware”.
   6. Division 26 Section “Electrical”.
   7. Division 28 Section “Access Control Hardware Devices”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
   1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
   2. ICC/IBC - International Building Code.
   3. NFPA 70 - National Electrical Code.
   4. NFPA 80 - Fire Doors and Windows.
   5. NFPA 101 - Life Safety Code.
   6. NFPA 105 - Installation of Smoke Door Assemblies.
   7. State Building Codes, Local Amendments.

E. Standards: Reference Related Sections for requirements regarding compliance with applicable industry standards.

1.03 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
   1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
   2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door

hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:
   a. Type, style, function, size, label, hand, and finish of each door hardware item.
   b. Manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
   e. Explanation of abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for door hardware.
   g. Door and frame sizes and materials.
4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.

D. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in the Related Sections.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.05 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1.06 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 PRODUCTS

2.01 SCHEDULED DOOR HARDWARE

A. Refer to “PART 3 – EXECUTION” for required specification sections.

PART 3 EXECUTION

3.01 DOOR HARDWARE SETS

A. The door hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
   1. Quantities listed are for each pair of doors, or for each single door.
   2. The supplier is responsible for handing and sizing all products.
   3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
   4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Products listed in the hardware sets shall be supplied by and in accordance with the requirements described in the specification section as noted for each item.
   1. Section 08 14 73 – Interior Sliding Wood Door Assemblies.
   2. Section 08 17 00 – Integrated Door Opening Assemblies.
   3. Section 08 34 73 – Interior Sliding Wood Sound Control Door Assemblies.
   4. Section 08 41 26 – All Glass Entrances.
   5. Section 08 71 00 – Door Hardware.

C. Manufacturer’s Abbreviations:

1. MK - MCKINNEY
2. RS - RITE SLIDE
3. RF - RIXSON
4. GS - ASSA ABLOY GLASS SOLUTIONS
5. YA - YALE
6. SU - SECURITRON
7. AD - ADAMS RITE
8. BE - DORMAKABA BEST
9. RO - ROCKWOOD
10. PE - PEMKO
11. OT - OTHER

PRELIMINARY HARDWARE SETS

SET: 1.0

DOORS: **110**

5	**HINGE, FULL MORTISE, HVY WT**	**T4A3386 (X NRP @ OUT-SWING DOORS W/LOCKS)**	**US32D**	**MK**	
1	**ELECTRIC HINGE, FULL MORTISE, HVY WT**	**T4A3386-QC**	**US32D**	**MK**	⚡
1	**CONCEALED VERT ROD EXIT, NIGHTLATCH**	**7120 B MELR 121NL**	**630**	**YA**	⚡

1	CONCEALED VERT ROD EXIT, EXIT ONLY	7120 EO	630	YA	
1	FINAL CORE	TO MATCH FACILITY STD	630	BE	
1	DOOR PULL	RM3312-24 MTG-TYPE 12HD	US32D	RO	
1	SURFACE CLOSER	PR4400	689	YA	
1	SURFACE CLOSER	UNI4400	689	YA	
2	ARMOR PLATE	K1050 34"H BEV CSK	US32D	RO	
1	DOOR STOP	466-RKW OR OH STOP WHERE FLOOR STOP PRESENTS TRIPPING HAZARD	BLACK	RO	
1	WALL STOP	406/409 AS REQUIRED	US26D	RO	
1	THRESHOLD	PER DETAIL X FHSL14		PE	
1	RAIN GUARD	346C X FULL FRAME WIDTH, OMIT @ OVERHANGS		PE	
1	GASKETING	2891APK @ HEAD, MOUNT UNDER CLOSER X 290APK @ JAMBS		PE	
2	EXT. SWEEP	3452CNB		PE	
2	SPLIT ASTRAGAL	29310CS		PE	
1	FRAME HARNESS	QC-C1500		MK	⚡
1	DOOR HARNESS	QC-C__ (AS REQUIRED)		MK	⚡
1	CARD READER AND POWER	BY SECURITY INTEGRATOR		OT	

NOTES: DOOR NORMALLY CLOSED AND SECURE. VALID CREDENTIALS PRESENTED TO CARD READER ALLOWS TEMPORARY ACCESS. KEY OVERRIDE PROVIDED. UPON LOSS OF POWER, DOOR REMAINS SECURE. FREE EGRESS AT ALL TIMES.

SET: 2.0

DOORS: V1A

1	PIVOT SET	147	626	RF	
1	INT PIVOT	M19	626	RF	
1	ELECTRIFIED INTER PIVOT	EM19 QC-8	626	RF	⚡
1	RIM EXIT DEVICE, NIGHTLATCH	7100 B MELR 121NL TEMP CORE	630	YA	⚡
1	FINAL CORE	TO MATCH FACILITY STD	630	BE	
1	DOOR PULL	RM3312-24 MTG-TYPE 12HD	US32D	RO	
1	SURFACE CLOSER	PR4400	689	YA	
1	DOOR STOP	466-RKW OR OH STOP WHERE FLOOR STOP PRESENTS TRIPPING HAZARD	BLACK	RO	
1	THRESHOLD	PER DETAIL X FHSL14		PE	
1	PERIMETER GASKETING	BY ALUM DOOR MANUFACTURER		OT	
1	EXT. SWEEP	3452CNB		PE	
1	FRAME HARNESS	QC-C1500		MK	⚡
1	DOOR HARNESS	QC-C__ (AS REQUIRED)		MK	⚡
1	CARD READER AND POWER	BY SECURITY INTEGRATOR		OT	

NOTES: DOOR NORMALLY CLOSED AND SECURE. VALID CREDENTIALS PRESENTED TO CARD READER ALLOWS TEMPORARY ACCESS. KEY OVERRIDE PROVIDED. UPON LOSS OF POWER, DOOR REMAINS SECURE. FREE EGRESS AT ALL TIMES.

SET: 3.0

DOORS: 130A, 130B

1	PIVOT SET	147	626	RF
2	INT PIVOT	M19	626	RF
1	MORTISE DEADLOCK	MS1850S 1	628	AD
1	THUMBTURN CYLINDER	4066	130	AD
1	MORTISE CYLINDER	TO MAQTCH FACILITY STD X ADAMS RITE CAM	630	BE
1	DOOR PULL	RM3312-24 MTG-TYPE 12HD	US32D	RO
1	PUSH BAR	RM3122 MTG-TYPE 12HD	US32D	RO
1	SURFACE CLOSER	4400 REG/PAR ARM TO SUIT LOCATION	689	YA
1	DOOR STOP	466-RKW OR OH STOP WHERE FLOOR STOP PRESENTS TRIPPING HAZARD	BLACK	RO
1	THRESHOLD	PER DETAIL X FHSL14		PE
1	PERIMETER GASKETING	BY ALUM DOOR MANUFACTURER		OT
1	EXT. SWEEP	3452CNB		PE

SET: 4.0

DOORS: L1S2B

1	PIVOT SET	147	626	RF
1	INT PIVOT	M19	626	RF
1	RIM EXIT DEVICE, NIGHTLATCH	7100 121NL TEMP CORE	630	YA
1	FINAL CORE	TO MATCH FACILITY STD	630	BE
1	SURFACE CLOSER	PR4400	689	YA
1	DOOR STOP	466-RKW OR OH STOP WHERE FLOOR STOP PRESENTS TRIPPING HAZARD	BLACK	RO
1	THRESHOLD	PER DETAIL X FHSL14		PE
1	PERIMETER GASKETING	BY ALUM DOOR MANUFACTURER		OT
1	EXT. SWEEP	3452CNB		PE

SET: 5.0

DOORS: 130D

1	PIVOT SET	147	626	RF
1	INT PIVOT	M19	626	RF
1	PASSAGE LATCH	AU 4701LN	626	YA
1	CONC OVERHEAD STOP	6ADJ-X36	689	RF
1	SURFACE CLOSER	4400 REG/PAR ARM TO SUIT LOCATION	689	YA
1	PERIMETER GASKETING	BY ALUM DOOR MANUFACTURER		OT

SET: 6.0

DOORS: 133B

1	BOTTOM PIVOT	PV-ENDLOAD	AL	GS
1	MAGNETIC LOCK	MAG-M380EBDX	US32D	GS ϟ
2	PULL	RM3301-B-16-1.25	630	RS
1	CONCEALED CLOSER	OHC-609 NHO		GS
1	PUSH BUTTON	EEB3N		SU ϟ
1	CARD READER AND POWER	BY SECURITY INTEGRATOR		OT

NOTES: DOOR NORMALLY CLOSED AND SECURE. VALID CREDENTIALS PRESENTED TO CARD READER ALLOWS TEMPORARY ACCESS. UPON LOSS OF POWER, DOOR REMAINS SECURE. FREE EGRESS AT ALL TIMES. EMERGENCY EXIT BUTTON PROVIDED.

SET: 7.0

DOORS: 202

1	BOTTOM PIVOT	**PV-ENDLOAD**	**AL**	**GS**	
1	**DOOR PULL**	**RM3301X24BTB**	**US32D**	**GS**	
1	**CONCEALED CLOSER**	**OHC-609 NHO**		**GS**	
1	**DOOR STOP**	**441CU**	**US26D**	**RO**	

SET: 8.0

DOORS: 160

6	HINGE, FULL MORTISE, HVY WT	**T4A3786 (X NRP @ OUT-SWING DOORS W/LOCKS)**	**US26D**	**MK**	
2	**MAGNETIC LOCK**	**IMXDA**		**SU**	⚡
1	**CONCEALED VERT ROD EXIT, EXIT ONLY**	**7120 LBR EO**	**630**	**YA**	
1	**CONCEALED VERT ROD EXIT, PASSAGE**	**7120 LBR AU628F**	**630**	**YA**	
1	**SURFACE CLOSER**	**UNI4400**	**689**	**YA**	
1	**SURFACE CLOSER**	**4400 REG/PAR ARM TO SUIT LOCATION**	**689**	**YA**	
2	**KICK PLATE**	**K1050 10"H BEV CSK**	**US32D**	**RO**	
1	**WALL STOP**	**406/409 AS REQUIRED**	**US26D**	**RO**	
1	**GASKETING**	**S88BL WIDTH X HEIGHT**		**PE**	
2	**CARD READER AND POWER**	**BY SECURITY INTEGRATOR**		**OT**	

NOTES: DOOR NORMALLY CLOSED AND SECURE. VALID CREDENTIAL PRESENTED TO CARD READER EITHER SIDE TEMPORARILY SHUNTS MAG LOCK, ALLOWING ENTRANCE/EXIT. EGRESS WITH ALARM AFTER 15-SECOND DELAY. TIE DELAYED EGRESS MAG LOCKS TO FIRE ALARM SYSTEM.

FIELD VERIFY EXISTING DOOR AND FRAME FOR COMPLIANCE WITH NEW COMPONENTS. PROVIDE FILLER PLATES WHERE REMOVAL OF EXISTING HARDWARE LEAVES HOLES IN DOOR OR FRAME.

SET: 9.0

DOORS: **113**

5	**HINGE, FULL MORTISE, HVY WT**	**T4A3786 (X NRP @ OUT-SWING DOORS W/LOCKS)**	**US26D**	**MK**	
1	**ELECTRIC HINGE, HVY WT**	**T4A3786-QC**	**US26D**	**MK**	⚡
1	**CONCEALED VERT ROD EXIT, EXIT ONLY**	**7120 LBR EO**	**630**	**YA**	
1	**CONCEALED VERT ROD EXIT, NIGHTLATCH**	**7120 LBR B MELR AU627F**	**630**	**YA**	⚡

1	**FINAL CORE**	**TO MATCH FACILITY STD**	**630**	**BE**
2	**SURFACE CLOSER**	**UNI4400**	**689**	**YA**
2	**ARMOR PLATE**	**K1050 34"H BEV CSK**	**US32D**	**RO**
2	**SPLIT ASTRAGAL**	**29310CS**		**PE**
1	**FRAME HARNESS**	**QC-C1500**		**MK** ⚡
1	**DOOR HARNESS**	**QC-C (AS REQUIRED)**		**MK** ⚡
1	**CARD READER AND POWER**	**BY SECURITY INTEGRATOR**		**OT**

SET: 10.0

DOORS: V1B

1	PIVOT SET	**147**	**626**	**RF**
1	**INT PIVOT**	**M19**	**626**	**RF**
1	**ELECTRIFIED INTER PIVOT**	**EM19 QC-8**	**626**	**RF** ⚡
1	**RIM EXIT DEVICE, NIGHTLATCH**	**7100 B MELR 121NL TEMP CORE**	**630**	**YA** ⚡
1	**FINAL CORE**	**TO MATCH FACILITY STD**	**630**	**BE**
1	**DOOR PULL**	**RM3312-24 MTG-TYPE 12HD**	**US32D**	**RO**
1	**SURFACE CLOSER**	**4400 REG/PAR ARM TO SUIT LOCATION**	**689**	**YA**
1	**DOOR STOP**	**466-RKW OR OH STOP WHERE FLOOR STOP PRESENTS TRIPPING HAZARD**	**BLACK**	**RO**
1	**THRESHOLD**	**PER DETAIL X FHSL14**		**PE**
1	**PERIMETER GASKETING**	**BY ALUM DOOR MANUFACTURER**		**OT**
1	**EXT. SWEEP**	**3452CNB**		**PE**
1	**FRAME HARNESS**	**QC-C1500**		**MK** ⚡
1	**DOOR HARNESS**	**QC-C (AS REQUIRED)**		**MK** ⚡
1	**CARD READER AND POWER**	**BY SECURITY INTEGRATOR**		**OT**

NOTES: DOOR NORMALLY CLOSED AND SECURE. VALID CREDENTIALS PRESENTED TO CARD READER ALLOWS TEMPORARY ACCESS. KEY OVERRIDE PROVIDED. UPON LOSS OF POWER, DOOR REMAINS SECURE. FREE EGRESS AT ALL TIMES.

SET: 11.0

DOORS: L1S2A, L2S2

3	HINGE, FULL MORTISE, HVY WT	**T4A3786 (X NRP @ OUT-SWING DOORS W/LOCKS)**	**US26D**	**MK**
1	**FIRE RATED RIM EXIT, PASSAGE**	**7100F AU628F**	**630**	**YA**
1	**SURFACE CLOSER**	**4400 REG/PAR ARM TO SUIT LOCATION**	**689**	**YA**
1	**KICK PLATE**	**K1050 10"H BEV CSK**	**US32D**	**RO**
1	**WALL STOP**	**406/409 AS REQUIRED**	**US26D**	**RO**
1	**GASKETING**	**S88BL WIDTH X HEIGHT**		**PE**

SET: 12.0

DOORS: 103A, 103B, 110A, 111, 112, 137, 169, 175, 177A, 177B, 180

2	HINGE, FULL MORTISE	**TA2714 (X NRP @ OUT-SWING DOORS W/LOCKS)**	**US26D**	**MK**
1	**ELECTRIC HINGE**	**TA2714-QC**	**US26D**	**MK** ⚡

1	**FAIL SECURE LOCK**	**AU 4791LN TEMP CORE**	**626**	**YA** ⚡
1	**FINAL CORE**	**TO MATCH FACILITY STD**	**630**	**BE**
1	**SURFACE CLOSER**	**4400 REG/PAR ARM TO SUIT LOCATION**	**689**	**YA**
1	**KICK PLATE**	**K1050 10"H BEV CSK**	**US32D**	**RO**
1	**WALL STOP**	**406/409 AS REQUIRED**	**US26D**	**RO**
3	**SILENCER**	**608-RKW**		**RO**
1	**FRAME HARNESS**	**QC-C1500**		**MK** ⚡
1	**DOOR HARNESS**	**QC-C__ (AS REQUIRED)**		**MK** ⚡
1	**CARD READER AND POWER**	**BY SECURITY INTEGRATOR**		**OT**

NOTES: DOOR NORMALLY CLOSED AND SECURE. VALID CREDENTIALS PRESENTED TO CARD READER ALLOWS TEMPORARY ACCESS. KEY OVERRIDE PROVIDED. UPON LOSS OF POWER, DOOR REMAINS SECURE. FREE EGRESS AT ALL TIMES.

SET: 13.0

DOORS: 117, 176

3	HINGE, FULL MORTISE	**TA2714 (X NRP @ OUT-SWING DOORS W/LOCKS)**	**US26D**	**MK**
3	**ELECTRIC HINGE**	**TA2714-QC**	**US26D**	**MK** ⚡
1	**FAIL SECURE LOCK**	**AU 4791LN TEMP CORE**	**626**	**YA** ⚡
1	**FINAL CORE**	**TO MATCH FACILITY STD**	**630**	**BE**
1	**CONC OVERHEAD STOP**	**6ADJ-X36**	**689**	**RF**
1	**SURFACE CLOSER**	**4400 REG/PAR ARM TO SUIT LOCATION**	**689**	**YA**
1	**KICK PLATE**	**K1050 10"H BEV CSK**	**US32D**	**RO**
3	**SILENCER**	**608-RKW**		**RO**
1	**FRAME HARNESS**	**QC-C1500**		**MK** ⚡
1	**DOOR HARNESS**	**QC-C__ (AS REQUIRED)**		**MK** ⚡
1	**CARD READER AND POWER**	**BY SECURITY INTEGRATOR**		**OT**

NOTES: DOOR NORMALLY CLOSED AND SECURE. VALID CREDENTIALS PRESENTED TO CARD READER ALLOWS TEMPORARY ACCESS. KEY OVERRIDE PROVIDED. UPON LOSS OF POWER, DOOR REMAINS SECURE. FREE EGRESS AT ALL TIMES.

SET: 14.0

DOORS: 126, 127

3	HINGE, FULL MORTISE	**TA2714 (X NRP @ OUT-SWING DOORS W/LOCKS)**	**US26D**	**MK**
1	**STOREROOM OR CLOSET LOCK**	**AU 4705LN TEMP CORE**	**626**	**YA**
1	**FINAL CORE**	**TO MATCH FACILITY STD**	**630**	**BE**
1	**KICK PLATE**	**K1050 10"H BEV CSK**	**US32D**	**RO**
1	**WALL STOP**	**406/409 AS REQUIRED**	**US26D**	**RO**
3	**SILENCER**	**608-RKW**		**RO**

NOTES: FIELD VERIFY EXISTING DOOR AND FRAME FOR COMPLIANCE WITH NEW COMPONENTS. PROVIDE FILLER PLATES WHERE REMOVAL OF EXISTING HARDWARE LEAVES HOLES IN DOOR OR FRAME.

SET: 15.0

DOORS: 110B, 154, 156

3	HINGE, FULL MORTISE	TA2714 (X NRP @ OUT-SWING DOORS W/LOCKS)	US26D	MK
1	STOREROOM OR CLOSET LOCK	AU 4705LN TEMP CORE	626	YA
1	FINAL CORE	TO MATCH FACILITY STD	630	BE
1	SURFACE CLOSER W/ DELAYED ACTION	4400 DL	689	YA
1	ARMOR PLATE	K1050 34"H BEV CSK	US32D	RO
1	WALL STOP	406/409 AS REQUIRED	US26D	RO
3	SILENCER	608-RKW		RO

SET: 16.0

DOORS: 119

3	HINGE, FULL MORTISE	TA2714 (X NRP @ OUT-SWING DOORS W/LOCKS)	US26D	MK
1	STOREROOM OR CLOSET LOCK	AU 4705LN TEMP CORE	626	YA
1	FINAL CORE	TO MATCH FACILITY STD	630	BE
1	SURFACE CLOSER	UNI4400	689	YA
1	KICK PLATE	K1050 10"H BEV CSK	US32D	RO
3	SILENCER	608-RKW		RO

NOTES: FIELD VERIFY EXISTING DOOR AND FRAME FOR COMPLIANCE WITH NEW COMPONENTS. PROVIDE FILLER PLATES WHERE REMOVAL OF EXISTING HARDWARE LEAVES HOLES IN DOOR OR FRAME.

SET: 17.0

DOORS: 129

3	HINGE, FULL MORTISE	TA2714 (X NRP @ OUT-SWING DOORS W/LOCKS)	US26D	MK
1	CLASSROOM LOCK	AU 4708LN TEMP CORE	626	YA
1	FINAL CORE	TO MATCH FACILITY STD	630	BE
1	KICK PLATE	K1050 10"H BEV CSK	US32D	RO
1	WALL STOP	406/409 AS REQUIRED	US26D	RO
3	SILENCER	608-RKW		RO

SET: 18.0

DOORS: 139, 155

3	HINGE, FULL MORTISE	TA2714 (X NRP @ OUT-SWING DOORS W/LOCKS)	US26D	MK
1	INSTITUTIONAL PRIVACY LOCK W/ INDICATOR	AUR 8864FL TEMP CORE V21	630	YA
1	FINAL CORE	TO MATCH FACILITY STD	630	BE
1	KICK PLATE	K1050 10"H BEV CSK	US32D	RO
1	WALL STOP	406/409 AS REQUIRED	US26D	RO
1	GASKETING	S88BL WIDTH X HEIGHT		PE
1	AUTOMATIC DOOR BOTTOM	434ARL		PE

SET: 19.0

DOORS: 153

3	HINGE, FULL MORTISE	TA2714 (X NRP @ OUT-SWING DOORS W/LOCKS)	US26D	MK
1	INSTITUTIONAL PRIVACY LOCK W/ INDICATOR	AUR 8864FL TEMP CORE V21	630	YA
1	FINAL CORE	TO MATCH FACILITY STD	630	BE
1	CONC OVERHEAD STOP	6ADJ-X36	689	RF
1	KICK PLATE	K1050 10"H BEV CSK	US32D	RO
1	GASKETING	S88BL WIDTH X HEIGHT		PE
1	AUTOMATIC DOOR BOTTOM	434ARL		PE

SET: 20.0

DOORS: 106, 107, 136, 152, 162, 163

3	HINGE, FULL MORTISE	TA2714 (X NRP @ OUT-SWING DOORS W/LOCKS)	US26D	MK
1	INSTITUTIONAL PRIVACY LOCK W/ INDICATOR	AUR 8864FL TEMP CORE V21	630	YA
1	FINAL CORE	TO MATCH FACILITY STD	630	BE
1	SURFACE CLOSER	4400 REG/PAR ARM TO SUIT LOCATION	689	YA
1	KICK PLATE	K1050 10"H BEV CSK	US32D	RO
1	MOP PLATE @ RESTROOMS	K1050 6"H BEV CSK	US32D	RO
1	WALL STOP	406/409 AS REQUIRED	US26D	RO
3	SILENCER	608-RKW		RO

SET: 21.0

DOORS: 108

3	HINGE, FULL MORTISE	TA2714 (X NRP @ OUT-SWING DOORS W/LOCKS)	US26D	MK
1	PASSAGE LATCH	AU 4701LN	626	YA
1	SURFACE CLOSER	4400 REG/PAR ARM TO SUIT LOCATION	689	YA
1	KICK PLATE	K1050 10"H BEV CSK	US32D	RO
1	WALL STOP	406/409 AS REQUIRED	US26D	RO
3	SILENCER	608-RKW		RO

SET: 22.0

DOORS: **132A** , **132B** , **133A** , **164** , **166** , **167** , **170** , **171** , **172** , **173** , **174**

1	SLIDE DOOR ASSEMBLY	STC-34 ACOUSTIC SLIDING DOOR SYSTEM (BY DIV. 083473)	081473.01.01	RS
1	ENTRY LOCK	S5350 S460PI X S3305	630	RS
1	FINAL CORE	TO MATCH FACILITY STD	630	BE

NOTES: VERIFY WALL THICKNESS FOR FRAME DEPTH.

SET: 23.0

DOORS: **102** , **135** , **138** , **140** , **141** , **142** , **143** , **144** , **145** , **146** , **147** , **148** , **149** , **150** , **151** , **178**

1 SLIDE DOOR ASSEMBLY	**STC-34 ACOUSTIC SLIDING DOOR SYSTEM (BY DIV. 083473)**	**081473.01.01**	**RS**	
1 PRIVACY LOCK	**S5340 S460PI X S3305**	**630**	**RS**	

NOTES: VERIFY WALL THICKNESS FOR FRAME DEPTH.

SET: 24.0

DOORS: **101** , **168A** , **168B**

1 SLIDE DOOR ASSEMBLY	**SLIDING DOOR SYSTEM (BY DIV. 083473)**	**081473.01.01**	**RS**	
1 ENTRY LOCK	**S5350 S460PI X S3305**	**630**	**RS**	
1 MAGNETIC LOCK	**SAMB**		**SU**	⚡
1 FINAL CORE	**TO MATCH FACILITY STD**	**630**	**BE**	
1 FRAME HARNESS	**QC-C1500**		**MK**	⚡
1 PUSH BUTTON	**EEB3N**		**SU**	⚡
1 MOTION SENSOR	**XMS**		**SU**	⚡
1 CARD READER AND POWER	**BY SECURITY INTEGRATOR**		**OT**	

NOTES: VERIFY WALL THICKNESS FOR FRAME DEPTH.

DOOR NORMALLY CLOSED AND SECURE. VALID CREDENTIALS PRESENTED TO CARD READER SHUNTS MAG LOCK, ALLOWING TEMPORARY ACCESS. KEY OVERRIDE PROVIDED. FREE EGRESS AT ALL TIMES - EMERGENCY EXIT BUTTON INCLUDED.

SET: 25.0

DOORS: **104A** , **104B** , **105** , **109**, **201**

1 SLIDE DOOR ASSEMBLY	**STC-34 ACOUSTIC SLIDING DOOR SYSTEM (BY DIV. 083473)**	**081473.01.01**	**RS**
1 PULL	**S3305-B-16-1.25**	**630**	**RS**

NOTES: VERIFY WALL THICKNESS FOR FRAME DEPTH.

SET: 26.0

DOORS: 130C

1 ALL HARDWARE	BY DOOR MANUFACTURER	OT

END OF SECTION

SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Hollow metal frames for wood doors.

C. Fire-rated hollow metal doors and frames.

D. Thermally insulated hollow metal doors with frames.

E. Hollow metal borrowed lites glazing frames.

1.02 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware.

B. Section 08 8000 - Glazing: Glass for doors and borrowed lites.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.

D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2020.

G. ASTM A1011/A1011M - 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; 2018a.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021.

I. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2016.

J. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

K. ITS (DIR) - Directory of Listed Products; current edition.

L. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

M. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

N. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2007.

O. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.

P. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2019.

Q. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2017.

R. UL (DIR) - Online Certifications Directory; Current Edition.

S. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

T. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide hollow metal doors and frames from SDI Certified manufacturer: https://steeldoor.org/sdi-certified/#sle.

B. Maintain at project site copies of reference standards relating to installation of products specified.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
1. Ceco Door, an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
2. Curries, an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
3. Mesker, dormakaba Group; FDJ Series Drywall Frames: www.meskeropeningsgroup.com/#sle.
4. Republic Doors, an Allegion brand; ____: www.republicdoor.com/#sle.
5. Steelcraft, an Allegion brand; ____: www.allegion.com/#sle.
6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
2. Accessibility: Comply with ICC A117.1 and ADA Standards.
3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
4. Door Edge Profile: Manufacturers standard for application indicated.
5. Typical Door Face Sheets: Flush.
6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.
7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip

process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
   a. Based on SDI Standards: Provide at least A40/ZF120 (galvannealed) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) for corrosive locations.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Exterior Doors: Thermally insulated.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 2 - Heavy-duty.
      b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.
      e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
   2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
      a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.
   3. Door Thickness: 1-3/4 inches, nominal.
   4. Weatherstripping: Refer to Section 08 7100.
   5. Door Finish: Factory primed and field finished.

C. Interior Doors, Non-Fire-Rated:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 2 - Heavy-duty.
      b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.
      e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
   2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
   3. Door Thickness: 1-3/4 inches, nominal.
   4. Door Finish: Factory primed and field finished.

D. Fire-Rated Doors:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 2 - Heavy-duty.
      b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gauge, 0.032 inch, minimum.
      e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
   2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
   3. Provide units listed and labeled by UL (DIR) or ITS (DIR).
      a. Attach fire rating label to each fire rated unit.
   4. Smoke and Draft Control Doors (Indicated with letter "S" on Drawings and/or Door Schedule): Self-closing or automatic closing doors in accordance with NFPA 80 and

NFPA 105, with fire-resistance-rated wall construction rated the same or greater than the fire-rated doors, and the following;
   a. Maximum Air Leakage: 3.0 cfm/sq ft of door opening at 0.10 inch w.g. pressure, when tested in accordance with UL 1784 at both ambient and elevated temperatures.
   b. Gasketing: Provide gasketing or edge sealing as necessary to achieve leakage limit.
   c. Label: Include the "S" label on fire-rating label of door.
5. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
6. Door Thickness: 1-3/4 inches, nominal.
7. Door Finish: Factory finished.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Frame Finish: Factory primed and field finished.

C. Exterior Door Frames: Face welded type.
   1. Frame Metal Thickness: 18 gauge, 0.042 inch, minimum.
   2. Weatherstripping: Separate, see Section 08 7100.

D. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
   1. Frame Metal Thickness: 18 gauge, 0.042 inch, minimum.

E. Door Frames, Fire-Rated: Face welded type.
   1. Fire Rating: Same as door, labeled.
   2. Terminated Stops: Provide at interior doors; closed end stop terminated 6 inch, maximum, above floor at 45 degree angle.
   3. Frame Metal Thickness: 18 gauge, 0.042 inch, minimum.

F. Exterior Four-Sided Frame: Face welded type
   1. Frame Metal Thickness: 18 gauge, 0.042 inch, minimum.

G. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.

H. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

I. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 ACCESSORIES

A. Door Window Frames: Door window frames with glazing securely fastened within door opening.
   1. Size: As indicated on drawings.
   2. Frame Material: 18 gauge, 0.0478 inch, galvanized steel.
   3. Glazing: 1/4 inch thick, tempered glass, in compliance with requirements of authorities having jurisdiction.

B. Glazing: As specified in Section 08 8000, factory installed.

C. Removable Stops: Formed sheet steel, mitered or butted corners; prepared for countersink style tamper proof screws.

D. Astragals for Double Doors: Specified in Section 08 7100.

E. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

F. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Install door hardware as specified in Section 08 7100.

E. Comply with glazing installation requirements of Section 08 8000.

F. Coordinate installation of electrical connections to electrical hardware items.

3.04 TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.06 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 1416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush and flush glazed configuration; fire-rated and non-rated.

1.02 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames.

B. Section 08 7100 - Door Hardware.

C. Section 08 8000 - Glazing.

1.03 REFERENCE STANDARDS

A. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2017, with Errata (2019).

D. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.

E. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

F. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

G. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2013.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
   1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

D. Samples: Submit two samples of door veneer, 12 by 12 inches in size illustrating wood grain, stain color, and sheen.

E. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

F. Manufacturer's Installation Instructions: Indicate special installation instructions.

G. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.
   1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

B. Woodwork Quality Assurance Program:
   1. Provide labels indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   2. Provide designated labels on shop drawings as required by quality assurance program.
   3. Provide designated labels on installed products as required by quality assurance program.

4. Submit documentation upon completion of installation that verifies this work is in compliance with specified requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging, and inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Interior Doors: Provide manufacturer's warranty for the life of the installation.

C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors:
1. VT Industries, Inc; ____: www.vtindustries.com/#sle.
2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DOORS

A. Doors: See drawings for locations and additional requirements.
1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
2. Wood Veneer Faced Doors: 7-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
1. Provide solid core doors at each location.
2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C - Positive Pressure; Underwriters Laboratories Inc (UL) labeled without any visible seals when door is open.
3. Smoke and Draft Control Doors: In addition to required fire rating, provide door assemblies tested in accordance with UL 1784 with maximum air leakage of 3.0 cfm per sq ft of door opening at 0.10 inch wg pressure at both ambient and elevated temperatures for "S" label; if necessary, provide additional gasketing or edge sealing.
4. Wood veneer facing with factory transparent finish.

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.

B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

2.04 DOOR FACINGS

A. Veneer Facing for Transparent Finish: Red oak, HPVA Grade A, rift cut (only red and white oak), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:
1. Provide solid blocks at lock edge for hardware reinforcement.

2. Provide solid blocking for other throughbolted hardware.

C. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.

D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

E. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

F. Provide edge clearances in accordance with the quality standard specified.

2.06 FINISHES - WOOD VENEER DOORS

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
1. Transparent:
a. System - 1, Lacquer, Nitrocellulose.
b. Stain: As selected by Architect.
c. Sheen: Flat.

B. Finish work in accordance with WDMA I.S. 1A for grade specified and as follows:
1. Transparent:
a. System - TR-2, Catalyzed Lacquer.
b. Stain: As selected by Architect.
c. Sheen: Flat.

C. Factory finish doors in accordance with approved sample.

D. Seal door top edge with color sealer to match door facing.

2.07 ACCESSORIES

A. Hollow Metal Door Frames: See Section 08 1113.

B. Glazed Openings:
1. Heat-Strengthened and Fully Tempered Glass: ASTM C1048.
2. Glazing: Single vision units, 1/4 inch thick glass.
3. Tint: Clear.

C. Door Window Frames: Door window frames with glazing securely fastened within door opening.
1. Size: As indicated on drawings.
2. Frame Material: 18 gauge, 0.0478 inch, galvanized steel.
3. Glazing: 1/4 inch thick, tempered glass, in compliance with requirements of authorities having jurisdiction.

D. Glazing Stops: Wood, of same species as door facing, mitered corners; prepared for countersink style tamper proof screws.

E. Door Hardware: See Section 08 7100.
1. Dropdown acoustic hardware shall be mortised into bottom of door panels. Surface mounting is prohibited.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.
1. Install fire-rated doors in accordance with NFPA 80 requirements.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

E. Coordinate installation of glazing.

3.03 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

3.05 SCHEDULE

A. See Door and Frame Schedule appended to this section.

END OF SECTION

SECTION 08 3100
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall- and ceiling-mounted access units.

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Shop Drawings: Indicate exact position of each access door and/or panel unit.

D. Manufacturer's Installation Instructions: Indicate installation requirements.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units:
   1. Size: 12 by 12 inches.
   2. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   3. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
   4. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.

B. Wall-Mounted Units in Wet Areas:
   1. Location: Where required to access valves, clean-outs or other building componants.
   2. Panel Material: Steel, hot-dipped zinc, or zinc-aluminum-alloy coated.
   3. Size: 12 by 12 inches.
   4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   5. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
   6. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.

C. Ceiling-Mounted Units:
   1. Location: Where required to access valves, clean-outs or other componants.
   2. Panel Material: Aluminum extrusion with gypsum board inlay.
   3. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
   4. Size - Other Ceilings: 12 by 12 inches.
   5. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

2.02 WALL- AND CEILING-MOUNTED ACCESS UNITS

A. Wall- and Ceiling-Mounted Units: Factory-fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
   1. Style: Exposed frame with door surface flush with frame surface.
      a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
   2. Door Style: Single thickness with rolled or turned in edges.
   3. Frames: 16 gauge, 0.0598 inch, minimum thickness.
   4. Single Steel Sheet Door Panels: 1/16 inch, minimum thickness.
   5. Steel Finish: Primed.
   6. Hardware:
      a. Hinges for Non-Fire-Rated Units: Continuous piano hinge.

b. Latch/Lock: Tamperproof tool-operated cam latch.
c. Gasketing: Extruded neoprene, around perimeter of door panel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 08 3223

SLIDING AND FOLDING GLAZED WALLS AND DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glazed aluminum sliding and pivoting wall panel systems, top supported.

1.02 REFERENCE STANDARDS

A. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.

B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

C. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal; 1997 (Reapproved 2018).

D. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

E. ASTM E413 - Classification for Rating Sound Insulation; 2016.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide information on dimensions, frame and sill construction, glazing, and hardware.

C. Shop Drawings: Indicate opening dimensions, elevations of different types, and framed opening tolerances.

D. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

E. Installer's qualification statement.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than three years of experience.

B. Installer Qualifications: Company specializing in installation of products of type specified, with not less than three years of experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site and store in manufacturer's protective cartons until openings are ready for installation.

B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glazed Aluminum Sliding and Pivoting Wall Systems:
   1. Modernfold, a DORMA Group Company; Acousti-Clear..
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Acoustical Performance: Provide glass partitions and door assemblies tested by qualified testing agency, calculated in accordance with ASTM E413, tested in accordance with ASTM E90, and rated for not less than Sound Transmission Class (STC) indicated.
   1. Partition STC Rating: 51, minimum, for framed partitions.

2.03 SLIDING AND FOLDING GLAZED DOORS AND WALLS

A. Glazed Aluminum Sliding and Pivoting Wall Panel Systems: Extruded aluminum sliding and fixed wall panel frames, factory fabricated; complete with support and anchorage devices.
   1. Configuration: As shown on drawings.
   2. Support System: Top hung.
   3. Panel Rail Depth: 1-1/4 inch.
   4. Top Rail Height: 3-5/8 inch, square edge.
   5. Bottom Rail Height: 3-5/8 inch, square edge.
   6. Panel Weight: 10 lbs per sq ft, maximum.
   7. Aluminum Frames: Factory finished; manufacturer's standard corner construction; non-thermally broken.
   8. Drainage: Provide drainage to exterior for moisture entering joints and glazing spaces and for condensation occurring within frame construction.
   9. Glass Stops: Same material and color as frame.
   10. Aluminum Frame Finish: Anodized coating in accordance with AAMA 611.
      a. Sheen: Matte.
      b. Exterior Color: As selected from manufacturer's full range of colors
      c. Interior Color: As selected from manufacturer's full range of colors

B. Glazing: Double glazed, clear, tempered, fully tempered, with glass thickness 1/4 inch.

C. Sliding Wall Panel Hardware: Manufacturer's standard hardware including carriages with sealed ball bearing rollers, and top or bottom tracks.
   1. Door Hardware: Back to back pull handle.
   2. Locking Mechanisms: Minimum two-point deadbolt locking of each panel; manufacturer's standard type.
   3. Exposed Hardware Finish: As selected from manufacturer's standard line.

2.04 FACTORY ASSEMBLY

A. Factory assemble sliding/folding operable panel frames as single unit, including head, jambs, and bottom sections; provide concealed fasteners.
   1. Sizes: Allow for tolerances of rough framed openings, clearances, and shims at perimeter of assemblies.
   2. Joints and Corners: Flush, hairline and waterproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   3. Glazing: Factory installed.

2.05 ACCESSORIES

A. Anchors: Hot-dipped galvanized or stainless steel in accordance with project and manufacturer's installation requirements.

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M, Type I.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings are ready to receive work and opening dimensions and clearances are as indicated on approved shop drawings.

3.02 PREPARATION

A. Prepare opening to permit correct installation of door unit in coordination with air and vapor seal.

3.03 INSTALLATION

A. Install assemblies in accordance with manufacturer's instructions.

B. Attach frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Use anchorage devices to securely fasten assembly to adjacent construction without distortion or imposed stresses.

3.04 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation from Plumb: 1/16 inch.

C. Maximum Variation from Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 feet straight edge.

3.05 ADJUSTING

A. Adjust hardware for smooth operation.

3.06 CLEANING

A. Remove protective material from factory finished surfaces.

B. Remove labels and visible markings.

C. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.

D. Upon completion of installation, thoroughly clean door aluminum surfaces in accordance with AAMA 609 & 610.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 3326
OVERHEAD COILING GRILLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead coiling metal grilles and operating hardware; electrically operated.

B. Wiring from electric circuit disconnect to operator and to control station.

1.02 RELATED REQUIREMENTS

A. Section 26 0583 - Wiring Connections: Power to disconnect.

1.03 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

B. ITS (DIR) - Directory of Listed Products; current edition.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

D. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000, with Errata (2008).

E. UL (DIR) - Online Certifications Directory; Current Edition.

F. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.

C. Samples: Submit two grille members, 8 by 8 inch in size illustrating shape, color and finish texture.

D. Manufacturer's Installation Instructions: Indicate installation sequences and procedures, adjustment and alignment procedures.

E. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of type specified and with at least three years experience.

B. Provide certificate of compliance from authorities having jurisdiction indicating approval of grille and operating hardware assembly.

C. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose specified.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Overhead Coiling Grilles:
   1. Cornell Iron Works, Inc; Steelweave Mesh Security Door, Cornell Iron. EAG10: www.cornelliron.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 GRILLES AND COMPONENTS

A. Grille: Stainless steel; horizontal bar curtain, coiling on overhead counterbalanced shaft.
   1. Mounting: Within framed opening.

B. Curtain: Round horizontal bars connected with vertical links.
   1. Curtain Pattern: Selected by Architect from manufacturer standard patterns.
   2. Bar Ends: Provide with nylon runners for quiet operation.
   3. Bottom Bar: Back-to-back angles with tubular resilient cushion.

C. Guides: Stainless steel angles, of profile to retain grille in place with snap-on trim, mounting brackets of same metal.

D. Hood Enclosure and Trim: Sheet metal; completely covering operating mechanisms; internally reinforced to maintain rigidity and shape.
   1. Material: Stainless steel.
   2. Finish: No. 4 - Brushed.

E. Lock Hardware:
   1. Latchset Lock Cylinders: 7-pin type.
      a. Keying: Alike.
   2. For motor operated units, additional lock or latching mechanisms are not required.
   3. Latching Mechanism: Inside mounted, adjustable keeper, spring activated latch bar feature to keep in locked or retracted position.
   4. Latch Handle: Manufacturer's standard.
   5. Slide Bolt: Provide on single-jamb side, extending into slot in guides.

F. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

2.03 MATERIALS

A. Stainless Steel: ASTM A666, Type 304, with rollable temper.

2.04 ELECTRIC OPERATION

A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
   1. Provide interlock switches on motor operated units.

B. Electric Operators:
   1. Mounting: Side mounted.
   2. Motor Enclosure:
   3. Motor Rating: 3/4 hp; continuous duty.
   4. Motor Voltage: 120 volts, single phase, 60 Hz.
   5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
   6. Controller Enclosure: NEMA 250 Type 1.
   7. Opening Speed: 12 inches per second.
   8. Brake: Adjustable friction clutch type, activated by motor controller.
   9. Manual override in case of power failure.
   10. Refer to Section 26 0583 for electrical connections.

C. Control Station: Provide standard three button (Open-Close-Stop) momentary-contact control device for each operator complying with UL 325.
   1. 24 volt circuit.
   2. Surface mounted, at interior door jamb.
   3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
      a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.

D. Safety Edge: Located at bottom of coiling grill, full width, electro-mechanical sensitized type, wired to stop and reverse grill direction upon striking object, hollow neoprene covered.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

3.02 INSTALLATION

A. Install grille unit assembly in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of electrical service with Section 26 0583.

F. Complete wiring from disconnect to unit components.

G. Install enclosure and perimeter trim.

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch.

C. Maximum Variation From Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.

3.04 ADJUSTING

A. Adjust grille, hardware and operating assemblies for smooth and noiseless operation.

3.05 CLEANING

A. Clean grille and components.

B. Remove labels and visible markings.

END OF SECTION

SECTION 08 3400

SPECIAL FUNCTION DOORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. SUMMARY
   1. Section includes:
      a. Interior Aluminum-Framed Top-Hung Sliding Doors

C. REFERENCES
   1. ANSI – American National Standards Institute
      a. ANSI 156.18 Materials and Finishes
      b. ANSI A117.1 Specifications for making buildings and facilities usable by physically handicapped people.
   2. BHMA – Builders Hardware Manufacturers Association
   3. DHI – Door and Hardware Institute
   4. NFPA – National Fire Protection Association
      a. NFPA 80 – Fire Doors and Windows
      b. NFPA 101 – Life Safety code
      c. NFPA 105 – Smoke and Draft Control Door Assemblies
      d. NFPA 252 – Fire Tests of Doors Assemblies
   5. AWS – Architectural Woodwork Standards

D. SUBMITTALS
   1. Comply with Section 01 3300 – Submittal Procedures
   2. Product Data: Submit manufacturer’s product data, including installation instructions.
   3. Shop Drawings: Submit manufacturer’s shop drawings, including plans, elevations, sections, and details, indicating dimensions, tolerances, materials, components, hardware, finish, options, and accessories. Shop Drawings to show required blocking by others.
   4. Samples: Submit manufacturer’s samples of the following sliding door components:
      a. Aluminum Frame finish sample.
   5. Manufacturer’s Certification: Submit manufacturer’s certification that materials comply with specified requirements and are suitable for intended application.
   6. Warranty Documentation: Submit manufacturer’s standard warranty for complete system
   7. Test Reports: Submit acoustical reports or UL1784 as applicable.

E. QUALITY ASSURANCE
   1. Product Options: Drawings indicate size, profiles, and dimensional requirements of interior aluminum frames and doors.
   2. Source: Obtain sliding aluminum framed doors and hardware from single source.
   3. Manufacturer's Qualifications: Manufacturer regularly engaged for past 5 years in manufacture of sliding doors similar to that specified.

F. PERFORMANCE
   1. Aluminum perimeter frames with integral acoustic seals at all door/frame interfaces
      a. Architect to verify frame thickness suitable for required application
   2. Soft-closing mechanism at both sides of door integrated with top track. Soft Closers tested to a minimum of 150,000 cycles.
   3. Concealed door guide.
   4. Manufacturer to 3rd party acoustical performance test data
   5. Manufacturer to submit 3rd party test data on air infiltration and/or smoke ratings as applicable

G. DELIVERY, STORAGE, AND HANDLING

1. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
2. Notify manufacturer immediately of any shipping damage.
3. Storage and Handling Requirements:
    a. Store and handle materials in accordance with manufacturer's instructions.
    b. Keep materials in manufacturer's original, unopened containers and packaging until installation.
    c. Store materials in clean, dry area indoors.
    d. Protect materials and finish during storage, handling, and installation to prevent damage.

1.02 PART 2 - PRODUCTS

A. MANUFACTURERS
1. AD SYSTEMS 2201 100th St. SW, Everett, WA 98204 | Website: http://specADsystems.com | Phone: 425-740-6011 | ADSystems.Estimating@allegion.com

B. INTERIOR SLIDING ALUMINUM-FRAMED DOORS AND PARTITIONS
1. ExamSlide™ High Performance Barn (Sliding) Door System by AD Systems.
2. Frame Profiles: Extruded aluminum frame "wrap" frame with integral vertical jamb (stile pocket). Frames required to complete seal around door leaf. Gasketing required at all frame to door interfacings. Exposed gaskets at jamb to be silicone.
3. Finish:
    a. Custom Painted Hardcoat (Kyanar).
4. Door Leafs. All Doors to be factory machined for hardware including pilot and function holes. Leading edge of door to be fully finished.
    a. Glazing: monolithic clear tempered.
    b. Aluminum Stile & Rail Door: 3-1/2" stiles plus 1/2" stop.
    c. 10" bottom Rail.
5. Door Components
    a. Single Top Track: Anodized finish aluminum track
    b. Valances: Extruded aluminum with integral end caps
    c. Standard square valance.
    d. Top Rollers: tandem nylon roller sized to match door weight
    e. Concealed Floor Guide: Integral Jamb floor guide by AD Systems
    f. Soft-Closers: Soft-closing dampeners at [one] both sides of door leaf. Demonstrate soft closers as tested to 150k cycles
    g. Handles:
        1) Standard Ladder Pull: 16" long x 1" diameter. Finish: US32D Satin Stainless Steel.
6. Self-Closing Spring Mechanism
7. Automatic Door Bottom for improved acoustical performance

1.03 PART 3 - EXECUTION

A. EXAMINATION
1. Examine wall openings to receive sliding doors for plumb, level, and square. Note: Finish door operation will be affected by out of tolerance framing.
2. Verify dimensions of wall openings.
3. Examine surfaces to receive top and bottom guide.
4. Notify Architect of conditions that would adversely affect installation or subsequent use of sliding doors.
5. Do not begin installation until unacceptable conditions are corrected.
6. Base of door side to be flush or minimal. Rubber Base acceptable.

B. INSTALLATION

1. Install sliding doors in accordance with manufacturer's instructions at locations indicated on the Drawings.
2. Install sliding doors plumb, level, square, and in proper alignment.
3. Install sliding doors to close against walls without gaps
4. Install sliding doors to open and close smoothly.
5. Anchor sliding doors securely in place to supports. Required: Fire treated 2 x 6 blocking required full length of track.

C. ADJUSTING
1. Adjust sliding doors for proper operation in accordance with manufacturer's instructions.
2. Adjust sliding doors to operate smoothly without binding.
3. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.

D. CLEANING
1. Clean sliding doors promptly after installation in accordance with manufacturer's instructions.
2. Do not use harsh cleaning materials or methods that could damage materials or finish.

E. PROTECTION
1. Protect installed sliding doors from damage during construction.

END OF SECTION

SECTION 08 4123

FIRE RATED ALUMINUM FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:
   1. Fire rated glazing and framing systems for installation as sidelights, borrowed lights, windows, and transoms.

B. Related Sections:
   1. Section 05 12 00 “Structural Steel Framing:” Steel attachment members
   2. Section 07 84 00 “Firestopping:” Firestops between work of this section and other fire resistive assemblies.
   3. Section 07 92 00 – “Joint Sealants” for installation of joint sealants installed with steel fire-rated glazed curtain-wall systems and for sealants to the extent not specified in this Section.
   4. Section 08 71 00 “Door Hardware:” Door hardware other than that provided by the work of this section

1.02 REFERENCES

A. American Architectural Manufacturers Association (AAMA)
   1. AAMA 2603-2002 Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
   2. AAMA 2604 -2005 Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
   3. AAMA 2605 -2005 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

B. American Society for Testing and Materials (ASTM):
   1. Fire safety related:
      a. ASTM E119: Methods for Fire Tests of Building Construction and Materials.
   2. Material related
      a. ASTM A 1008/A 1008M - 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; 2007.
      b. ASTM A 1011/A 1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2006b.

C. American Welding Society (AWS)
   1. AWS D1.3 - Structural Welding Code - Sheet Steel; 2007

D. National Fire Protection Association (NFPA):
   1. NFPA 80: Fire Doors and Windows.

E. Underwriters Laboratories, Inc. (UL):
   1. UL 9: Fire Tests of Window Assemblies.
   2. UL 10 B: Fire Tests of Door Assemblies
   3. UL 10 C: Positive Pressure Fire Tests of Window & Door Assemblies

F. American Society of Civil Engineers (ASCE)
   1. ASCE 7-16 – Minimum Design Loads for Buildings and Other Structures; 2005

1.03 DEFINITIONS

A. Manufacturer: A firm that produces primary glass, fabricated glass or framing as defined in referenced glazing publications.

1.04 SUBMITTALS

A. Product Data:
   1. Technical Information: Submit latest edition of manufacturer's product data providing product descriptions, technical data, Underwriters Laboratories, Inc. listings and installation instructions.

B. Shop Drawings:
   1. Include plans, elevations and details of product showing component dimensions; framing opening requirements, dimensions, tolerances, and attachment to structure

C. Samples (optional). For following products:
   1. Sample of frame
   2. Verification of sample of selected finish

D. Warranties: Submit manufacturer's warranty.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualifications according to
   1. International Accreditation Service for Testing Body-Building Materials and Systems
   2. Fire Testing
      a. ASTM Standards E 119
      b. NFPA Standards 251, 252, 257
      c. UL Standards 9, 10B, 10C, 1784, UL Subject 63

B. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are classified and labeled by UL, for fire ratings indicated, based on testing according to NFPA 257 and UL 9.

C. Listings and Labels - Fire Rated Assemblies: Under current follow-up service by Underwriters Laboratories® maintaining a current listing or certification. Label assemblies accordance with limits of manufacturer's listing.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle under provisions specified by manufacturer.

1.07 PROJECT CONDITIONS

A. Obtain field measurements prior to fabrication of frame units. If field measurements will not be available in a timely manner coordinate planned measurements with the work of other sections.
   1. Note whether field or planned dimensions were used in the creation of the shop drawings.

B. Coordinate the work of this section with others effected including but not limited to: other interior and/or exterior envelope components and door hardware beyond that provided by this section.

1.08 WARRANTY

A. Provide the Pilkington Pyrostop® and Fireframes® standard five-year manufacturer warranty.

PART 2 – PRODUCTS

3.01 MANUFACTURERS - (ACCEPTABLE MANUFACTURERS/PRODUCTS]

A. Manufacturer Glazing Material: "Pilkington Pyrostop®" fire-rated glazing as manufactured by the Pilkington Group and distributed by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 phone (800.426.0279) fax (425.396.8300) e-mail sales@fireglass.com, web site http://www.fireglass.com

B. Frame System: "Fireframes® Aluminum Series" fire-rated frame system as manufactured and supplied by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 phone (800.426.0279) fax (425.396.8300 e-mail sales@fireglass.com web site http://www.fireglass.com

C. Substitutions: Substitutions for Glazing Material and Frame System per requirements of Section 01 1600.

3.02 PERFORMANCE REQUIREMENTS

A. System Description:
   1. Steel fire-rated glazed wall and/or window system, dual aluminum cover cap format
      a. Face widths:
         1) 2”
         2) Custom stainless steel cover caps
            (a) Duration – Windows Capable of providing a fire rating for 120 minutes.
               (1) Duration – Walls: Capable of providing a fire rating for 120 minutes.

B. Structural Performance
   1. Design and size the system to withstand structural forces placed upon it without damage or permanent set when tested in accordance with ASTM E330 using load 1.5 times the design wind loads and of 10 seconds in duration.
   2. Member deflection: Limit deflection of the edge of the glass normal to the plane of the glass to [flexure limit of glass][1/175 of the glass edge length or ¾ inch, whichever is less][of any framing member
   3. Accommodate movement between storefront and adjoining systems

C. Air Infiltration: ASTM E 283; Air infiltration rate shall not exceed 0.06 cfm/ft2 at a static air pressure differential of 6.24 psf.

D. Water Resistance, (static): ASTM E 331; No leakage at a static air pressure differential of 15 psf as defined in AAMA 501.

3.03 MATERIALS - GLASS

A. Fire Rated Glazing: Composed of multiple sheets of Pilkington Optiwhite™ high visible light transmission glass laminated with an intumescent interlayer.

B. Impact Safety Resistance: ANSI Z97.1 and CPSC 16CFR1201(Cat. I and II).

C. Properties Interior Glazing

Fire-Rating				120 minutes
Manufacturer’s designation				120-106
Glazing type				IGU
Nominal Thickness				2-1/4” (57mm)
Weight in lbs/sf				22.9
Daylight Transmission				75%
Sound Transmission Coefficient				46dB

D. Glazing Accessories: Manufacturer’s standard compression gaskets, standoff, spacers, setting blocks and other accessories necessary for a complete installation.

3.04 MATERIALS –ALUMINUM FRAMES

A. Aluminum Framing System [45 min. 60 min. 120 min.]
   1. Steel Frame — The steel framing members are made of two halves, nom. 1.9 in. wide (48.3 mm) with a nom. minimum depth of 1.38 in. (35 mm) with lengths cut according to glazing size.
   2. Aluminum Trim — Supplied with the steel framing members. Nom. 2 in. (50.8 mm) wide with a nom. depth of 1.54 in. (39 mm) with lengths cut according to glazing size.
   3. Stainless Steel Standoffs — Supplied with the steel framing members. Nom 5/16 in. (8 mm) diameter with a nom. minimum depth of 1 1/8 in. (28 mm) with depth adjusted to match Pilkington Pyrostop® Panel thickness.

4. Stainless Steel Moment and Connecting Braces: — Supplied with the steel framing members. Nom 3/8 in. (10 mm) thick with a nom. minimum depth of 1 1/8 in. (28 mm) with depth adjusted to match Pilkington Pyrostop® Panel thickness.
5. Framing Member Fasteners — Supplied with the steel framing members. Screws are M6 x16mm Button Head Socket Cap Screws for frame assembly and #6 x 1" Pan Head Sheet Metal Screws for door installation.
6. Glazing Gasket —
   a. Interior Gasketing-Supplied with the steel framing members. Nom. 3/4 in. (19 mm) x 3/16 (4.5 mm) black applied to the steel framing members to cushion and seal the glazing material when installed.
   b. Exterior Gasketing- Supplied with the steel framing members. Nom. 2 in. (50 mm) x 3/16 (4.5 mm) black applied to the steel framing members to cushion and seal the glazing material when installed.

B. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
   1. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221 (ASTM B 221M).

C. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
   1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
   2. Cold-Rolled Sheet and Strip: ASTM A 611.
   3. Hot-Rolled Sheet and Strip: ASTM A 570/A 570M.

D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
   1. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
   2. Reinforce members as required to receive fastener threads.

3.05 ACCESSORIES

A. Fasteners: Use fasteners fabricated from Type 304 or Type 316 stainless steel.

B. Glazing Gaskets:
   1. Glazing gaskets for interior or exterior applications: ASTM C 864 (extruded EPDM rubber that provides for silicone adhesion) or ASTM C1115 Standard Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories (extruded silicone).

C. Intumescent Tape: As supplied by frame manufacturer.

D. Setting Blocks: ¼" Calcium silicate.

E. Perimeter Anchors: Steel.

F. Flashings: As recommended by manufacturer; same material and finish as cover caps.

G. Silicone Sealant: One-Part Low Modulus, neutral cure High Movement-Capable Sealant: Type S; Grade NS; Class 25 with additional movement capability of 100 percent in extension and 50 percent in compression (total 150 percent); Use (Exposure) NT; Uses (Substrates) M, G, A, and O as applicable. (Use-O joint substrates include: Metal factory-coated with a high-performance coating; galvanized steel; ceramic tile.)
   1. Available Products:
      a. Dow Corning 790, 795 - Dow Corning Corp.
      b. Momentive
      c. Tremco

H. Intumescent Caulk: Single component, latex-based, intumescent caulk designed to stop passage of fire, smoke, and fumes through fire-rated separations; permanently flexible after cure; will not support mold growth; flame spread/smoke developed 10/10.

1. Available Products:
   a. 3M CP-25 WP+

3.06 SLAG-WOOL-FIBER/ROCK-WOOL-FIBER INSULATION

A. Available Manufacturers:
   1. Fibrex Insulations Inc.
   2. Owens Corning
   3. Thermafiber.
   4. Rockwool

B. Unfaced, Slag-Wool-Fiber/Rock-Wool-Fiber Board Insulation: ASTM C 612, maximum flame-spread and smoke-developed indexes of 15 and 0, respectively; passing ASTM E 136 for combustion characteristics; and of the following nominal density and thermal resistivity:
   1. Nominal density of 4 lb/cu. ft. (64 kg/cu. m), Types IA and IB, thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F (27.7 K x m/W at 24 deg C).
   2. Fiber Color: Regular color, unless otherwise indicated.

3.07 FABRICATION

A. Obtain reviewed shop drawings prior to fabrication.

B. Fabrication Dimensions: Fabricate fire-rated assembly to field dimensions.

C. Factory prepared, fire-rated steel door assemblies by TGP to be prehung, prefinished with hardware preinstalled for field mounting.

D. Field glaze door and frame assemblies.

3.08 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish frames after assembly.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.

3.09 POWDERCOAT FINISHES

A. Finish after fabrication.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.

C. Steel or Aluminum Finishes
   1. Powder-Coat Finish: Polyester Super Durable powder coating which meets AAMA 2604 for chalking and fading. Apply manufacturer's standard powder coating finish system applied to factory-assembled frames before shipping, complying with manufacturer's recommended instructions for surface preparation including pretreatment, application, and minimum dry film thickness.
   2. Color and Gloss: As selected by Architect from manufacturer's full range.
   3. Acceptable Manufacturers:
      a. Tiger Drylac
      b. Additional manufacturers as approved by TGP

D. Aluminum Finishes
   1. Color: As selected by Architect from full range of industry colors and color densities.
   2. High-Performance Organic Finish (2-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA [2604] [2605] and with coating and resin manufacturers' written instructions.

3. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

4.01 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions. Verify openings are sized to receive curtain wall system and sill plate is level in accordance with manufacturer's acceptable tolerances.

B. Notify Architect of any conditions which jeopardize the integrity of the proposed fire wall / door system.

C. Do not proceed until such conditions are corrected.

4.02 INSTALLATION

A. See Fireframes Aluminum Series Installation Manual

4.03 REPAIR AND TOUCH UP

A. Anodized Finishes
   1. Protect the anodized finish from harsh chemicals such as concrete/mortar or muriatic acid/brick wash. If reasonable care is taken during handling and high and low pH chemicals can be avoided, repair and/or touch-up of an anodize finish will not be needed.
   2. Some rub marks on an anodized surface can be removed with a mild abrasive pad such as a Scotch-Brite pad prior to touch up painting.
   3. Touch-up paint should be used even more sparingly over anodize. Only the visible raw aluminum in the scratch or gouge should be touched up with a matching paint.

B. Powder Coated Finishes
   1. Limited to minor repair of small scratches. Use only manufacturer's recommended products.
   2. Such repairs shall match original finish for quality or material and view.
   3. Repairs and touch-up not visible from a distance of 5 feet Owner and Architect to approve.

C. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged.

4.04 PROTECTION AND CLEANING

A. Protect glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove non-permanent labels, and clean surfaces.
   1. Do not clean with astringent cleaners. Use a clean "grit free" cloth and a small amount of mild soap and water or mild detergent.
   2. Do not use any of the following:
      a. Steam jets
      b. Abrasives
      c. Strong acidic or alkaline detergents, or surface-reactive agents
      d. Detergents not recommended in writing by the manufacturer
      e. Do not use any detergent above 77 degrees F
      f. Organic solvents including but not limited to those containing ester, ketones, alcohols, aromatic compounds, glycol ether, or halogenated hydrocarbons.
      g. Metal or hard parts of cleaning equipment must not touch the glass surface

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION

SECTION 08 4313

ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors and frames.

C. Weatherstripping.

1.02 RELATED REQUIREMENTS

A. Section 07 2500 - Weather Barriers: Sealing framing to water-resistive barrier installed on adjacent construction.

B. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

C. Section 08 4413 - Glazed Aluminum Curtain Walls.

D. Section 08 7100 - Door Hardware: Hardware items other than specified in this section.

E. Section 08 8000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2020.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

E. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

F. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

C. Samples: Submit two samples ____by____ inches in size illustrating finished aluminum surface, glass, infill panels, glazing materials.

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

E. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

F. Installer's Qualification Statement.

G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aluminum-Framed Storefronts Manufacturers:
   1. Kawneer North America; _____: www.kawneer.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

A. Front-Set Style, Thermally-Broken:
   1. Basis of Design: Kawneer, 451-T.
   2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.

B. Front-Set Style, Not Thermally-Broken:
   1. Basis of Design: Kawneer, 451.
   2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.

C. Substitutions: See Section 01 6000 - Product Requirements.
   1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.03 BASIS OF DESIGN -- SWINGING DOORS

A. Medium Stile, Insulating Glazing, Thermally-Broken:
   1. Basis of Design: Kawneer.

2.04 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Finish: Class I natural anodized.
      a. Factory finish all surfaces that will be exposed in completed assemblies.
   2. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   3. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   4. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

5. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
6. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
7. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

B. Performance Requirements
1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
a. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
2. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf pressure difference.

2.05 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
1. Framing members for interior applications need not be thermally broken.
2. Glazing Stops: Flush.

B. Glazing: See Section 08 8000.

C. Swing Doors: Glazed aluminum.
1. Thickness: 1-3/4 inches.
2. Top Rail: 4 inches wide.
3. Vertical Stiles: 4-1/2 inches wide.
4. Bottom Rail: 10 inches wide.
5. Glazing Stops: Square.
6. Finish: Same as storefront.

2.06 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Fasteners: Stainless steel.

C. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.07 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.08 HARDWARE

A. For each door, include weatherstripping, sill sweep strip, and threshold.

B. Other Door Hardware: See Section 08 7100.

C. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.

D. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.

E. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Set thresholds in bed of sealant and secure.

J. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for general testing and inspection requirements.

B. Repair or replace storefront components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.06 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 4413

GLAZED ALUMINUM CURTAIN WALLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed curtain wall, with vision glazing and glass infill panels.

B. Firestopping between curtain wall and edge of floor slab.

1.02 RELATED REQUIREMENTS

A. Section 05 1200 - Structural Steel Framing: Steel attachment members.

B. Section 07 8400 - Firestopping: Firestop at system junction with structure.

C. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

D. Section 08 8000 - Glazing.

E. Section 12 2400 - Window Shades: Attachments to framing members.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

B. AAMA 501.4 - Recommended Static Test Method for Evaluating Curtain Wall and Storefront Systems Subjected to Seismic and Wind Induced Interstory Drifts; 2018.

C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

D. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

E. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

F. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

H. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021.

I. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2020.

J. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

K. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015.

L. ASTM C793 - Standard Test Method for Effects of Laboratory Accelerated Weathering on Elastomeric Joint Sealants; 2005 (Reapproved 2017).

M. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants; 2018.

N. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

O. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2016.

P. ASTM C1135 - Standard Test Method for Determining Tensile Adhesion Properties of Structural Sealants; 2015.

Q. ASTM C1184 - Standard Specification for Structural Silicone Sealants; 2018, with Editorial Revision.

R. ASTM C1249 - Standard Guide for Secondary Seal for Sealed Insulating Glass Units for Structural Sealant Glazing Applications; 2018.

S. ASTM C1401 - Standard Guide for Structural Sealant Glazing; 2014.

T. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

U. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

V. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, internal drainage details, glazing, and infill.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.

D. Shop Drawings: Provide details of proposed structural sealant glazing (SSG) and weather sealant joints indicating dimensions, materials, bite, thicknesses, profile, and support framing.

E. Samples: Submit two samples 16 by 16 inches in size illustrating finished aluminum surface, glazing, infill panels, and glazing materials.

F. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

G. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations; include load calculations at points of attachment to building structure.

H. Structural Sealant Glazing (SSG): Submit product data and calculations showing compliance with performance requirements.

I. Test Reports: Submit results of full-size mock-up testing. Reports of tests previously performed on the same design are acceptable.

J. Designer's Qualification Statement.

K. Manufacturer's Qualification Statement.

L. Installer's Qualification Statement.

M. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design curtain wall and its structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the State in which the Project is located.

B. Verify that each component is appropriate for use in structural sealant glazing (SSG) application in regards to at least the following properties; size, shape, dimensions, material, self-life, storage conditions, and color.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glazed Aluminum Curtain Walls Manufacturers:
   1. Kawneer North America; 1620UT SSG: www.kawneer.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 CURTAIN WALL

A. Aluminum-Framed Curtain Wall: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Outside triple-glazed, with pressure plate and mullion cover.
   2. Fabrication Method: Field fabricated stick system.
   3. Glazing Method: Field glazed system.
   4. Perimeter and Horizontal Mullion Dimensions: 2 inches wide by 6 3/4 inches deep.
   5. Vertical Mullions: Silicone butt glazed
   6. Finish: Class I natural anodized.
      a. Factory finish surfaces that will be exposed in completed assemblies.
      b. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
   7. Provide flush joints and corners, weathersealed, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   8. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   9. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   10. Maintain continuous air barrier and/or vapor retarder seal throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel and heel bead of glazing compound.

B. Structural Performance Requirements: Design and size components to withstand the following load requirements without damage or permanent set.
   1. Design Wind Loads: Comply with the following:
      a. Positive & Negative Design Wind Load: See Structural drawings (S006)
      b. Measure performance by testing in accordance with ASTM E330/E330M, using test loads equal to 1.5 times the design wind loads and 10 second duration of maximum pressure.
      c. Member Deflection: For spans less than 13 feet 6 inches, limit member deflection to flexure limit of glass in any direction, and maximum of 1/175 of span or 3/4 inch, whichever is less and with full recovery of glazing materials.

d. Member Deflection: For spans over 13 feet 6 inches and less than 40 feet, limit member deflection to flexure limit of glass in any direction, and maximum of 1/240 of span plus 1/4 inch, with full recovery of glazing materials.

2. Seismic Loads: Design and size components to withstand seismic loads and sway displacement in accordance with requirements of ASCE 7.
3. Interstory Differential Lateral Movement: Meeting pass/fail criteria of AAMA 501.4 for Use Group I, Standard Occupancy, when tested at design displacement of 0.010 times greater adjacent story height, maximum, and 1.5 times design displacement, through three complete cycles.
4. Movement: Accommodate the following movement without damage to components or deterioration of seals:
   a. Expansion and contraction caused by 180 degrees F surface temperature.
   b. Expansion and contraction caused by cycling temperature range of 170 degrees F over a 12 hour period.
   c. Movement of curtain wall relative to perimeter framing.
   d. Deflection of structural support framing, under permanent and dynamic loads.
5. Structural Sealant Glazing (SSG) System: For individual glass lites, design framing members to not exceed a deflection normal to the wall of L/175 between supports with 3/4 inch maximum, and a deflection parallel to the wall of L/360 with 1/8 inch maximum, whichever is less.

C. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on indoor face when tested as follows:
   1. Test Pressure Differential: 10 psf.

D. Air Leakage: 0.06 cfm/sq ft maximum leakage of wall area when tested in accordance with ASTM E283/E283M at 6.27 psf pressure difference across assembly.

E. Thermal Performance Requirements:
   1. Condensation Resistance Factor of Framing: 50, minimum, measured in accordance with AAMA 1503.

2.03 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.

B. Glazing: See Section 08 8000.

C. Infill Panels: Insulated, aluminum sheet face and back, with edges formed to fit glazing channel and sealed.
   1. Face Sheet: 0.032 inch thick.
   2. Core: Glass fiber insulation core with R-value of depth of mullion (R=12 min).
   3. Back Sheet: 0.032 inch thick.

D. Sun Screens: Shop fabricated, shop finished, extruded aluminum outriggers.
   1. Outrigger Shape: Straight.
   2. Design Criteria: Design and fabricate to resist the same loads as curtain wall system as well as the following loads without failure, damage, or permanent deflection:
      a. Snow: ___ psf; minimum.
      b. Live: ___ psf; minimum.
      c. Thermal Movement: Plus/minus 1/8 inch, maximum.
   3. Sizes: As indicated on drawings.
   4. Shop fabricate to the greatest extent possible; disassemble if necessary for shipping.
   5. Products:
      a. Terracotta, Agrob Buchtal: KeraShape.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209/B209M.

C. Structural Steel Sections including those inside long-span vertical mullions: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.

D. Structural Supporting Anchors: See Section 05 1200.

E. Structural Supporting Anchors Attached to Structural Steel: Design for bolted attachment.

F. Structural Supporting Anchors Attached to Reinforced Concrete Members: Design for welded attachment to weld plates embedded in concrete.

G. Fasteners: Stainless steel; type as required or recommended by curtain wall manufacturer.

H. Exposed Flashings: Aluminum sheet, 20 gauge, 0.032 inch minimum thickness; finish to match framing members.

I. Concealed Flashings: Sheet aluminum, 26 gauge, 0.017 inch minimum thickness.

J. Firestopping: See Section 07 8400.

K. Structural Sealant Glazing (SSG) Adhesive: Neutral curing, silicone sealant formulated for SSG applications in compliance with ASTM C1184 and structural glazing industry guidelines, ASTM C1401.
   1. SSG adhesive in compliance with ASTM C920; Type S - Single-component, Grade NS, Class 50, Use NT, G, and A.
   2. Ultimate Tensile Strength: Minimum of 50 psi as determined by test method ASTM C1135 under the following conditions.
      a. Exposure to air temperatures of 190 degrees F and minus 20 degrees F.
      b. Water immersion for seven (7) days, minimum.
      c. Exposure to weathering for 5,000 hours, minimum.
   3. Sealant Design Tensile Strength: 20 psi, maximum.
   4. Hardness: 20 to 60 with Type A-2 durometer in compliance with test method ASTM C661.
   5. Color: Black.
   6. SSG sealant tested for compatibility with glazing accessories in compliance with ASTM C1087, tested for accelerated weathering in compliance with ASTM C793, and in compliance with insulating glass secondary sealant design standards of ASTM C1249.

L. Weatherseal Sealant: Silicone, with adhesion in compliance with ASTM C794; compatible with glazing accessories.

M. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, and compatible with flashing material.

N. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

O. Beauty Caps: 2" at system perimeter and horizontal mullions as indicated in the drawings.

P. Glazing Accessories: See Section 08 8000.

Q. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.05 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

B. Color: To be selected by Architect from manufacturer's full range.

C. Touch-Up Materials: As recommended by coating manufacturer for field application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other related work.

B. Verify that curtain wall openings and adjoining water-resistive and air barrier seal materials are ready to receive work of this section.

C. Verify that anchorage devices have been properly installed and located.

3.02 INSTALLATION

A. Install curtain wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Install firestopping at each floor slab edge.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Structural Sealant Glazing (SSG) Adhesive: Install structural sealant glazing adhesive and weatherseal sealant in accordance with manufacturer's instructions.

J. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 0.5 inches per 100 ft, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

C. Sealant Space Between Curtain Wall Mullions and Adjacent Construction: Maximum of 3/4 inch and minimum of 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for general testing and inspection requirements.

B. Repair or replace curtain wall components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, take care to remove dirt from corners, and wipe surfaces clean.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 5113
ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extruded aluminum windows with fixed sash.

B. Factory glazing.

1.02 RELATED REQUIREMENTS

A. Section 07 2500 - Weather Barriers: Sealing frame to water-resistive barrier installed on adjacent construction.

B. Section 07 9200 - Joint Sealants: Sealing joints between window frames and adjacent construction.

1.03 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights; 2017.

B. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

D. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

E. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Include component dimensions, information on glass and glazing, and internal drainage details.

C. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, anchorage locations, _____, and installation requirements.

D. Samples:
   1. Sashes: Two samples, 12 by 12 inch in size illustrating typical corner construction, accessories, and finishes.

E. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
   1. Evidence of AAMA Certification.
   2. Evidence of WDMA Certification.
   3. Evidence of CSA Certification.
   4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.

F. Test Reports: Prior to submitting shop drawings or starting fabrication, submit test report(s) by independent testing agency showing compliance with performance requirements in excess of those prescribed by specified grade.

G. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

H. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

I. Installer's qualification statement.

J. Specimen warranty.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of AAMA CW-10.

B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F.

B. Maintain this minimum temperature during and 24 hours after installation of sealants.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Manufacturer Warranty: Provide 5-year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Kawneer 8225TL.

B. Other Acceptable - Aluminum Windows Manufacturers:
   1. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ALUMINUM WINDOWS

A. Aluminum Windows: Extruded aluminum frame and sash, factory fabricated, factory finished, with operating hardware, related flashings, and anchorage and attachment devices.
   1. Frame Depth: 2-1/4 inch.
   2. Provide factory-glazed units.
   3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for operating hardware and imposed loads.
   4. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
   5. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
   6. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

B. Fixed, Non-Operable Type:
   1. Construction: Thermally broken.
   2. Glazing: Double; clear; transparent.
   3. Exterior Finish: Class I natural anodized.

2.03 PERFORMANCE REQUIREMENTS

A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:
   1. Performance Class (PC): CW.

B. Design Pressure (DP): In accordance with applicable codes.

C. Water Leakage: No uncontrolled leakage on interior face when tested in accordance with ASTM E331 at differential pressure of 12.11 psf.

D. Air Leakage: 0.1 cfm/sq ft maximum leakage per unit area of outside window frame dimension when tested at 1.57 psf pressure difference in accordance with ASTM E283/E283M.

E. Overall Thermal Transmittance (U-value): 0.35, maximum, including glazing, measured on window sizes required for this project.

2.04 MATERIALS

2.05 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41, clear anodic coating not less than 0.7 mil thick.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings and adjoining water-resistive barrier materials are ready to receive aluminum windows; see Section 07 2500.

3.02 PRIME WINDOW INSTALLATION

A. Install windows in accordance with manufacturer's instructions.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

D. Install sill and sill end angles.

E. Set sill members and sill flashing in continuous bead of sealant.

F. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

3.03 TOLERANCES

A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.

3.05 CLEANING

A. Remove protective material from factory finished aluminum surfaces.

B. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.

C. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

END OF SECTION

SECTION 08 5659

SERVICE AND TELLER WINDOW UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Service and teller window units.

B. Service and teller window units with pass-through device.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2020.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate work with adjacent materials specified in other sections and as indicated on drawings and approved shop drawings.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate configuration, sizes, rough-in, mounting, anchors and fasteners, and installation clearances.

C. Samples for Selection of Finishes:
   1. Color Anodized Finishes: Frame member sections showing range of color to be expected in finished work.

D. Manufacturer Qualification Statement.

E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with at least ten years documented experience, and with ability to provide test reports showing that their standard manufactured products meet the specified requirements.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide manufacturer's warranty agreeing to repair or replace units and their components that fail in materials or workmanship within five years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Service and Teller Window Units:
   1. Quikserv Corp; _____: www.quikserv.com/#sle.

2.02 SERVICE AND TELLER WINDOW UNITS

A. Location: Built within interior wall, as indicated on drawings.

B. Type of Use: As indicated on drawings.

C. Window Type: Slider.
   1. Operation: Manual.
   2. Mounting: Flush with wall surface.
   3. Window Size: 24 inch wide by 36 inch high.
   4. Material: Aluminum.
      a. Finish: Clear anodized.

D. Glazing: Single (monolithic), clear.
   1. Tempered safety glazing.

E. Products:
   1. Quikserv Corp; T1-2436S Ticket Window with speak-thru and built-in deal tray: www.quikserv.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.03 ASSEMBLY COMPONENTS

A. Windows: Factory-fabricated, finished, and glazed, with extruded aluminum frame and glazing stops; complete with hardware and anchors.
   1. Provide window units that are re-glazable from the secure side without dismantling the non-secure side of framing.
   2. Rigidly fit and secure joints and corners with internal reinforcement. Make joints and connections flush, hairline, and weatherproof. Fully weld corners.
   3. Horizontal Sliding Windows: Top-hung operable sash; with thumb-turn release.

2.04 MATERIALS

A. Aluminum Extrusions: Minimum 1/8 inch thick frame and sash material complying with ASTM B221 and ASTM B221M.

B. Concealed Steel Items: Galvanized in accordance with ASTM A123/A123M to thickness Grade 85, 2.0 ounces per square foot.

C. Monolithic Glass: Fully tempered float glass; minimum 1/4 inch thickness.

D. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

2.05 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that window openings are ready for installation of windows.

B. Verify that correct embedded anchors are in place and in proper location; repair or replace anchors as required to achieve satisfactory installation.

C. Notify Architect if conditions are not suitable for installation of units; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install units in correct orientation (inside/outside or secure/non-secure).

C. Anchor units securely in manner so as to achieve performance specified.

3.03 ADJUSTING

A. Adjust operating components for smooth operation while also maintaining a secure, weather-tight enclosure and a tight fit at the contact points; lubricate operating hardware.

3.04 CLEANING

A. Remove protective material from factory finished surfaces.

B. Clean exposed surfaces promptly after installation without damaging finishes.

3.05 PROTECTION

A. Provide temporary protection to ensure that service and teller windows are without damage upon Date of Substantial Completion.

END OF SECTION

SECTION 08 7000
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood, aluminum, and hollow metal doors.
   1. Hardware for fire-rated doors.
   2. Electrically operated and controlled hardware.
   3. Thresholds.
   4. Weatherstripping and gasketing.
   5. RELATED REQUIREMENTS
      a. Section 08 1113 - Hollow Metal Doors and Frames.
         1) Section 08 1116 - Aluminum Doors and Frames.
         2) Section 08 1416 - Flush Wood Doors.
         3) Section 08 4413 - Glazed Aluminum Curtain Walls: Door hardware, except cylinders.
         4) Section 28 1000 - Access Control: Electronic access control devices.
   6. REFERENCE STANDARDS
      a. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
         1) BHMA (CPD) - Certified Products Directory; Current Edition.
         2) BHMA A156.1 - American National Standard for Butts and Hinges; 2016.
         3) BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches; 2017.
         4) BHMA A156.3 - American National Standard for Exit Devices; 2014.
         5) BHMA A156.4 - American National Standard for Door Controls - Closers; 2013.
         6) BHMA A156.6 - American National Standard for Architectural Door Trim; 2015.
         7) BHMA A156.13 - American National Standard for Mortise Locks & Latches Series 1000; 2017.
         8) BHMA A156.16 - American National Standard for Auxiliary Hardware; 2018.
         9) BHMA A156.17 - American National Standard for Self Closing Hinges & Pivots; 2014.
         10) BHMA A156.21 - American National Standard for Thresholds; 2014.
         11) BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems Sponsor; 2017.
         12) BHMA A156.23 - American National Standard for Electromagnetic Locks; 2017.
         13) BHMA A156.31 - American National Standard for Electric Strikes and Frame Mounted Actuators; 2013.
         14) BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2016.
         15) BHMA A156.115W - American National Standard for Hardware Preparation in Wood Doors with Wood or Steel Frames; 2006.
         16) ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
         17) ITS (DIR) - Directory of Listed Products; current edition.
         18) NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
         19) NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.
         20) NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2017.
         21) UL (DIR) - Online Certifications Directory; Current Edition.
         22) UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
   7. ADMINISTRATIVE REQUIREMENTS

a. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.
    1) Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

8. SUBMITTALS
    a. See Section 01 3000 - Administrative Requirements for submittal procedures.
        1) Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.
    b. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
        1) Prepared by or under supervision of Architectural Hardware Consultant (AHC).
        2) Provide complete description for each door listed.
        3) Provide manufacturer name, product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
        4) Shop Drawings - Electrified Door Hardware: Submit diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
            (a) Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).
            (b) Elevations: Submit front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
            (c) Diagrams: Submit point-to-point wiring diagram that shows each device in door opening system with related colored wire connections to each device.
        5) Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
        6) Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

9. QUALITY ASSURANCE
    a. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.

10. DELIVERY, STORAGE, AND HANDLING
    a. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

11. WARRANTY
    a. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
        1) Warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion.
            (a) Closers: Five years, minimum.
            (b) Exit Devices: Three years, minimum.
            (c) Locksets and Cylinders: Three years, minimum.
            (d) Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.
    1. Provide individual items of single type, of same model, and by same manufacturer.
    2. Provide door hardware products that comply with the following requirements:
        a. Applicable provisions of federal, state, and local codes.

b. Accessibility: ADA Standards and ICC A117.1.
c. Fire-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
d. Hardware on Fire-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), testing firm acceptable to authorities having jurisdiction, or as suitable for application indicated.
e. Listed and certified compliant with specified standards by BHMA (CPD).
f. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
g. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
h. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.
    1) Electrically Operated and/or Controlled Hardware: Provide necessary power supplies, power transfer hinges, relays, and interfaces as required for proper operation; provide wiring between hardware and control components and to building power connection in compliance with NFPA 70.
        (a) See Section 28 1000 for additional access control system requirements.
    2) Fasteners:
        (a) Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
            (1) Aluminum fasteners are not permitted.
            (2) Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
            (3) Fire-Rated Applications: Comply with NFPA 80.
            (4) Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
            (5) Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.

3. HINGES
    a. Hinges: Comply with BHMA A156.1, Grade 1.
        1) Provide hinges on every swinging door.
        2) Provide following quantity of butt hinges for each door:
4. PIVOTS
    a. Center-Hung and Offset Pivots: Comply with BHMA A156.4.
        1) Self-Closing Pivots: Comply with BHMA A156.17.
5. EXIT DEVICES
    a. Exit Devices: Comply with BHMA A156.3, Grade 1.
        1) Lever design to match lockset trim.
        2) Provide cylinder with cylinder dogging or locking trim.
        3) Provide exit devices properly sized for door width and height.
        4) Provide strike as recommended by manufacturer for application indicated.
        5) Provide UL (DIR) listed exit device assemblies for fire-rated doors and panic device assemblies for non-fire-rated doors.
6. ELECTRIC STRIKES
    a. Electric Strikes: Comply with BHMA A156.31, Grade 1.
        1) Provide UL (DIR) listed burglary-resistant electric strike; style to suit locks.
        2) Provide non-handed 24 VDC electric strike suitable for door frame material and scheduled lock configuration.
7. ELECTROMAGNETIC LOCKS
    a. Electromagnetic Locks: Comply with BHMA A156.23, Grade 1.
        1) Holding Force: 600 lbs, minimum.
        2) Voltage: 12 VDC, and provide power supplies by same manufacturer as locks.

3) Mounting: Surface mounted to door and frame on secure side, with fasteners, brackets, and spacer bars as required for application.

B. LOCK CYLINDERS
1. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
a. Provide cylinders from same manufacturer as locking device.
b. Provide cams and/or tailpieces as required for locking devices.
2. CYLINDRICAL LOCKS
a. Cylindrical Locks (Bored): Comply with BHMA A156.2, Grade 1, 4000 Series.
1) Bored Hole: 2-1/8 inch diameter.
2) Latchbolt Throw: 1/2 inch, minimum.
3) Backset: 2-3/4 inch unless otherwise indicated.
4) Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
(a) Finish: To match lock or latch.

C. MORTISE LOCKS
1. Mortise Locks: Comply with BHMA A156.13, Grade 1, Security, 1000 Series.
a. Latchbolt Throw: 3/4 inch, minimum.
b. Deadbolt Throw: 1 inch, minimum.
c. Backset: 2-3/4 inch unless otherwise indicated.
d. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
1) Finish: To match lock or latch.

D. DOOR PULLS AND PUSH PLATES
1. Door Pulls and Push Plates: Comply with BHMA A156.6.
a. Pull Type: Straight, unless otherwise indicated.
b. Push Plate Type: Flat, with square corners, unless otherwise indicated.
1) Edges: Beveled, unless otherwise indicated.
(a) Material: Aluminum, unless otherwise indicated.
2. COORDINATORS
a. Coordinators: Provide on doors having closers and self-latching or automatic flush bolts to ensure that inactive door leaf closes before active door leaf.
1) Type: Bar, unless otherwise indicated.
2) Material: Aluminum, unless otherwise indicated.
3) Ensure that coordination of other door hardware affected by placement of coordinators and carry bar is applied properly for completely operable installation.

E. CLOSERS
1. Manufacturers; Concealed - Overhead:
a. Closers: Comply with BHMA A156.4, Grade 1.
1) Type: Surface mounted to door.
2) Provide door closer on each exterior door.
2. PROTECTION PLATES
a. Protection Plates: Comply with BHMA A156.6.
1) Edges: Beveled, on four sides unless otherwise indicated.
2) Fasteners: Countersunk screw fasteners.
3. ARMOR PLATES
a. Armor Plates: Provide on bottom half of push side of doors that require protection from objects moving through openings that may damage door surface.
1) Size: 16 inch high by 1-1/2 inch less door width (LDW) on pull side and 2 inch LDW on push side of door.

F. KICK PLATES
1. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
a. Size: 8 inch high by 2 inch less door width (LDW) on push side of door.

G. DOOR HOLDERS
1. Door Holders: Comply with BHMA A156.16, Grade 1.
a. Type: Lever, or kick down stop, with rubber bumper at bottom end.
b. Material: Aluminum.

H. WALL STOPS
1. Wall Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
a. Type: Bumper, concave, wall stop.
b. Material: Aluminum housing with rubber insert.

I. ASTRAGALS
1. Astragals: Comply with BHMA A156.22.
a. Type: Split, two parts, and with sealing gasket.
b. Material: Aluminum, with neoprene weatherstripping.
c. Provide non-corroding fasteners at exterior locations.
2. THRESHOLDS
a. Thresholds: Comply with BHMA A156.21.
1) Provide threshold at each exterior door, unless otherwise indicated.
2) Type: Flat surface.
3) Material: Aluminum.
4) Threshold Surface: Fluted horizontal grooves across full width.
5) Field cut threshold to profile of frame and width of door sill for tight fit.
6) Provide non-corroding fasteners at exterior locations.
3. WEATHERSTRIPPING AND GASKETING
a. Weatherstripping and Gasketing: Comply with BHMA A156.22.
1) Head and Jamb Type: Adjustable.
2) Door Sweep Type: Encased in retainer.
3) Material: Aluminum, with brush weatherstripping.
4. COAT HOOKS
a. Coat Hooks: Provide on room side of door, screw fastened.
1) Material: Brass.

J. SILENCERS
1. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
a. Single Door: Provide three on strike jamb of frame.
b. Pair of Doors: Provide two on head of frame, one for each door at latch side.
c. Material: Rubber, gray color.
2. EXIT MOTION SENSOR
a. Exit Motion Sensor: Interior passive infrared detection device to initiate door release of exit door magnetic lock.
1) Power: 12 VDC.
2) Provide adjustable detector face to allow for precise pattern configurations, and easy pattern adjustment.
3) Provide relay that operates before transistor to prevent false alarms.
4) Operating Temperature: 32 to 110 degrees F.
3. POWER SUPPLY
a. Power Supply: Hard wired, with multiple zones providing eight (8) breakers for each output panel with individual control switches and LED's; UL (DIR) Class 2 listed.
1) Power: 24 VAC, 10 Amp; with 120 VAC power supply.

2) Operating Temperature: 32 to 110 degrees F.
3) Provide with emergency release terminals that release devices upon activation of fire alarm system.

2.02 FINISHES PART 3 EXECUTION

A. INSTALLATION
1. Install hardware in accordance with manufacturer's instructions and applicable codes.
   a. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.
   b. Use templates provided by hardware item manufacturer.
   c. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
   d. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.
2. FIELD QUALITY CONTROL
   a. Perform field inspection and testing under provisions of Section 01 4000 - Quality Requirements.
3. ADJUSTING
   a. Adjust work under provisions of Section 01 7000 - Execution and Closeout Requirements.
      1) Adjust hardware for smooth operation.
      2) Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.
4. CLEANING
   a. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.
      1) Clean adjacent surfaces soiled by hardware installation.
      2) Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.
5. PROTECTION
   a. Protect finished Work under provisions of Section 01 7000 - Execution and Closeout Requirements.
      1) Do not permit adjacent work to damage hardware or finish.

END OF SECTION

SECTION 08 8000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.
B. Glazing units.
C. Plastic films.
D. Glazing compounds.
E. Decorative glazing.

1.02 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.
B. Section 08 1416 - Flush Wood Doors: Glazed lites in doors.
C. Section 08 3200 - Sliding Glass Doors: Glazing provided by door manufacturer.
D. Section 08 4126 - All-Glass Entrances and Storefronts: Glazing provided as part of entrance assembly.
E. Section 08 4313 - Aluminum-Framed Storefronts: Glazing provided as part of storefront assembly.
F. Section 08 4413 - Glazed Aluminum Curtain Walls: Glazing provided as part of wall assembly.
G. Section 08 5113 - Aluminum Windows: Glazing provided by window manufacturer.
H. Section 08 5659 - Service and Teller Window Units: Glazing provided as part of assembly.
I. Section 08 8300 - Mirrors.
J. Section 08 8813 - Fire-Rated Glazing.
K. Section 10 2219 - Demountable Partitions: Glazed panels.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.
B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015.
C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2015).
D. ASTM C1036 - Standard Specification for Flat Glass; 2016.
E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.
F. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021.
G. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.
H. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.
I. GANA (GM) - GANA Glazing Manual; 2008.
J. GANA (SM) - GANA Sealant Manual; 2008.
K. GANA (LGRM) - Laminated Glazing Reference Manual; 2009.
L. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (2016).
M. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2017.

N. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2014, with Errata (2017).

O. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2017.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit two samples 12" by 12" inch in size of glass and decorative units.

E. Certificate: Certify that products of this section meet or exceed specified requirements.

F. Installer's qualification statement.

G. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods. Maintain one copy on site.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years experience.

1.06 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

C. Heat Soaked Tempered Glass: Provide a five (5) year manufacturer warranty to include coverage for spontaneous breakage of fully tempered glass caused by nickel sulfide (NiS) inclusions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass Fabricators:
   1. Viracon, Inc: www.viracon.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Float Glass Manufacturers:
   1. Vitro Architectural Glass (formerly PPG Glass); _____: www.vitroglazings.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

C. Mirrored Glass Manufacturers:
   1. Pilkington North America Inc; Pilkington Mirropane Transparent Mirror: www.pilkington.com/na/#sle.

D. Decorative Interior Glazing Manufacturer:
   1. 3Form.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
   3. Glass thicknesses listed are minimum.

B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
   1. In conjunction with weather barrier related materials described in other sections, as follows:

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
   1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
   2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
   3. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
   4. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
   5. Heat-Soak Testing (HST): Provide HST of fully tempered glass used on canopy, point-supported, spider wall, high-risk, sloping overhead, horizontal overhead, free-standing glass protective barrier, or other demanding applications of project, to reduce risks of spontaneous breakage due to nickel sulfide (NiS) induced fractures in accordance with industry established testing requirements.

2.04 INSULATING GLASS UNITS

A. Manufacturers:
   1. Glass: Any of the manufacturers specified for float glass.
   2. Vitro Architectural Glass (formerly PPG Glass); Solarban 72: www.vitroglazings.com/#sle.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Insulating Glass Units: Types as indicated.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   3. Metal-Edge Spacers: Aluminum, bent and soldered corners.
   4. Spacer Color: Black.
   5. Edge Seal:
      a. Color: Black.
   6. Purge interpane space with dry air, hermetically sealed.

C. Insulating Glass Units: Vision glass, double glazed.
   1. Applications: Insulated Hollow Metal System(s).
   2. Space between lites filled with air.

3. Outboard Lite: Fully tempered float glass, 1/4 inch thick.
   a. Tint: Clear.
4. Metal edge spacer.
5. Inboard Lite: Fully tempered float glass, 1/4 inch thick.
   a. Tint: Clear.
   b. Coating: Low-E (passive type), on #3 surface.

D. IGL-1 Insulating Glass Units: Vision glass, triple glazed.
1. Applications: Exterior glazing unless otherwise indicated.
2. Space between lites filled with air.
3. Outboard Lite: Fully tempered float glass, 1/4 inch thick.
   a. Tint: Clear.
   b. Coating: Solarban 72 on #2 surface.
   c. Coating: Self-cleaning type, Pilkington Activ on #1 surface.
4. Middle Lite: Fully tempered float glass, 1/4 inch thick.
   a. Tint: Clear.
5. Inboard Lite: Fully tempered float glass, 1/4 inch thick.
   a. Tint: Clear.

E. [IGL-1A] Insulating Glass Units: Horizontal Frit, triple glazed.
1. Applications: Exterior glazing where indicated on drawings.
2. Space between lites filled with air.
3. Outboard lite: Fully tempered, 1/4 inch thick.
   a. Tint: Clear.
   b. Coating: Solarban 72 on #2 surface.
   c. Coating: Self-cleaning type, Pilkington Activ on #1 surface.
4. Middle Lite: Fully tempered, 1/4 inch thick.
   a. Tint: Clear.
5. Inboard Lite: Fully tempered, 1/4 inch thick.
   a. Tint: Clear.
   b. Coating: 30% white ceramic frit horizontal lines on #5 surface

F. [IGL-2] Insulating Glass Units: Opaque Spandrel glass, triple glazed.
1. Applications: Exterior spandrel glazing.
2. Space between lites filled with air.
3. Outboard Lite: Fully tempered, 1/4 inch thick
   a. Tint: Clear.
   b. Coating: Solarban 72 on #2 surface.
   c. Coating: Self-cleaning type, Pilkington Activ on #1 surface.
4. Middle Lite: Fully tempered, 1/4 inch thick.
   a. Tint: Clear.
5. Inboard Lite: Fully tempered, 1/4 inch thick.
   a. Tint: Clear.
   b. Opacifier: Ceramic frit on #5 surface.
      1) Opaci-coat 300.
      2) Color: 2-3868 vine leaf.

G. [GLX] Decorative Interior Glazing: Varia
1. Applications: Interior
   a. Glazing: Safety.
   b. Gauge: 3/4 inch.
   c. Color: To be selected from manufacturer full range.
   d. Mounting hardware: 3Form top support 200.25.

2.05 GLAZING UNITS

A. Monolithic Interior Vision Glazing:

1. Applications: Interior glazing unless otherwise indicated.
2. Glass Type: Fully tempered float glass.
3. Tint: Clear.
4. Thickness: 1/4 inch, nominal.

B. Monolithic Safety Glazing: Non-fire-rated.
1. Applications:
   a. Glazed lites in doors, except fire doors.
   b. Glazed sidelights to doors, except in fire-rated walls and partitions.
   c. Other locations required by applicable federal, state, and local codes and regulations.
   d. Other locations indicated on drawings.
2. Glass Type: Fully tempered safety glass as specified.
3. Tint: Clear.
4. Thickness: 1/4 inch, nominal.

2.06 PLASTIC FILMS

A. Type VF1 - Solar Control Plastic Film: Vinyl type.
1. locations: PHARMACY PICK-UP (100A) Demountable Partitions DP03 and DP02, north elevation in STAFF WORK AREA (180), Nanowall assembly north elevation of WAITING (130), south elevation of ADMIN (133), east elevation of FLEXIBLE GATHERING/LEARNING MEETING AREA (125), east elevation of ICT BREAK ROOM (201), and glazed partitions of TALKING ROOM (202).
2. Color: White.
3. Thickness Without Liner: 0.00236 inch.
4. Manufacturers:
   a. 3M Window Films; S70: solutions.3m.com/wps/portal/3M/en_US/Window_Film/Solutions/#sle.

B. VF2 - Safety and Security Plastic Film: Polyester type.
1. Locations: West wall of PHARMACY TEAM (104) and TALKING/CONF (105), exterior glazing ini STAFF BREAK (108) and LOCKER (109).
2. Color: Clear.
3. Thickness Without Liner: 0.002 inch.

2.07 GLASS COATINGS

A. Solar Control Coating: Two-component, metal-oxide nano-particles with 5 percent solids content, minimum.
1. Application: Locations as indicated on drawings.
2. Color: Clear, fade resistant.
3. Dry Film Thickness: 10 microns, bubble and crack resistant.

2.08 GLAZING COMPOUNDS

A. Type GC-1 - Glazing Putty: Polymer modified latex recommended by manufacturer for outdoor use, knife grade consistency; gray color.

2.09 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Tape: Closed cell polyvinyl chloride (PVC) 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 effect an air barrier and vapor retarder seal; ____x____ inch size.

D. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

2.10 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 FIELD QUALITY CONTROL

A. Monitor and report installation procedures and unacceptable conditions.

3.06 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove non-permanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.07 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 08 8300
MIRRORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass mirrors.
   1. Tempered safety glass.

1.02 RELATED REQUIREMENTS

A. Section 10 2800 - Toilet, Bath, and Laundry Accessories: Metal mirror frames.

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2020.

B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

C. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

1.05 QUALITY ASSURANCE

A. Fabricate, store, transport, receive, install, and clean mirrors in accordance with manufacturer's recommendations.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for reflective coating on mirrors and replacement of same.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Mirrors:
   1. Binswanger Mirror/ACI Distribution; ____: www.binswangerglass.com/#sle.
   2. Trulite Glass and Aluminum Solutions; _____: www.trulite.com/#sle.
   3. Walker Glass Company Ltd; Walker Glass Mirrors: www.walkerglass.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.

B. Mirror Glass: Clear, tempered safety glass; ASTM C1048, with copper and silver coatings, and protective overcoating.
   1. Thickness: 1/4 inch.
   2. Size: As indicated on drawings.

2.03 ACCESSORIES

A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness.

B. Glazing Tape: Preformed butyl compound; 10 to 15 Shore A durometer hardness; on release paper.

C. Mirror Attachment Accessories: Stainless steel clips.

D. Mirror Adhesive: Silicone pre-polymer based, chemically compatible with mirror coating and wall substrate.

E. U-Shape Frame: Aluminum extrusion, dimensions as detailed on drawings.
   1. Material: Comply with ASTM B221 (ASTM B221M), 6005-T6 alloy and temper.
   2. Finish: Anodized, clear.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

3.02 INSTALLATION

A. Install mirrors in accordance with manufacturer's recommendations.

B. Set mirrors plumb and level, and free of optical distortion.

C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

3.03 CLEANING

A. Remove wet glazing materials from finish surfaces.

B. Remove labels after work is complete.

C. Clean mirrors and adjacent surfaces.

END OF SECTION

SECTION 08 8813
FIRE-RATED GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire-rated glazing units.

B. Glazing compounds.

1.02 RELATED REQUIREMENTS

A. Section 08 1416 - Flush Wood Doors: Glazed lites in doors.

B. Section 08 4123 - Fire Rated Aluminum Frames Entrances and Storefronts.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015.

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2015).

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

E. ASTM C1036 - Standard Specification for Flat Glass; 2016.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

G. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.

H. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

I. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2020.

J. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

K. GANA (GM) - GANA Glazing Manual; 2008.

L. GANA (SM) - GANA Sealant Manual; 2008.

M. GANA (LGRM) - Laminated Glazing Reference Manual; 2009.

N. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

O. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (2016).

P. ITS (DIR) - Directory of Listed Products; current edition.

Q. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2017.

R. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2017.

S. UL (DIR) - Online Certifications Directory; Current Edition.

T. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

U. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

V. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data on Glazing Unit Glazing Types: Provide structural, physical, and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Two samples ___ by ___ inch in size of glass units.

E. Certificate: Certify that products of this section meet or exceed specified requirements.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements for additional provisions.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods. Maintain one copy on site.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of experience.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty for Laminated Glass: Provide five-year manufacturer warranty coverage for delamination, including providing products to replace failed units, and commencing on the Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass Fabricators:
   1. Fireglass.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Fire-Resistance-Rated Glass:
   1. Firelite Plus, Fireglass
      a. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads and withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   2. Provide glass edge support system sufficiently stiff to limit lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
   3. Glass thicknesses listed are minimum.

B. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated, in accordance with manufacturer's published data as determined with the following procedures or test methods:
   1. Solar Optical Properties: Comply with NFRC 300 test method.

C. Fully Tempered Safety Glass: Comply with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
   2. Kind FT - Fully Tempered Type: Comply with ASTM C1048.

3. Impact-Resistant Safety Glass: Comply with ANSI Z97.1 - Class B, or 16 CFR 1201 - Category I criteria.

B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
   1. Laminated Safety Glass: Comply with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.

2.04 GLAZING UNITS

A. Fire-Resistance-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and blocks radiant heat, as required to achieve indicated fire rating period exceeding 120 minutes.
   1. Applications:
      a. Glazing in fire-rated door assembly.
      b. Glazing in sidelites, borrowed lites, and other glazed openings in fire-rated wall assemblies.
   2. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
   3. Safety Glazing Certification: 16 CFR 1201 Category II.
   4. Fire Rating Period: As indicated on drawings.
   5. Markings for Fire-Resistance-Rated Glazing Assemblies: Provide permanent markings on fire-resistance-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction.
      a. "W" - meets wall assembly criteria of ASTM E119 or UL 263 fire test standards.
      b. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
      c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire test standards.
      d. "T" - meets temperature rise of not more than 450 degrees F above ambient at end of 30 minutes fire exposure in accordance with NFPA 252, UL 10B, or UL 10C fire test standards.
      e. "XXX" - placeholder that represents fire rating period, in minutes.
   6. Products:
      a. Firelite.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.05 GLAZING COMPOUNDS

A. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; nonbleeding, nonstaining; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; _____ color.

2.06 ACCESSORIES

A. Setting Blocks: Aluminum silicate, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Continuous by one half the height of glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Gaskets: Flexible intumescent seals.
   1. Material: Co-extruded intercalated graphite combined with thermoplastic lip.

2.07 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

C. Verify that sealing between joints of glass framing members has been completed effectively.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION - GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers unless more stringent requirements are indicated, including those in referenced glazing standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

F. Prevent glass from contact with contaminating substances that may result from construction operations including, but not limited to weld spatter, fire-safing, plastering, mortar droppings, etc.

3.04 INSTALLATION - DRY GLAZING METHOD (TAPE AND TAPE)

A. Application - Interior Glazed: Set glazing infills from interior of building.

B. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sightline.

C. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.

D. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.

E. Place glazing tape on free perimeter of glazing in same manner described above.

F. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.

G. Carefully trim protruding tape with knife.

3.05 FIELD QUALITY CONTROL

A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

3.06 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove non-permanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than four days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.07 PROTECTION

A. After installation, mark pane with 'X' by using removable plastic tape or paste; do not mark heat-absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 09 0561

COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
   1. Resilient tile and sheet.
   2. Carpet tile.
   3. Thin-set ceramic tile and stone tile.

B. Removal of existing floor coverings.

C. Preparation of new and existing concrete floor slabs for installation of floor coverings.

D. Testing of concrete floor slabs for moisture and alkalinity (pH).

E. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
   1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.

1.02 RELATED REQUIREMENTS

A. Section 01 2300 - Alternates: Bid pricing for remediation treatments if required.

B. Section 03 3000 - Cast-in-Place Concrete: Moisture emission reducing curing and sealing compound for slabs to receive adhered flooring, to prevent moisture content-related flooring failures; to remain in place, not to be removed.

1.03 PRICE AND PAYMENT PROCEDURES

A. Alternates : See Section 01 2300 - Alternates.

1.04 REFERENCE STANDARDS

A. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2016a.

B. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

C. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2011.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.06 SUBMITTALS

A. Visual Observation Report: For existing floor coverings to be removed.

B. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

C. Testing Agency's Report:
   1. Description of areas tested; include floor plans and photographs if helpful.
   2. Summary of conditions encountered.
   3. Moisture and alkalinity (pH) test reports.
   4. Copies of specified test methods.
   5. Recommendations for remediation of unsatisfactory surfaces.
   6. Submit report directly to Owner.

7. Submit report not more than two business days after conclusion of testing.

D. Floor Moisture Testing Technician Certificate: International Concrete Repair Institute (ICRI) Concrete Slab Moisture Testing Technician- Grade I certificate.

1.07 QUALITY ASSURANCE

A. Moisture and alkalinity (pH) testing will be performed by an independent testing agency employed and paid by Owner.

B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
   1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

C. Contractor's Responsibility Relating to Independent Agency Testing:
   1. Provide access for and cooperate with testing agency.
   2. Confirm date of start of testing at least 10 days prior to actual start.
   3. Allow at least 4 business days on site for testing agency activities.
   4. Achieve and maintain specified ambient conditions.
   5. Notify Owner when specified ambient conditions have been achieved and when testing will start.

D. Floor Moisture Testing Technician Qualifications: International Concrete Repair Institute (ICRI) Concrete Slab Moisture Testing Technician Certification- Grade I.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with manufacturer’s instructions and recommendations.

B. Deliver materials in manufacturer’s packaging; include installation instructions.

C. Keep materials from freezing.

1.09 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 MATERIALS

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
   1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:
      a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.
      b. Removal of existing floor covering.
   2. Preliminary cleaning.
   3. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
   4. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   5. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   6. Specified remediation, if required.
   7. Patching, smoothing, and leveling, as required.

8. Other preparation specified.
9. Adhesive bond and compatibility test.
10. Protection.

B. Remediations:
1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.
3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.02 REMOVAL OF EXISTING FLOOR COVERINGS

A. Comply with local, State, and federal regulations and recommendations of RFCI Recommended Work Practices for Removal of Resilient Floor Coverings, as applicable to floor covering being removed.

B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.03 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.04 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.

F. Report: Report the information required by the test method.

3.05 INTERNAL RELATIVE HUMIDITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F2170 Procedure A and as follows.

D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

F. Report: Report the information required by the test method.

3.06 ALKALINITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.07 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Do not fill expansion joints, isolation joints, or other moving joints.

3.08 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.
B. Metal stud wall framing.
C. Metal channel ceiling framing.
D. Acoustic insulation.
E. Gypsum sheathing.
F. Cementitious backing board.
G. Gypsum wallboard.
H. Joint treatment and accessories.
I. Plenum space sound control.
J. Textured finish system.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.
B. Section 07 2100 - Thermal Insulation: Acoustic insulation.
C. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.
D. Section 07 9200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.
E. Section 09 2216 - Non-Structural Metal Framing.
F. Section 09 3000 - Tiling: Tile backing board.

1.03 REFERENCE STANDARDS

A. ASHRAE Std 62.1 - Ventilation for Acceptable Indoor Air Quality; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.
C. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017.
D. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2018.
E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.
F. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.
G. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2020.
H. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2019.
I. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.
J. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing; 2018.
K. ASTM C1288 - Standard Specification for Discrete Non-Asbestos Fiber-Cement Interior Substrate Sheets; 2017.
L. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

M. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2019.

N. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2019, with Ediorial Revision (2020).

O. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.

P. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021.

Q. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

R. ASTM E413 - Classification for Rating Sound Insulation; 2016.

S. GA-216 - Application and Finishing of Gypsum Panel Products; 2016.

T. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

C. Samples: Submit two samples of gypsum board finished with proposed texture application, 12 by 12 inches in size, illustrating finish color and texture.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 3 years of experience.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
   1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. Shaft Walls at HVAC Shafts: Provide completed assemblies with the following characteristics:
   1. Air Pressure Within Shaft: Sustained loads of 5 lbf/sq ft with maximum mid-span deflection of L/240.
   2. Acoustic Attenuation: STC of 35-39 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

D. Fire-Resistance-Rated Assemblies: Provide completed assemblies complying with applicable code.
   1. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.02 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. ClarkDietrich; ____: www.clarkdietrich.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Non-structural Steel Framing for Application of Gypsum Board: See Section 09 2216.

C. Non-structural Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.

1. Studs: C-shaped with knurled or embossed faces.
2. Paired Studs for Sound-Rated Assemblies: Engineered single-piece assemblies comprised of paired studs coupled by sound isolators, designed to replace conventional side-by-side, parallel, double-wall partition framing.
   a. Widths: As indicated on drawings.
3. Runners: U shaped, sized to match studs.
4. Ceiling Channels: C-shaped.
5. Sill Plate Isolation Pads: Acoustical separation between sole plate and subfloor.

D. Shaft Wall Studs and Accessories: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.
   1. Products:
      a. Same manufacturer as other framing materials.

E. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and screwed to secondary deflection channel set inside but unattached to top track.

F. Deflection and Firestop Track: Intumescent strip factory-applied to track flanges expands when exposed to heat or flames to provide a perimeter joint seal.

G. Non-structural Framing Accessories:
   1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
   2. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.
   3. Framing Connectors: ASTM A653/A653M G90 galvanized steel clips; secures cold rolled channel to wall studs for lateral bracing.

H. Grid Suspension Systems: Steel grid system of main tees and support bars connected to structure using hanging wire.
   1. Products:
      a. USG Corporation; Drywall Suspension System: www.usg.com/#sle.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. American Gypsum Company; ____: www.americangypsum.com/#sle.
   2. CertainTeed Corporation; ____: www.certainteed.com/#sle.
   3. Georgia-Pacific Gypsum; ____: www.gpgypsum.com/#sle.
   4. National Gypsum Company; ____: www.nationalgypsum.com/#sle.
   5. USG Corporation; ____: www.usg.com/#sle.
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. Glass mat faced gypsum panels, as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
   3. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   4. Thickness:
      a. Vertical Surfaces: 5/8 inch.
      b. Ceilings: 5/8 inch.
      c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
   5. Paper-Faced Products:
      a. American Gypsum Company; FireBloc Type X Gypsum Wallboard: www.americangypsum.com/#sle.
      b. CertainTeed Corporation; Type X Drywall: www.certainteed.com/#sle.
      c. Continental Building Products; Firecheck Type X: www.continental-bp.com/#sle.

d. Georgia-Pacific Gypsum; ToughRock Fireguard X: www.gpgypsum.com/#sle.
e. Substitutions: See Section 01 6000 - Product Requirements.

6. Mold Resistant Paper Faced Products:
   a. American Gypsum Company; M-Bloc Type X: www.americangypsum.com/#sle.
   b. CertainTeed Corporation; M2Tech 5/8" Type X Moisture & Mold Resistant Drywall: www.certainteed.com/#sle.
   c. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard: www.gpgypsum.com/#sle.
7. Glass Mat Faced Products:
   a. National Gypsum Company; Gold Bond eXP Interior Extreme Gypsum Panel: www.nationalgypsum.com/#sle.
   b. Substitutions: See Section 01 6000 - Product Requirements.

C. Impact Resistant Wallboard:
1. Application: Loading/Staging (Room 110).
2. Surface Abrasion: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
3. Hard Body Impact: Level 2, minimum, when tested in accordance with ASTM C1629/C1629M.
4. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
5. Type: Fire-resistance-rated Type X, UL or WH listed.
6. Thickness: 5/8 inch.
7. Edges: Tapered.
8. Paper-Faced Products:
   a. American Gypsum Company; M-Bloc IR Type X: www.americangypsum.com/#sle.
   b. CertainTeed Corporation; Extreme Impact Resistant Drywall with M2Tech: www.certainteed.com/#sle.
   c. National Gypsum Company; Gold Bond Hi-Impact XP Gypsum Board: www.nationalgypsum.com/#sle.
   d. USG Corporation; USG Sheetrock Brand Mold Tough VHI Firecode X Panels: www.usg.com/#sle.

D. Backing Board For Wet Areas: One of the following products:
1. Application: Surfaces behind tile in wet areas including _____.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. ASTM Cement-Based Board: Non-gypsum-based, cementitious board complying with ASTM C1288.
   a. Thickness: 1/2 inch.

E. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Ceilings, unless otherwise indicated.
2. Thickness: 1/2 inch.
3. Edges: Tapered.
4. Products:
   a. CertainTeed Corporation; 1/2" Easi-Lite: www.certainteed.com/#sle.
   b. Substitutions: See Section 01 6000 - Product Requirements.

F. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
1. Application: Exterior sheathing, unless otherwise indicated.
2. Glass Mat Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.
3. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
4. Core Type: Type X.
5. Type X Thickness: 5/8 inch.

6. Edges: Square.
7. Glass Mat Faced Products:
    a. American Gypsum Company; M-Glass Exterior Sheathing Type X: www.americangypsum.com/#sle.
    b. CertainTeed Corporation; GlasRoc Type X Exterior Sheathing: www.certainteed.com/#sle.
    c. Georgia-Pacific Gypsum; DensGlass Fireguard Sheathing: www.gpgypsum.com/#sle.
    d. National Gypsum Company; Gold Bond eXP Sheathing: www.nationalgypsum.com/#sle.
    e. USG Corporation; USG Securock Brand Ultralight Glass-Mat Sheathing Firecode X: www.usg.com/#sle.
    f. Substitutions: See Section 01 6000 - Product Requirements.

G. Exterior Soffit Board: Exterior gypsum soffit board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Ceilings and soffits in protected exterior areas, unless otherwise indicated.
2. Types: Type X, in locations indicated.
3. Type X Thickness: 5/8 inch.
4. Edges: Tapered.
5. Products:
    a. American Gypsum Company; Exterior Soffit Gypsum Wallboard Type X: www.americangypsum.com/#sle.
    b. Georgia-Pacific Gypsum; ToughRock Fireguard C Soffit Board: www.gpgypsum.com/#sle.
    c. Substitutions: See Section 01 6000 - Product Requirements.

H. Shaftwall and Coreboard: Type X; 1 inch thick by 24 inches wide, beveled long edges, ends square cut.
1. Paper-Faced Type: Gypsum shaftliner board or gypsum coreboard as defined ASTM C1396/C1396M; water-resistant faces.
2. Paper-Faced Products:
    a. American Gypsum Company; M-Bloc Shaft Liner: www.americangypsum.com/#sle.
    b. CertainTeed Corporation; M2Tech Type X Shaftliner: www.certainteed.com/#sle.
    c. Georgia-Pacific Gypsum; ToughRock Shaftliner: www.gpgypsum.com/#sle.
    d. National Gypsum Company; Gold Bond Fire-Shield Shaftliner XP: www.nationalgypsum.com/#sle.
    e. Substitutions: See Section 01 6000 - Product Requirements.

2.04 PLENUM SPACE SOUND CONTROL

A. Manufacturers:
1. AcoustiGuard – WILREP LTD; Privacy Board and Return-Air Silencers: www.acoustiguard.com/#sle.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: Acoustical extension wall board for noise control within ceiling plenums above wall partitions.

C. General Requirements:
1. Airstream surfaces installed in return air plenum to comply with requirements in ASHRAE Std 62.1.

2.05 GYPSUM WALLBOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3 1/2 inch.

B. Sound Isolation Tape: Elastomeric foam tape for sound decoupling.
1. Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2. Tape Thickness: 1/4 inch.
3. Products:
   a. Armacell LLC; ArmaComfort MTD: www.armacell.us/#sle.
   b. Substitutions: See Section 01 6000 - Product Requirements.

C. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
   1. Products:
      a. Franklin International, Inc; Titebond GREENchoice Professional Acoustical Smoke and Sound Sealant: www.titebond.com/#sle.
      b. Liquid Nails, a brand of PPG Architectural Coatings; _____: www.liquidnails.com/#sle.
      c. Specified Technologies Inc; Smoke N Sound Acoustical Sealant: www.stifirestop.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements.

D. (CG2) Beads and Joint Accessories: ASTM C1047, galvanized steel, unless noted otherwise.
   1. Corner Beads: Embedded, for 90 degree outside corners.
      a. Products:
         1) Fry Reglet, DWCT-375.
   2. Architectural Reveal Beads (RV1):
      a. Reveal Depth: 5/8 inch.
      b. Reveal Width: 3/8 inch.
      c. Products:
         1) Fry Reglet, DRM 625-375.
   3. Expansion Joints:
      a. Type: V-shaped metal with factory-installed protective tape.
   4. Art Hanging and Display System: Systemic Art.
      a. Moderna 251# Picture Rail, WM685M with handing rods, two per unit.
      b. Color: White.
      c. Finish: Powder coat.
      d. Location(s): TH Exam Rooms.

E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
   1. Paper Tape: 2 inch wide, creased paper tape for joints and corners.
   2. Joint Compound: Setting type, field-mixed.

F. Abuse Resistant Finishes:
   1. Acrylic, water-based, non-textured, high build, tintable primer and surfacer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 SHAFT WALL INSTALLATION

A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.
   1. Fasten runners to structure with short leg to finished side, using appropriate power-driven fasteners at not more than 24 inches on center.
   2. Install studs at spacing required to meet performance requirements.

B. Shaft Wall Liner: Cut panels to accurate dimensions and install sequentially between special friction studs.
   1. Seal perimeter of shaft wall and penetrations with acoustical sealant.

3.03 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
   1. Level ceiling system to a tolerance of 1/1200.
   2. Laterally brace entire suspension system.

C. Studs: Space studs at 16 inches on center.
   1. Extend partition framing to structure where indicated and to ceiling in other locations.
   2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
   3. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

E. Resilient Sound Isolation Clips: Install resilient sound isolation clips, and where applicable, associated furring sections and channels, in accordance with clip manufacturer's written instructions.

F. Blocking: Install wood blocking for support of:
   1. Framed openings.
   2. Wall-mounted cabinets.
   3. Plumbing fixtures.
   4. Toilet partitions.
   5. Toilet accessories.
   6. Wall-mounted door hardware.

3.04 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Sound Isolation Tape: Apply to vertical studs and top and bottom tracks/runners in accordance with manufacturer's instructions.

C. Acoustic Sealant: Install in accordance with manufacturer's instructions.
   1. Place one bead continuously on substrate before installation of perimeter framing members.
   2. Place continuous bead at perimeter of each layer of gypsum board.
   3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

D. Acoustical Shielding: Install in accordance with manufacturer's instructions for application between studs and gypsum board.

3.05 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Double-Layer, Nonrated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.

D. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

E. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.

F. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.

1. Seal joints, cut edges, and holes with water-resistant sealant.

G. Exterior Soffits: Install exterior soffit board perpendicular to framing, with staggered end joints over framing members or other solid backing.
   1. Seal joints, cut edges, and holes with water-resistant sealant.

H. Installation on Metal Framing: Use screws for attachment of gypsum board.

3.06 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
   1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
   2. At exterior soffits, not more than 30 feet apart in both directions.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

D. Decorative Trim: Install at locations shown on drawings and in accordance with manufacturer's instructions.

3.07 JOINT TREATMENT

A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.

B. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.

C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
   2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   3. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.

D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.

E. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.08 TEXTURE FINISH

A. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions and to match approved sample.

3.09 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 2216
NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal partition, ceiling, and soffit framing.

B. Framing accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping: Sealing top-of-wall assemblies at fire-resistance-rated walls.

B. Section 07 9200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

C. Section 08 3100 - Access Doors and Panels.

D. Section 09 2116 - Gypsum Board Assemblies: Metal studs for gypsum board partition framing.

1.03 REFERENCE STANDARDS

A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2018).

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

D. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.

E. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2018.

F. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

G. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

H. ASTM 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; 2020.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing, Connectors, and Accessories:
   1. Clarkdietrich; _____: www.clarkdietrich.com/#sle.
   2. SCAFCO Corporation; _____: www.scafco.com/#sle.
   3. Steel Construction Systems; _____: www.steelconsystems.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FRAMING MATERIALS

A. Fire-Resistance-Rated Assemblies: Comply with applicable code and as indicated on drawings.

B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
   1. Studs: C shaped with knurled or embossed faces.
   2. Paired Studs for Sound-Rated Assemblies: Engineered single-piece assemblies comprised of paired studs coupled by sound isolators, designed to replace conventional side-by-side, parallel, double-wall partition framing.
      a. Widths: As indicated on drawings.
   3. Runners: U shaped, sized to match studs.
   4. Ceiling Channels: C shaped.

C. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws, and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
   1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100.
   2. Material: ASTM A653/A653M steel sheet, SS Grade 50, with G60/Z180 hot-dipped galvanized coating.
   3. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems indicated on drawings.

D. Preformed Top Track Firestop Seal:
   1. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems of fire rating and movement required.
   2. Products:
      a. Hilti, Inc; Top Track Seal CFS TTS: www.us.hilti.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

E. Non-Loadbearing Framing Accessories:
   1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
   2. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.
      a. Materials: ASTM A36/A36M formed sheet steel support member with factory-welded ASTM A1003/A1003M steel plate base.
   3. Sheet Metal Backing: 0.036 inch thick, galvanized.
   4. Fasteners: ASTM C1002 self-piercing tapping screws.
   5. Anchorage Devices: Powder actuated.
   6. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced.
   7. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

F. Sound Isolation Tape: Elastomeric foam tape for sound decoupling.
   1. Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   2. Tape Thickness: 1/4 inch.

PART 3 EXECUTION

3.01 INSTALLATION OF STUD FRAMING

A. Extend partition framing to structure where indicated and to ceiling in other locations.

B. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.

C. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs as indicated.

D. Align and secure top and bottom runners at 24 inches on center.

E. At partitions indicated with an acoustic rating:
   1. Place one bead of acoustic sealant between runners and substrate, studs and adjacent construction.
   2. Sound Isolation Tape: Apply to vertical studs and top and bottom tracks/runners in accordance with manufacturer's instructions.

F. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.

G. Install studs vertically at spacing indicated on drawings.

H. Align stud web openings horizontally.

I. Secure studs to tracks using crimping method. Do not weld.

J. Stud splicing is not permissible.

K. Fabricate corners using a minimum of three studs.

L. Install double studs at wall openings, door and window jambs, not more than 2 inches from each side of openings.

M. Coordinate erection of studs with requirements of door frames; install supports and attachments.

N. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.

O. Blocking: Use wood blocking secured to studs. Provide blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, and opening frames.

P. Sound Isolation Clips: Mechanically attach to framing or structure with fasteners recommended by clip manufacturer. Install at spacing indicated on drawings.

3.02 CEILING AND SOFFIT FRAMING

A. Comply with requirements of ASTM C754.

B. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.

C. Install furring independent of walls, columns, and above-ceiling work.

D. Securely anchor hangers to structural members or embed them in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.

E. Space main carrying channels at maximum 72 inch on center, and not more than 6 inches from wall surfaces. Lap splice securely.

F. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.

G. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.

H. Reinforce openings in suspension system that interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 24 inches past each opening.

I. Laterally brace suspension system.

3.03 TOLERANCES

A. Maximum Variation From True Position: 1/8 inch in 10 feet.

B. Maximum Variation From Plumb: 1/8 inch in 10 feet.

END OF SECTION

SECTION 09 3000
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Cementitious backer board as tile substrate.

D. Stone thresholds.

E. Ceramic accessories.

F. Ceramic trim.

G. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

B. Section 09 0561 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.03 REFERENCE STANDARDS

A. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2017.

B. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar; 2017.

C. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex-Portland Cement; 1999 (Reaffirmed 2016).

D. ANSI A108.2 - American National Standard General Requirements: Materials, Environmental and Workmanship; 2019.

E. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive; 2009 (Revised).

F. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).

G. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy; 1999 (Reaffirmed 2010).

H. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2010).

I. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (Reaffirmed 2010).

J. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 2017.

K. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2018.

L. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).

M. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2016).

N. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2020.

O. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation; 2010 (Reaffirmed 2016).

P. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2016).

Q. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes For Thin-Set Ceramic Tile And Dimension Stone Installation; 2014.

R. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014.

S. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2019.

T. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2019.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, and control and expansion joints.

D. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches in size illustrating pattern, color variations, and grout joint size variations.

E. Installer's Qualification Statement:
   1. Submit documentation of National Tile Contractors Association (NTCA) or Tile Contractors' Association of America (TCAA) accreditation.

F. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Tile: 10 square feet of each size, color, and surface finish combination.

1.06 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Company specializing in performing tile installation, with minimum of five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

PART 2 PRODUCTS

2.01 TILE

A. Manufacturers: All products of each type by the same manufacturer.

B. Ceramic /Porcelain Floor Tile, Type (T1): Crossville, Shades.
   1. Size: 12" x 24".
   2. Color: Thunder
   3. Pattern: Stack Bond.
   4. Finish: UPS.
   5. Grout joint: 1/8".

C. Ceramic/Porcelain Wall Tile, Type (T2): Crossville, Shades
   1. Size: 6" x 24"
   2. Color: Frost.
   3. Pattern: Stack Bond.
   4. Finish: Honed.
   5. Grout joint: 1/8".

D. Ceramic/Porcelain Base Tile, Type (T3): Mosa, Core Collection, Terra Maestricht.
   1. Size: 4" x 24".
   2. Color: 263.
   3. Finish: Smooth (V).

E. Ceramic/Porcelain Floor Tile, Type (T4): Mosa, Core Collection, Terra Maestricht.
   1. Size: 30" x 30".
   2. Color: 263.
   3. Finish: Smooth (V).

2.02 TRIM AND ACCESSORIES

A. Ceramic Accessories: Glazed finish, same color and finish as adjacent field tile; same manufacturer as tile.

B. Pre-Formed Accessories To Be Covered with Tile: High density expanded polystyrene with ANSI A118.10 waterproofing finish or membrane.

C. Ceramic Trim: Matching bullnose and cove ceramic shapes in sizes coordinated with field tile.
   1. Applications:
      a. Open Edges: Bullnose.
      b. Inside Corners: Jointed.
   2. Manufacturers: Same as for tile.

D. Non-Ceramic Trim: Brushed stainless steel, style, Jolly.
   1. Applications:
      a. Top trim on T3 tile base.
   2. Manufacturers:
      a. Schluter-Systems: www.schluter.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

E. Thresholds: 2 inches wide by full width of wall or frame opening; beveled edge on both long edges; without holes, cracks, or open seams.
   1. Applications:
      a. At doorways where tile terminates.

2.03 SETTING MATERIALS

A. Provide setting and grout materials from same manufacturer.

2.04 GROUTS

A. Provide setting and grout materials from same manufacturer.

B. Standard Grout: ANSI A118.6 standard cement grout.

1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
3. Color: (GR1), Pearl Grey 19.
4. Color: (GR2), Silver 27.
5. Color: (GR3), Selected from manufacturer full range.
6. Products:
    a. Mapei, Keraflex.
    b. Substitutions: See Section 01 6000 - Product Requirements.

2.05 MAINTENANCE MATERIALS

A. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout.
1. Composition: Water-based colorless silicone.
2. Products:
    a. Merkrete, by Parex USA, Inc; Merkrete Revive: www.merkrete.com/#sle.
    b. Substitutions: See Section 01 6000 - Product Requirements.

2.06 ACCESSORY MATERIALS

A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
1. Crack Resistance: No failure at 1/8 inch gap, minimum.
2. Fluid or Trowel Applied Type:
    a. Thickness: 20 mils, maximum.
3. Peel-and-Stick Sheet Type:
    a. Thickness: 20 mils, maximum.

B. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 5/8 inch thick; 2 inch wide coated glass fiber tape for joints and corners.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.

D. Cementitious Subfloor Surfaces: Verify that substrates are ready for tiling installation by testing for moisture and alkalinity (pH).
1. Test in accordance with Section 09 0561.
2. Obtain instructions if test results are not within limits recommended by tiling material manufacturer and setting material manufacturer.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.

3.03 INSTALLATION - GENERAL

A. Install tile, thresholds, and stair treads and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.19 , manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Install ceramic accessories rigidly in prepared openings.

G. Install non-ceramic trim in accordance with manufacturer's instructions.

H. Install thresholds where indicated.

I. Sound tile after setting. Replace hollow sounding units.

J. Keep control and expansion joints free of mortar, grout, and adhesive.

K. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

L. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

M. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.

3.05 INSTALLATION - WALL TILE

A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244, using membrane at toilet rooms.

B. Over interior concrete and masonry install in accordance with TCNA (HB) Method W202, thin-set with dry-set or latex-Portland cement bond coat.

3.06 CLEANING

A. Clean tile and grout surfaces.

3.07 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 RELATED REQUIREMENTS

A. Section 05 3100 - Steel Decking: Placement of special anchors or inserts for suspension system.

B. Section 21 1300 - Fire-Suppression Sprinkler Systems: Sprinkler heads in ceiling system.

C. Section 23 3700 - Air Outlets and Inlets: Air diffusion devices in ceiling.

D. Section 26 5000 - Lighting

E. Section 27 5116 - Public Address Systems: Speakers in ceiling system.

F. Section 28 4600 - Fire Detection and Alarm: Fire alarm components in ceiling system.

1.03 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2017.

C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.

D. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2020.

E. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2019.

1.04 ADMINISTRATIVE REQUIREMENTS

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. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on suspension system components and acoustical units.

C. Reflected ceiling plan for each floor indicating:
   1. For each ceiling, proposed two adjacent 'fixed' edges.
   2. For each ceiling area or cloud exceeding 1,000 square feet in areas, proposed location of compression struts shown graphically.
   3. For each ceiling area or cloud exceeding 2,500 square feet in area, proposed location of seismic joints diving it into areas less than 2,500 sf shown graphically.

D. Samples: Submit two full size samples illustrating material and finish of acoustical units.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.06 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc; ____: www.armstrongceilings.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Metal Acoustic Panels:
   1. Ceilings Plus.
   2. Substitutions: See Section 01 6000 - Product Requirements.

C. Suspension Systems:
   1. Same as for acoustical units.

2.02 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions determined according to ASCE 7-16 for Seismic Design Category D and complying with the following:
   1. Local authorities having jurisdiction.

2.03 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.

B. Acoustical Panels: Basis-of-Design:
   1. Suspension System: Exposed grid, 15/16".
   2. Products:
      a. Armstrong World Industries, Inc; Ultima: www.armstrongceilings.com/#sle.
      b. Ceilings Plus.

C. Acoustical Panels, Type ACT-1: Ultima
   1. Size: 24 by 48 inch.
   2. Thickness: 3/4 inch.
   3. Panel Edge: Tegular.
   4. Color: White.

D. Acoustical panels, Type ACT-2: Illusions, Sarente, S-22.
   1. Black acoustibond backing.
   2. Color: Oak Line.
   3. Size: 24" x 48".

E. Acoustical panels, Type ACT-3: Illusions, Sarente, S-22.
   1. Black acoustibond backing.
   2. Color: Oak Line.
   3. Size: 24" x 72".

2.04 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

B. Exposed Suspension System: Hot-dipped galvanized steel grid with aluminum cap.
   1. Application(s): Seismic.
   2. Structural Classification: Heavy-duty, when tested in accordance with ASTM C635/C635M.
   3. Profile: Tee; 15/16 inch face width.
   4. Finish: Baked enamel.
   5. Color: White.
   6. Main runners: Heavy duty.
   7. Main runners and cross tee connection strength shall be 180 lbs. minimum.

8. For ceilings greater than 1,000 square feet in contiguous area, compression struts shall be provided.
    a. Compression struts shall be 12'-0" o.c. (max) in both directions, starting six feet from walls. Horizontal restraint (splay wires or rigid bracing) shall be provided within 2" of intersection and splayed 90 degrees apart at 45 degree angles. Splay bracing connection strength shall be 250 pounds.

2.05 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Seismic Clips: Manufacturer's standard clips for seismic conditions and to suit application.

D. Perimeter Moldings: Same metal and finish as grid.
    1. Size: As required for installation conditions and specified Seismic Design Category.
    2. Angle Molding: L-shaped, for mounting at same elevation as face of grid.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Locate system on room axis according to reflected plan.

D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
    1. Use longest practical lengths.

E. Seismic Suspension System, Seismic Design Categories D, E, F: Hang suspension system with grid ends attached to the perimeter molding on two adjacent walls; on opposite walls, maintain a 3/4 inch clearance between grid ends and wall.

F. 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.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

I. Vertical wire hangers shall be 12-gauge @ 4'-0" o.c. (max) and be 1 in 6 to plumb.

J. Perimeter vertical hangers shall be provided within 8" of walls.

K. Provide ASCE 7-16 seismic clips at EACH PERIMETER TEE.
    1. Two adjacent ceiling edges shall be "fixed" with two screws through the clip and perimeter angle and one through the tee through the clip hole.
    2. Opposing two ceiling edges shall be "loose" with two screws through the clip and perimeter angle and one through the tee through the clip slot.

L. For contiguous ceilings that exceed 2,500 sf in area, provide expansion joint to reduce ceiling into contiguous ceilings under 2,500 sf.

M. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.

F. Where round obstructions occur, provide preformed closures to match perimeter molding.

G. Install safety clips on wood veneer panels 2 inches from outside edge of panel and at 24 inches on center.
   1. Use wire ties to attach safety clips.

3.05 COORDINATION OF WORK BY OTHER TRADES

A. Sprinkler heads shall be provided in center of ceiling panels with flexible hose fittings.

B. Cable tray and electrical conduit shall be independently supported and not connected to the acoustical ceiling system.

C. Pendant-hung light fixtures shall be supported from structure above with 9-gauge wire or approved alternate.

3.06 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09 6500
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient sheet flooring.

B. Resilient base.

C. Resilient stair accessories.

D. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.

B. Section 09 0561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

C. Section 09 0561 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

D. Section 26 0526 - Grounding and Bonding for Electrical Systems: Grounding and bonding of static control flooring to building grounding system.

1.03 REFERENCE STANDARDS

A. ASTM F1859 - Standard Specification for Rubber Sheet Floor Covering Without Backing; 2014, with Editorial Revision (2016).

B. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Shop Drawings: Indicate seaming plans and floor patterns.

D. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

E. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

F. Installer's Qualification Statement.

G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Flooring Material: 100 square feet of each type and color.
   3. Extra Wall Base: 40 linear feet of each type and color.
   4. Extra Stair Materials: Quantity equivalent to 5 percent of each type and color.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in installing specified flooring with minimum three years experience.

B. Testing Agency Qualifications: Independent firm specializing in performing concrete slab moisture testing and inspections of the type specified in this section.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

D. Protect roll materials from damage by storing on end.

1.07 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 SHEET FLOORING

A. Rubber Sheet Flooring - Type RF-1, RF-2, RF-3, RF-4: 100 percent rubber composition, color and pattern through total thickness.
   1. Manufacturers:
      a. (RF1, RF2, RF3) Nora, Senica.
      b. (RF4) Nora, Satura.
   2. Minimum Requirements: Comply with ASTM F1859, Type 1, without backing.
   3. Thickness: 3 mm
   4. Sheet Width: 72 inch minimum.
   5. Seams: Heat welded.
   6. Surface Texture: Smooth.
   7. Color:
      a. RF1, 6504 Down Feather.
      b. RF2, 6505 Silk.
      c. RF3, 6506 Cashmere.
      d. RF4, Selected from manufacturer full range.
         1) Location(s): Stair landings, Rooms 110 and 111.
         2) Finish: hammered.

B. Welding Rod: Solid bead in material compatible with flooring, produced by flooring manufacturer for heat welding seams, and in color matching field color.

2.02 STAIR COVERING

A. Stair Treads (RTR): Rubber; full width and depth of stair tread in one piece; tapered thickness.
   1. Manufacturers:
      a. Nora, Satura.
   2. Nosing: Square.
   3. Texture: Smooth.
   4. Color: To be selected by Architect from manufacturer's full range.

B. Stair Treads with Integral Risers: Rubber; full height of riser, full width and depth of tread in one piece; tapered thickness.
   1. Nosing: Square.

2.03 RESILIENT BASE

A. Resilient Base - Type RB1, RB2, RB3: ASTM F1861, Type TS rubber, vulcanized thermoset; style as scheduled.
   1. Manufacturers:
      a. Johnsonite, a Tarkett Company; Clearing/Shifting Fields Collection 5T381: www.johnsonite.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.
   2. Height:
      a. (RB1): 4 inch.
      b. (RB2): 3"
   3. Thickness: 0.125 inch.

4. Finish: Satin.
5. Length: Roll.
6. Color:
   a. (RB-1): Coiled w/ toe kick.
   b. (RB2): Mandalay.
7. Accessories: Premolded external corners and internal corners.

B. Resilient Base (RB3): TH Exam roomsype TP, Rubber thermoplastic.
1. Manufacturer: Nora.
2. Sanitary Base.
3. Height: 6".
4. Length: 32.8".
5. Thickness: 10mm
6. Color: Match flooring.

2.04 ACCESSORIES

A. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

B. Moldings, Transition and Edge Strips: Same material as flooring.

C. Filler for Coved Base: Plastic.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
1. Test in accordance with Section 09 0561.
2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

C. Prohibit traffic until filler is fully cured.

D. Clean substrate.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Adhesive-Applied Installation:
1. Place copper grounding strip in conductive adhesive and apply additional adhesive to top side of strip before installing static control flooring. Allow strip to extend beyond flooring in accordance with static control flooring manufacturer's instructions. Refer to Section 26 0526 for grounding and bonding to building grounding system.
2. Fit joints and butt seams tightly.
3. Set flooring in place, press with heavy roller to attain full adhesion.

D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

E. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

F. At movable partitions, install flooring under partitions without interrupting floor pattern.

3.04 INSTALLATION - SHEET FLOORING

A. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns at seams.

B. Seams are prohibited in bathrooms and toilet rooms.

C. Seal seams by heat welding where indicated.

3.05 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Install base on solid backing. Bond tightly to wall and floor surfaces.

C. Scribe and fit to door frames and other interruptions.

3.06 INSTALLATION - STAIR COVERINGS

A. Install stair coverings in one piece for full width and depth of tread.

B. Adhere over entire surface. Fit accurately and securely.

3.07 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.08 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 09 6813
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

B. Removal of existing carpet tile.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.

B. Section 09 0561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

C. Section 09 0561 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.03 PRICE AND PAYMENT PROCEDURES

A. Section 01 2100 - Allowances: Cash allowances affecting this section.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Shop Drawings: Indicate layout of joints.

D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

E. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

F. Installer's Qualification Statement.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.06 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tile Carpeting:
   1. Shaw Contract.

2.02 MATERIALS

A. Tile Carpeting, Type CPT-1: Clearings (5T381)/Shifting Field Collection, manufactured in one color dye lot.
   1. Color: Brilliant 71105.
   2. Installation Pattern: Monolithic.

B. Woven Vinyl Luxury Tile, Type (WVP-1): Rethink, 0733V: Minimal 33155.
   1. Pattern: Ashlar.
   2. Installation Type: Dry back, direct glue.
      a. Per manufacturer requirements.
   3. Size: 9" x 36" x 3mm

C. Carpet Tile. Type (WOM): Path 5T034, Sterling 34557.

2.03 ACCESSORIES

A. Edge Strips: Embossed aluminum, color as selected by Architect.

B. Stair Nosing: As specified in Section 09 6500.

C. Adhesives:

D. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
   1. Test in accordance with Section 09 0561.
   2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Remove existing carpet tile.

B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

C. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.

D. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

E. Vacuum clean substrate.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.

F. Locate change of color or pattern between rooms under door centerline.

G. Fully adhere carpet tile to substrate.

H. Trim carpet tile neatly at walls and around interruptions.

I. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 8414

ACOUSTIC STRETCHED-FABRIC WALL AND CEILING SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Acoustic stretched-fabric wall system.

B. Acoustic stretched-fabric ceiling system.

C. Accessories as required for complete installation.

1.02 REFERENCE STANDARDS

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2017.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021.

C. ASTM E795 - Standard Practices for Mounting Test Specimens During Sound Absorption Tests; 2016.

D. ASTM E2573 - Standard Practice for Specimen Preparation and Mounting of Site-Fabricated Stretch Systems to Assess Surface Burning Characteristics; 2019.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Details indicating typical transitions to other finish surfaces.

C. Verification Samples:
   1. For each fabric specified, minimum size 12 inch square, representing actual product in color, texture, and pattern.
   2. Acoustic material, minimum size 12 inch square.

D. Installer's Qualification Statement.

E. Maintenance Contract.

F. Warranty Documentation: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Supply an additional 10 (ten) percent of accessories installed for Owner's use in maintenance of project.
   2. Supply an additional 5 (five) percent of fabric installed for Owner's use in maintenance of project.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of experience and approved by manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect fabric, acoustical backing, and track from excessive moisture in shipment, storage, and handling.

B. Do not deliver materials to project until wet work such as concrete and plaster has been completed.

C. Store products in manufacturer's unopened packaging until ready for installation.

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.06 FIELD CONDITIONS

A. Do not begin installation until interior conditions have reached temperature and humidity that will be maintained during occupancy.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Stretched-Fabric Wall Systems:
   1. Fitzfelt.

B. Acoustic Stretched-Fabric Ceiling Systems:
   1. Fitzfelt. www.texaa.com

2.02 ACOUSTIC STRETCHED-FABRIC SYSTEM

A. Products:
   1. AP1: Akustika 25 Ceiling.
      a. 100% Wool design felt + acoustic substrate.
         1) 60% recycled content.
      b. Interlocking mounting hardware.
      c. Color: #551 Eis.
      d. Exposed edge.
      e. Size: Custom.
      f. Location: Pharmacy Pick-up Ceiling.
   2. AP2: Akustica 10.
      a. 100% Wool design felt + acoustica 10 substrate.
      b. Z-clip mounting hardware.
      c. Color: #551 Eis.
      d. Exposed Edge.
      e. Size: Custom.
      f. Location: Pharmacy Pick-up Walls.
   3. AP3: Facade.
      a. 100% Wool design felt + acoustica 10 substrate.
      b. Manufacturer heavy duty wall covering adhesive.
      c. Color: #481 Sandstein.
      d. Chamfered Edge.
      e. Location: Talking Rooms.
      f. Thickness: 1/2" thick.
   4. AP4: Merge hanging panel.
      a. Color: #995 Wasser.
      b. Filzfelt hanging track system, ceiling mounted with cable and weighted pocket with rod.
      c. Size: 5'-9" x 8'-0".
      d. Location: Room 180.
   5. AP5: Wall Panel, Index-Linear.
      a. Manufacturer approved adhesive.
      b. Color: #481 Sandstein.
      c. Size: 6" wide, 9' tall, 3mm and 5mm depth.
         1) See drawings for install pattern.
      d. Location: Traditional Healing.
   6. AP6: Wall Panel, Index-Dimensional.
      a. Manufacturer recommended mounting method.
      b. Color: #551 Eis

c. Size: 6" high, 2'-0" wide, installed horizontally.
d. Location: ICT, including end trim.

7. AP7: Wall Panel, Index-Dimensional.
   a. Manufacturer recommended mounting horizontally.
   b. Color: #481 Sandstein.
   c. Size: 6" high, 2'-0" wide, installed horizontally.
   d. Location: Rooms 153 and 155.
8. AP8: Wall panel, Facade
   a. Felt + Akustika 10 Substrate, chamfered edge.
   b. Adhesive: manufacturer heavy duty.
   c. Thickness: 1/2"
   d. Color: From manufacturer full range.

B. Acoustic Stretched-Fabric System: Field installed, fabric is stretched and set into framework and laid over acoustic material anchored to substrate. Framework consists of continuous perimeter and intermediate mounting frames anchored to substrate, and designed to permit removal and replacement of fabric within framed areas without affecting adjacent areas.
   1. Surface Burning Characteristics: Flame Spread Index of 25, maximum; Smoke Developed Index of 450, maximum; when whole system is tested in accordance with ASTM E84 using mounting specified in ASTM E2573 for stretched systems.
   2. Noise Reduction Coefficient (NRC): 0.80, minimum, when tested in accordance with ASTM C423, Type A mounting per ASTM E795.

2.03 MATERIALS

PART 3 EXECUTION

3.01 EXAMINATION

A. Begin installation only after substrates have been properly prepared.

B. Verify that casework, markerboards, door and window jambs, finished ceiling, and other finished items adjacent or abutting the acoustic stretched-fabric system have been properly installed.

C. When preparation of substrate is the responsibility of another installer, notify Architect of unsatisfactory preparation prior to proceeding with this work.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation of this work.

B. Prepare substrate surfaces using methods as recommended by the manufacturer for achieving acceptable result as required for this work.

C. Remove wall plates and other obstacles, and properly prepare substrates to receive frames and acoustic material in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install acoustic stretched-fabric system at locations indicated in accordance with approved shop drawings and manufacturer's instructions.

B. Frames: Install perimeter and intermediate frames using appropriate fasteners for prepared substrate, firmly secured to ensure frames do not separate from substrate.
   1. For tile or masonry substrates, apply continuous bead of adhesive along base of framing in addition to spacing of conical anchors and/or fasteners at 6 to 8 inches on center.
   2. Follow contours of wall and scribe to adjoining work at borders, penetrations, and imperfections.
   3. Install framing around openings and penetrations.
   4. Allow for spacing of framework to accommodate insertion of installation tool.

C. Acoustic Material: Cut and trim acoustic material to fit snugly within perimeter and intermediate framework.
   1. Apply adhesive and press acoustic material into place, maintaining constant plane.

D. Fabric: Stretch fabric over acoustic material, locking edges of fabric into frame's serrated jaws using manufacturer's recommended tool. Maintain fabric weave plumb, level and true, in proper relation to building lines, without ripples, waviness, hourglass, or other deleterious effects.
   1. Upon fabric installation, do not employ adhesives or mechanical fasteners of any type, and ensure fabric is free-floating and in contact with acoustic material as necessary.
   2. Stapling or gluing of fabric to cores or channel framework is not permitted.
   3. Provide tension in fabric sufficient to prevent sagging under anticipated changes in temperature and humidity.

3.04 CLEANING

A. Clean exposed surfaces of acoustic stretched-fabric system in compliance with manufacturers instructions for cleaning and repair of minor damage to exposed surfaces.

3.05 PROTECTION

A. Protect installed materials upon completion of this work, using methods that will ensure that the finished work is without damage or deterioration upon Date of Substantial Completion.

3.06 MAINTENANCE

A. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide a separate maintenance contract for specified maintenance service.

END OF SECTION

SECTION 09 8430

SOUND-ABSORBING WALL AND CEILING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sound-absorbing panels.

B. Sound-absorbing ceiling baffles.

1.02 RELATED REQUIREMENTS

A. Section 09 5100 - Acoustical Ceilings: Ceiling suspension system.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Fabrication and installation details, panel layout, fabric orientation, and wood grain orientation.

C. Selection Samples: Manufacturer's color charts for fabric covering, indicating full range of fabrics, colors, and patterns available.

D. Test Reports: Certified test data from an independent test agency verifying that panels meet specified requirements for acoustical and fire performance.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Panels: Quantity equal to 5 percent of total installed, but not less than one of each type.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect acoustical units from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until units are needed for installation.

B. Store units flat, in dry, well-ventilated space; do not stand on end.

C. Protect edges from damage.

PART 2 PRODUCTS

2.01 FABRIC-COVERED SOUND-ABSORBING UNITS

A. Manufacturers:
   1. Haworth; Buzzispace.

B. General:
   1. Prefinished, factory assembled fabric-covered panels.
   2. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.

C. Fabric-Covered Acoustical Panels for Walls:
   1. Panel Core: Manufacturer's standard mineral fiber core.
      a. Facing: 1/16 inch impact-resistant and tackable surface laminated to core.
   2. Panel Size: As shown on drawings.
   3. Panel Thickness: 2 inches.
   4. Edges: Perimeter edges reinforced by a formulated resin hardener.
   5. Corners: Mitered.
   6. Fabric: as indicated on Finish Schedule.
   7. Color: As indicated.
   8. Mounting Method: Spline-mounted, concealed.

D. Fabric-Covered Acoustical Ceiling Baffles:
   1. Baffle Core: Manufacturer's standard rigid or semi-rigid fiberglass core.
   2. Baffle Size: 24 inches by 48 inches.
   3. Color: As indicated.

2.02 FABRICATION

A. Fabric Wrapped, General: Fabricate panels to sizes and configurations as indicated, with fabric facing installed without sagging, wrinkles, blisters, or visible seams.
   1. Where radiused or mitered corners are indicated, install fabric to avoid seams or gathering of material.

2.03 ACCESSORIES

A. Spline-Mounting Accessories: Manufacturer's standard concealed connecting splines of extruded aluminum designed for screw attachment to walls, with coordinating moldings and trim for interior and exterior corners and miscellaneous conditions.
   1. Color of Exposed Trim: As selected from manufacturer's standards.

B. Ceiling-Suspended Accessories: Manufacturer's standard accessories at locations as indicated on each acoustical unit, sized appropriately for weight of acoustical unit.
   1. Provide galvanized wire for suspension from ceiling at heights as indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install acoustical units in locations as indicated, following manufacturer's installation instructions.

B. Install mounting accessories and supports in accordance with shop drawings.

C. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.

D. Suspend ceiling baffles at locations and heights as indicated.

E. Install acoustical units to construction tolerances of plus or minus 1/16 inch for the following:
   1. Plumb and level.
   2. Flatness.

3.03 CLEANING

A. Clean fabric facing upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

3.04 PROTECTION

A. Provide protection of installed acoustical panels until Date of Substantial Completion.

B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION

SECTION 09 9123
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Prime surfaces to receive wall coverings.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
   6. Floors, unless specifically indicated.
   7. Ceramic and other tiles.
   8. Glass.
   9. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications: Shop-primed items.

B. Section 05 5100 - Metal Stairs: Shop-primed items.

C. Section 09 9300 - Staining and Transparent Finishing: Wood substrates.

1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2016.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

C. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

D. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
   2. MPI product number (e.g., MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
   4. Manufacturer's installation instructions.

C. Samples: Submit two paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.

2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.
3. Allow 30 days for approval process, after receipt of complete samples by Architect.

D. Manufacturer's Instructions: Indicate special surface preparation procedures.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
3. Label each container with color in addition to the manufacturer's label.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
1. If a single manufacturer cannot provide specified products; minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.

B. Paints:
1. Base Manufacturer: Sherman Williams.

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
2. Supply each paint material in quantity required to complete entire project's work from a single production run.
3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

2.03 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board and shop primed steel.
1. Two top coats and one coat primer.

2. Top Coat(s): High Performance Architectural Interior Latex; 139.
   a. Products:
      1) Sherwin-Williams Pre-Catalyzed Waterbased Epoxy, Eg-Shel. (MPI #139)
      2) Substitutions: Section 01 6000 - Product Requirements.
3. Top Coat Sheen:
   a. Flat: MPI gloss level 1; use this sheen per schedule in Part 3..
   b. Eggshell: MPI gloss level 3; use this sheen per schedule in Part 3.
   c. Gloss: MPI gloss level 6; use this sheen for per schedule in Part 3..
4. Primer: As recommended by top coat manufacturer for specific substrate.

B. Paint I-OP-DF - Dry Fall: Metals; exposed structure and overhead-mounted services, including shop primed steel deck, structural steel, and metal fabrications.
   1. Shop primer by others.
   2. Top Coat: Latex Dry Fall; MPI #118, 155, or 226.
      a. Products:
         1) Sherwin-Williams Waterborne Acrylic Dryfall, Eg-Shel. (MPI #155, 226)
         2) Substitutions: Section 01 6000 - Product Requirements.

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
   1. Interior Latex Primer Sealer; MPI #50.
      a. Products:
         1) As recommended by manufacturer for application..
   2. Interior/Exterior Quick Dry Alkyd Primer for Metal; MPI #76.
      a. Products:
         1) As recommended by manufacturer for application..

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are 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. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
   1. Gypsum Wallboard: 12 percent.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

F. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
   3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

3.06 SCHEDULE

A. P1, Field: Snowbound SW 7004, Eggshell.

B. P2, Accent: Silver Mist SW7621, Eggshell.

C. P3, Steel Stairs: Elephant Ear SW 9168, Flat.

D. P4, Interior Bracing: Snowbound SW 7004, Gloss.

E. P5, Accent: Mega Greige SW7031, Eggshell.

F. P6, Accent: Grecian Ivory SW 7541, Eggshell.

G. P7, Accent: Koi Pond SW7727, Eggshell.

END OF SECTION

SECTION 10 1100
VISUAL DISPLAY UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Letter Board Indoor Enclosed Bulletin board.

B. Glass markerboards.

1.02 RELATED REQUIREMENTS

A. Section 09 2116 - Gypsum Board Assemblies: Concealed supports in metal stud walls.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015.

C. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate wall elevations, dimensions, joint locations, special anchor details.

1.05 QUALITY ASSURANCE

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Grainger: Quartet.

B. (MB1) Clarus.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.02 VISUAL DISPLAY UNITS

A. Enclosed fabric bulletin board backed by high-density fiberboard.
   1. Source: Grainger
   2. Model: 2367L
   3. UNSPC#: 44111907.
      a. Three locking shatterproof acrylic doors.

B. Magnetic Glass Markerboards: Back-coated glass, laminated to steel.
   1. Glass: Laminated, low iron, 1/2 inch thick, with bevel edges and radiused corners, laminated to steel backing sheet for use with magnets. Coated or treated for use as dry erase board or projection surface.
   2. Steel Backing Sheet Thickness: 24 gauge, 0.0239 inch .
   3. Size: As indicated on drawings.
   4. Frame: No frame, with concealed fasteners.
   5. Mounting: Concealed Z clips.
   6. Accessories: Provide magnetic marker tray, magnetic marker holder, magnetic eraser, and magnets.
   7. Manufacturers:
      a. Clarus: Float + Depth.
      b. Substitutions: See Section 01 6000 - Product Requirements.

C. Units Made of More Than One Panel: Factory-assembled tackboards in a single frame, of materials specified above.

1. Configuration: As indicated on drawings.

2.03 MATERIALS

A. Float Glass: Provide float-glass-based glazing unless otherwise indicated.

B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
   1. Laminated Safety Glass: Comply with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.

2.04 ACCESSORIES

A. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.

B. Marker Tray: Aluminum, manufacturer's standard profile, one piece full length of markerboard, molded ends, manufacturer's standard fastening method, same finish as frame.

C. Mounting Brackets: Concealed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

3.02 INSTALLATION

A. Install boards in accordance with manufacturer's instructions.

B. Secure units level and plumb.

3.03 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.

B. Cover with protective cover, taped to frame.

C. Remove temporary protective cover at Date of Substantial Completion.

END OF SECTION

SECTION 10 1400
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Emergency evacuation maps.

B. Building identification signs.

1.02 RELATED REQUIREMENTS

A. Section 26 5100 - Interior Lighting: Exit signs required by code.

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
   1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
   2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
   3. Submit for approval by Owner through Architect prior to fabrication.

C. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

D. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

E. Verification Samples: Submit samples showing colors specified.

F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Store tape adhesive at normal room temperature.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Dimensional Letter Signs:

2.02 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Emergency Evacuation Maps:
   1. Use clear plastic panel silk-screened on reverse, in brushed aluminum frame, screw-mounted.

C. Building Identification Signs:

2.03 SIGN TYPES

A. Schedule:
1. (A1): Room signage - permanent signage.
   a. DEPARTMENT, room NAME, and NUMBER.
   b. Level II braille with domed top.
   c. Image: To be determined.
   d. Mounting: Adhered to substrate with vinyl tape.
   e. Dimensional numbers and letters:
      1) Color: Match owner standard.
      2) Depth: 1/32"
      3) Font: Match owner standard.
   f. Finish: Matte.
   g. Size: Match owner standard, approximately 8" wide x 6" high.
2. (A2): Room signage for designated rooms.
   a. DEPARTMENT, room NAME, and NUMBER.
   b. Level II braille with domed top.
   c. Paper insert graphic
      1) Image to be determined.
   d. OCCUPIED/NOT OCCUPIED window.
   e. Mounting: Adhered to substrate with vinyl tape.
   f. Dimensional numbers and letters:
      1) Color: Match owner standard.
      2) Depth: 1/32".
      3) Font: Match owner standard.
   g. Size: Match owner standard, approximately 8" wide x 6" high.
3. (A3): Room signage for Conference/Talking Rooms:
   a. DEPARTMENT, room NAME, and NUMBER.
   b. Level II braille with domed top.
   c. Paper insert graphic
      1) Image to be determined.
   d. OCCUPIED/NOT OCCUPIED window.
   e. Mounting: Adhered to substrate with vinyl tape.
   f. Dimensional numbers and letters:
      1) Color: Match owner standard.
      2) Depth: 1/32".
      3) Font: Match owner standard.
   g. Size: Match owner standard, approximately 8" wide x 8" high.
4. (B1): Stair - Outside Stairs, MECHANICAL, PLUMBING, and ELECTRICAL.
   a. Room NUMBER & room NAME.
   b. Stair pictogram.
   c. Level II braille with domed top.
   d. Dimensional numbers and letters:
      1) Color: Match owner standard.
      2) Depth: 1/32".
      3) Font: Match owner standard.
   e. Size: 6" x 8".
5. (B2) Restrooms:
   a. Room NUMBER and room NAME.
   b. Level II braille with domed top.
   c. ADA pictogram.
   d. Dimensional numbers and letters:
      1) Color: Match owner standard.

2) Depth: 1/32".
3) Font: Match owner standard.

e. Size: 6" x 8".
f. Location: Adjacent to door on wall.

6. (B3)Restrooms/Stair:
   a. Flag sign: room NAME
   b. Pictogram.
   c. Lettering: Match (B2)
7. (C): Stair - Inside Stair.
   a. Floor LEVEL, Stair NAME, ROOF ACCESS if applicable and EXIT DISCHARGE LEVEL.
   b. Level II braille with domed top.
   c. 1/4" Polycarbonate, clear.
   d. Dimensional numbers and letters:
      1) Color: Match owner standard.
      2) Depth: 1/32"
   e. Mounting: Adhered to substrate with vinyl tape.
   f. Size: 1'-6" x 1'-0"
8. (D): Wayfinding:
   a. FLOOR, department NAME, suite NUMBER and directional Arrows.
   b. Resin panel.
   c. Adhered to glass/gwb with vinyl tape.
   d. Finish: Matte.
   e. Size: 18" x 24".
   f. Dimensional numbers and letters:
      1) Color: Match owner standard.
      2) Depth: 1/32".
      3) Font: Match owner standard.
9. (E): Exterior Building Signage:
   a. Exterior sign, halo lit individual characters.
   b. Dimensional aluminum letters and numbers.
   c. SCF Stacked Logo.
   d. Mounted on 2" standoffs to facade.
   e. Color: From manufacturer full line.
   f. Size: 11" high.
      1) Font: Match existing.
   g. Location: As shown in architectural drawings.
10. (F): SCF Departments:
    a. Halo lit, individual characters.
    b. Dimensional aluminum letters and numbers.
    c. Mounted on 3/4" standoffs.
    d. Color: From manufacturer full line.
    e. Location: Coordinate with Architect.
11. (G): Not used.
12. H: Pick up Numbering:
    a. Dimensional numbers.
    b. Mounted on 3/4" standoffs.
    c. Model and Color: From manufacturer full line.
    d. Height: 5" numbers.
    e. Location: On each side of Pick up window wing walls.
13. Construction Related Signage:
    a. C-Sign 1: "Excuse out mess".
    b. Branded banner/sign.

14. Evacuation Maps:
    a. Thermoplastic, 8" x 10".
    b. Suitable to receive paper floor plan.
    c. Adhered to substrate.

2.04 DIMENSIONAL LETTERS

A. Metal Letters:
   1. Metal: Aluminum sheet, fabricated reverse channel.
   2. Text and Typeface:
      a. Character Font: Fact Variable Regular.
      b. Character Case: Upper case only.

2.05 ACCESSORIES

A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.

B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 10 2219
DEMOUNTABLE PARTITIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal stud framing system.
B. Acoustic insulation.
C. Glass partition panels.
D. Frames for doors and glazed openings.
E. Doors and door hardware.
F. Glazing.
G. Wall base.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2020.
B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.
C. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2018.
D. ASTM C1036 - Standard Specification for Flat Glass; 2016.
E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.
F. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).
G. ASTM E413 - Classification for Rating Sound Insulation; 2016.
H. BHMA A156.4 - American National Standard for Door Controls - Closers; 2013.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on metal framing.
C. Shop Drawings: Indicate layout, module joint locations, and special details associated with acoustic seals.
D. Manufacturer's Instructions: Indicate special procedures.
E. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Demountable Glass Partitions:
   1. KI, Lightline Architectural Wall.

2.02 DEMOUNTABLE GLASS PARTITIONS

A. Partition System: Demountable, single dry glazed, non-progressive, capable of four direction lateral expansion with reusable components.
   1. Module Width: As indicated on drawings.

2. Partition Height: As indicated on drawings.
3. Nominal Partition Thickness: 3-15/16 inches.
4. Joints: Vertical, aluminum profile with concealed fasteners.
5. Utility Raceways: Provide access through posts, cap channels, vertical support profiles, and floor and base channels.

B. Performance Requirements:
1. Acoustic Attenuation: STC of 45 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

2.03 MATERIALS

A. Aluminum Extrusions: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

B. Glazing:
1. Tempered Glass: Annealed flat glass meeting requirements of ASTM C1036, Type 1-Transparent Flat, Class 1-Clear, Quality Q3, and fully tempered in accordance with ASTM C1048, Kind FT.
a. Thickness: 1/2 inch.
b. Prepare glazing panels for indicated fittings and hardware before tempering.
c. Provide exposed glazing edges with flat polished/ground glass finish.
d. Temper glass materials horizontally; visible tong marks or tong mark distortions are not permitted.

C. Acoustic Insulation:
1. Type: As required for acoustic attenuation indicated.
2. Thickness: As required for acoustic attenuation indicated.

D. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

E. Fasteners: Type recommended by system manufacturer.

2.04 PARTITION COMPONENTS

A. Studs and Tracks: ASTM C645, sheet steel, 26 gauge, 0.0179 inch minimum thickness, C shaped, with serrated faces.

B. Posts: Extruded aluminum, 14 gauge, 0.0641 inch, thick, ____ inch nominal dimensions.

C. Panel Termination Trim: Extruded aluminum.
1. Finish: Anodized finish.
2. Color: As selected.

D. Miscellaneous Trim: Snap-on accessories.

E. Wall Base: Extruded aluminum.
1. Height: 3 1/4 inch.
2. Finish: Anodized finish.
3. Color: As selected by Architect.

2.05 DOOR AND WINDOW COMPONENTS

A. Frames: Extruded aluminum, manufacturers standard profile and thickness.
1. Finish: Anodized finish.
2. Color: As selected by Architect.
3. Prepare and reinforce door frames for door hardware; provide resilient silencers color matched to frame color.

B. Doors: Manufacturer's standard.

C. Door Hardware: Manufacturer's standard.
1. Pulls: Ladder.
2. Finish: As selected by Architect from manufacturer's full range.

2.06 FITTINGS AND HARDWARE

A. Overhead Concealed Closers and Bottom Pivots: Non-handed closer for both single and double-acting doors with mechanical backcheck, and meeting requirements of BHMA A156.4, Grade 1.
   1. Application: Center hung, with swing as indicated on drawings.
   2. Hold Open: Fixed.
   3. Opening Force: Comply with requirements of authorities having jurisdiction.
   4. Door Weight: Maximum 200 lbs for exterior doors, and 250 lbs for interior doors, including hardware.
   5. Cover Plate Finish: Aluminum painted; BHMA Code 689.
   6. Provide accessories as required for complete installation, including wall/floor stop.

B. Non-Locking Ladder Pulls: Tubular pull handles.
   1. Mounting: As indicated on drawings.
   2. Diameter: 1-3/8 inch.
   3. Length: 60 inch
   4. Pull Material: Stainless steel.
   5. Finish: Satin.
   6. Door Thickness: 1/2 inch.
   7. Door Material: Glass.
   8. Provide accessories as required for complete installation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building conditions are ready to receive partitions and that field measured dimensions are as indicated on shop drawings.

3.02 INSTALLATION

A. Install partitions before placement of carpet.

B. Metal Stud Framing System:
   1. Construct framing full height to underside of floor or roof construction above.
   2. Install studs in accordance with partition system manufacturer's installation instructions.

C. Acoustic Components:
   1. Install acoustic sealant within partition system in accordance with sealant manufacturer's instructions and as required to achieve acoustic attenuation (STC) rating indicated.
   2. Install acoustic insulation in partitions tight within spaces, around openings, behind and around electrical and mechanical items, within or behind adjoining partitions, and tight to items passing through partitions.

D. Partition Panels:
   1. Install panels in vertical direction; locate ends and edges over rigid support.

E. Frames: Install in accordance with partition system manufacturer's instructions; erect vertical members plumb, and horizontal members level.

F. Doors: Install in accordance with partition system manufacturer's instructions; hang to fit square within frame and to swing freely, without binding.

G. Door Hardware: Install in accordance with partition system manufacturer's instructions.

H. Wall Base: Install in accordance with partition system manufacturer's instructions.

3.03 TOLERANCES

A. Maximum Variation from True Plane of Partition Surfaces: 1/8 inch in 10 feet in any direction.

3.04 ADJUSTING

A. Adjust doors and frames to provide smooth door operation from open to closed position without gravity movement of door from any position.

3.05 PROTECTION

A. Do not permit subsequent construction activities to cause damage to appearance or operation of installed partition components before Date of Substantial Completion.

END OF SECTION

SECTION 10 2239
FOLDING PANEL PARTITIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Top-supported folding panel partitions, horizontal opening.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking and track support shimming.

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2020.

B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

C. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

D. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

E. ASTM E413 - Classification for Rating Sound Insulation; 2016.

F. ASTM E557 - Standard Guide for Architectural Design and Installation Practices for Sound Isolation between Spaces Separated by Operable Partitions; 2012 (Reapproved 2020).

G. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics; 2015.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on partition materials, operation, hardware and accessories, electric operating components, track switching components, and colors and finishes available.

C. Shop Drawings: Indicate opening sizes, track layout, details of track and required supports, static and dynamic loads, and stacking depth.

D. Samples for Selection: Submit two samples of full manufacturer's color range for selection of colors.

E. Samples for Review: Submit two samples of surface finish, 12 by 12 inches size, illustrating quality, colors selected, texture, and weight.

F. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods. Describe cleaning materials detrimental to finish surfaces and hardware finish.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until installation.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Folding Panel Partitions - Horizontal Opening:
   1. Modernfold, a DORMA Group Company; Acousti-Seal and Acousti-Clear: www.modernfold.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FOLDING PANEL PARTITIONS - HORIZONTAL OPENING

A. Folding Panel Partitions: Side opening; paired panels; side stacking; manually operated.

B. Panel Construction:
   1. Frame: 16 gauge, 0.0598 inch thick formed sheet steel frame top, bottom, jambs, and intermediates; welded construction, with acoustical insulation fill.
   2. Substrate: Gypsum board.
   3. Panel Substrate Facing: Steel sheet, manufacturer's standard thickness.
   4. Hinges: Continuous piano type, ___ gauge, _____ inch stainless steel.
   5. Panel Properties:
      a. Thickness With Finish: 4 inches.
      b. Width: Equal widths.

C. Panel Finishes:
   1. Facing: Vinyl coated fabric.
   2. Exposed Metal Trim: Custom powder coated paint finish.

D. Panel Seals:
   1. Panel to Panel Seals: Grooved and gasketed astragals, with continuous flexible ribbed vinyl seal fitted to panel edge construction; color to match panel finish.
   2. Acoustic Seals: Flexible acoustic seals at jambs, meeting mullions, ceilings, retractable floor and ceiling seals, and above track to structure acoustic seal.

E. Suspension System:
   1. Track: Formed steel; 1-1/4 by 1-1/4 inch size; thickness and profile designed to support loads, steel sub-channel and track connectors, and track switches.
   2. Carriers: Nylon wheels on trolley carrier at top of every second panel, sized to carry imposed loads, with threaded pendant bolt for vertical adjustment.

F. Performance:
   1. Acoustic Performance:
      a. Sound Transmission Class (STC): 38 to 42 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90, on panel size of 100 sq ft.
      b. Acoustia-Clear: STC, 51.
   2. Installed partition system track capable of supporting imposed loads, with maximum deflection of 1/360 of span.

G. Accessories:
   1. Ceiling Closure: White enameled ceiling closure; aluminum jamb and head molding, fittings and attachments.
   2. Pocket Enclosures: Door, frame, and trim to match adjacent walls.
   3. Acoustic Sealant: As recommended by partition manufacturer.

2.03 MATERIALS

A. Aluminum Extrusions: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

B. Standard Gypsum Board: ASTM C1396/C1396M, 3/8 inch thick, maximum permissible length; ends square cut, square edges.

C. Vinyl Coated Fabric: ASTM F793/F793M, Category VI, polyvinyl fluoride (PVC) finish for washability and improved flame retardance; color as selected by Architect from manufacturer's standard range.

D. Markerboard: Porcelain enamel on steel, laminated to core.

E. Tackboard: Natural, light brown, fine grained cork; ____ inch thick; color as selected from manufacturer's standard range.

F. Acoustic Insulation:
   1. Type: As required for acoustic performance indicated.

2. Thickness: As required for acoustic performance indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify track supports are laterally braced and will permit track to be level within 1/4 inch of required position and parallel to the floor surface.

3.02 INSTALLATION

A. Install partition in accordance with manufacturer's instructions and ASTM E557.

B. Install electric operator, wiring, and controls. Locate control station(s) as indicated.

C. Fit and align partition assembly and pocket doors level and plumb.

D. Install acoustic sealant to achieve required acoustic performance.

E. Coordinate electrical connections.

3.03 ADJUSTING

A. Adjust partition assembly to provide smooth operation from stacked to full open position. Do not over-compress acoustic seals.

B. Visually inspect partition in full extended position for light leaks to identify a potential acoustical leak.

C. Adjust partition assembly to achieve lightproof seal.

3.04 CLEANING

A. Clean finish surfaces and partition accessories.

B. Condition markerboard surfaces in accordance with manufacturer's instructions.

3.05 CLOSEOUT ACTIVITIES

A. Demonstrate operation of partition and identify potential operational problems.

3.06 SCHEDULES

A. Acousti-Seal Legacy - paired panels: Talking Rooms 153/155.

END OF SECTION

SECTION 10 2600
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Corner guards.

B. Protective wall covering.

C. Door and frame protection.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010 (Reapproved 2018).

B. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies; 2014.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Include plans, elevation, sections, and attachment details.

C. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
   1. Submit two samples of protective wall covering, 6 by 6 inches square.
   2. Submit two full-size samples of door frame protectors.

D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

E. Maintenance Data: Manufacturer's instructions for care and cleaning of each type of product. Include information about both recommended and potentially detrimental cleaning materials and methods.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.

B. Protect work from UV light damage.

C. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.

D. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion.

C. Provide five year manufacturer and installer warranty for metal crash rails.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Corner Guards:
   1. Construction Specialties, Inc; Stainless Steel Corner Guards: www.c-sgroup.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. (WP1, WP2) Rigid Sheet Wall Protection:
   1. Construction Specialties, Inc; Acrovyn High-Impact Wall Covering: 4000 www.c-sgroup.com/#sle.

2. Substitutions: See Section 01 6000 - Product Requirements.

C. (FRP) Fiberglass Reinforced Panel:
1. Marlite

D. (WP3) Protective Wall Coverings:
1. Koroseal

E. Metal Door Frame Protection:
1. Koroseal.
2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE CRITERIA

A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for compliance with applicable provisions of ASTM D256 and/or ASTM F476.

2.03 PRODUCT TYPES

A. (CG1) Corner Guards - Flush Mounted:
1. Material: Type 304 stainless steel, No. 4 finish, 20 gauge, __ inch thick.
2. Width of Wings: 2 inches.
3. Corner: Square.
4. Length: One piece, 96".
5. Locations: Outside corners in Rooms 110, 113, 114, 115, 129, and 156.

B. (WP1, WP2) Rigid Sheet Wall Protection:
1. Material: Fiber Reinforced Laminate (FRL): Thermofused melamine overlay, decorative paper and fire-rated phenolic paper with fiber reinforcing inner layers.
2. Thickness: 0.06 inch.
3. Panel Size: 3 feet by 8 feet.
4. (WP1, WP2) Color and Pattern: As selected from manufacturer's standard finishes.
5. Texture: As indicated on drawings.
a. Texture Direction: Horizontal.
6. Accessories: Provide manufacturer's standard PVC color-matched trim and moldings.
a. Outside Corner Trim: Flat.
b. Division Bar: Flat.
7. Mounting: Adhesive.

C. (WP3) Protective Wall Coverings:
1. Color/Pattern: Urban, Linen - URB-15.

D. Doorway Protection:
1. Frames Protection: Attached to jambs.
a. Material: Stainless steel.
b. Mounting: Mechanically fastened to push side exposed corner of door frame, using stainless steel, phillips pan head, self-tapping, sheet metal screws of size recommended by manufacturer.
c. Location(s): Jambs in Rooms 110, 111, 156 and 154.

E. Adhesives and Primers: As recommended by manufacturer.

2.04 FABRICATION

A. Fabricate components with tight joints, corners and seams.

B. Pre-drill holes for attachment.

C. Form end trim closure by capping and finishing smooth.

2.05 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Provide wall and door protection systems of each type from a single source and manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

B. Verify that substrate surfaces for adhered items are clean and smooth.

C. Start of installation constitutes acceptance of project conditions.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

B. Position bottom of corner guards at top of wall base.

C. Position protective wall covering no less than 1 inch above finished floor to allow for floor level variation.

1. Full-Height Installation: Establish a plumb line located at edge of starting point of first sheet to ensure following sheets will be installed plumb.
2. Wainscot Installation: Establish a level line at the specified height for entire length of run. Install by aligning top of edge of covering with this line.
3. Apply adhesive with 1/8 inch V-notch trowel to an area of wall surface that can be completed within cure time of the adhesive.
4. Install trim pieces as required for a complete installation. Allow tolerance for thermal movement.
5. Use a roller to ensure maximum contact with adhesive.

3.03 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch.

B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

3.04 CLEANING

A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION

SECTION 10 2800

TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Under-lavatory pipe supply covers.

C. Diaper changing stations.

D. Utility room accessories.

E. Coat Hooks.

1.02 RELATED REQUIREMENTS

A. Section 08 8300 - Mirrors: Other mirrors.

B. Section 09 3000 - Tiling: Ceramic washroom accessories.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a (Reapproved 2019).

C. ASTM C1036 - Standard Specification for Flat Glass; 2016.

D. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2018.

E. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2004, with Editorial Revision (2016).

F. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement to receive anchor attachments.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet Accessories:
   1. AJW Architectural Products; _____: www.ajw.com/#sle.
   2. American Specialties, Inc; _____: www.americanspecialties.com/#sle.
   3. Bobrick.
   4. Substitutions: Section 01 6000 - Product Requirements.

B. Diaper Changing Stations:
   1. Koala Kare Products; _____: www.koalabear.com/#sle.
   2. Substitutions: 01 6000 - Product Requirements.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

C. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

D. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

2.04 COMMERCIAL TOILET ACCESSORIES

A. Toilet Paper Dispenser:
   1. Products:
      a. Bobrick, B-2888._____.

B. Soap Dispenser: Liquid soap dispenser, wall-mounted, surface, with stainless steel cover and horizontal stainless steel tank and working parts; push type soap valve, check valve, and window gauge refill indicator, tumbler lock.
   1. Products:
      a. Bobrick, B-4112.
      b. Substitutions: Section 01 6000 - Product Requirements.

C. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.
   1. Products:
      a. Bobrick, B-165-2436.
      b. Substitutions: Section 01 6000 - Product Requirements.

D. Seat Cover Dispenser: Stainless steel, surface-mounted, reloading by concealed opening at base, tumbler lock.
   1. Products:
      a. Bobrick, B-4221.
      b. Substitutions: Section 01 6000 - Product Requirements.

E. Grab Bars: Stainless steel, smooth surface.
   1. Standard Duty Grab Bars:
      a. Push/Pull Point Load: 250 pound-force, minimum.
      b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
      c. Finish: Satin.
      d. Length and Configuration: As indicated on drawings.
      e. Products:
         1) Bobrick, B-5806 x 18.
         2) Bobrick, B-5806 x 36.
         3) Bobrick, B-5806 x 42.
         4) Substitutions: Section 01 6000 - Product Requirements.

2.05 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers:
   1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
   2. Construction: 1/8 inch flexible PVC.
      a. Comply with ICC A117.1.
   3. Color: White.

2.06 DIAPER CHANGING STATIONS

A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
   1. Material: Stainless steel.
   2. Mounting: Surface.
   3. Minimum Rated Load: 250 pounds.
   4. Products:
      a. Koala, KB310-SSWM.

b. Substitutions: 01 6000 - Product Requirements.

2.07 UTILITY ROOM ACCESSORIES

A. Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, hat-shaped channel.
   1. Holders: Three spring-loaded rubber cam holders.
   2. Length: 36 inches.

B. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
   1. Hooks: Two, 0.06 inch stainless steel rag hooks at shelf front.
   2. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.

C. Coat Hooks:
   1. Products:
      a. Davis, Dots.
      b. Color: Oak
      c. Locations: TH Exam Rooms/ TH 125.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
   1. Grab Bars: As indicated on drawings.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

B. FM (AG) - FM Approval Guide; current edition.

C. NFPA 10 - Standard for Portable Fire Extinguishers; 2017, with Errata (2018).

D. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

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

D. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:
   1. Kidde, a unit of United Technologies Corp; _____: www.kidde.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Fire Extinguisher Cabinets and Accessories:
   1. Kidde, a unit of United Technologies Corp; _____: www.kidde.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
   1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Class: A:B:C type.
   2. Size: 5 pound.
   3. Finish: Baked polyester powder coat, Red color.
   4. Temperature range: Minus 40 degrees F to ___ degrees F.

2.03 FIRE EXTINGUISHER CABINETS

A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.

B. Cabinet Construction: Non-fire rated.
   1. Formed primed steel sheet; 0.036 inch thick base metal.

C. Cabinet Configuration: Semi-recessed type.

1. Size to accommodate accessories.
2. Trimless type.
3. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.

D. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinges.

E. Door Glazing: Float glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.

F. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

G. Finish of Cabinet Exterior Trim and Door: Baked enamel, white color.

H. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

A. Lettering: “FIRE EXTINGUISHER” decal, or vinyl self-adhering, pre-spaced black lettering in accordance with authorities having jurisdiction (AHJ).

B. Wall sign:
1. 24" tall triangular "FIRE EXTINGUISHER" sign with lettering on two sides over each FEC location.
2. Sign size, font, font size and mounting height to comply with AHJ requirements.

C. Self-Service Reloading Kits: Type ABC.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure rigidly in place.

C. Place extinguishers and accessories in cabinets.

3.03 MAINTENANCE - SELF-SERVICE FIRE EXTINGUISHERS

A. Monthly Inspections: Inspect self-service fire extinguishers on monthly basis in accordance with manufacturer’s instructions, and requirements of the authorities having jurisdiction (AHJ).

B. Annual Inspections: Inspect self-service fire extinguishers on annual basis in accordance with manufacturer’s instructions, and requirements of the authorities having jurisdiction (AHJ).

C. Inspection Certification Tag: Provide new tag indicating acceptable condition of fire extinguisher, date of inspection, and name of self-service inspector for each inspection.

END OF SECTION

SECTION 10 5620

MOBILE STORAGE SHELVING UNITS - MECHANICALLY-ASSISTED

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:
   1. Mechanically assisted, carriage mounted high-density mobile storage units, support rails, fabrication, and installation including leveling of support rails.

B. Related Work, Not Furnished:
   1. Structural floor system capable of supporting live and dead loads required by prevailing building codes, including rolling loads of storage units to be installed.
   2. Finish floor covering materials and installation on concrete with recessed rail installation.

C. Related Sections:
   1. Section 03300 – Concrete Work
   2. Sections in Division 9 – Finishes, relating to finish floor and base materials.

D. Alternates:

1.03 REFERENCES

A. American National Standards Institute (ANSI) Standards:
   1. Applicable standards for fasteners used for assembly.

B. American Society for Testing and Materials (ASTM) Standards:
   1. Applicable standards for steel materials used for fabrication.

C. American Institute Of Steel Construction (AISC) Standards:
   1. Applicable standards for steel materials used for fabrication.

1.04 SYSTEM DESCRIPTION

A. General: The system consists of manufactured storage units mounted on manufacturer's track-guided carriages to form a compact storage system. System design permits access to any single aisle by manually moving units until the desired aisle is opened. The carriage/rail system provides uniform carriage movement along the total length of travel, even with unbalanced loads.

B. Carriage System Design and Features: The carriage system consists of a formed structural steel frame with machined and balanced wheels riding on steel rails recessed mounted to the floor. Rails shall be types selected by the manufacturer to ensure smooth operation and self-centering of mobile storage units during travel without end play or binding. Rail types, quantities and spacing shall be selected by the manufacturer to suit installation conditions and requirements. All bearings used in the drive mechanism shall be permanently shielded and lubricated.

C. Movement Controls: Triple or single arm operating wheels with rotating hand knobs shall be provided on the accessible (drive) ends of shelf units, centered on the end panel, located 40 inches (1051MM) from the base of each unit to permit units to be moved to create a single aisle opening. Turning the handle transmits power through chain drive to drive wheels on each carriage.

D. Drive System: The system shall be designed with a positive type mechanically-assisted drive which minimizes end play, ensures there is no play in the drive handle, and that carriages will stop without drifting.
   1. System shall include a chain sprocket drive system for each movable carriage to ensure that carriages move uniformly along the total length of travel, even with unbalanced loads.

All system components shall be selected to ensure a smooth, even movement along the entire carriage length. Drive system gearing shall be designed to permit 1 lb. of force applied to the drive handle to move a minimum of 4,000 lbs. of load.

2. A tensioning device shall be provided on each chain drive with provision for adjusting tension without removing end panels.
3. All bearings used in the drive mechanism shall be permanently shielded and lubricated.

E. Safety Features:
1. Color-coded visual indicators shall provide verification that carriages are in a locked or unlocked mode.
2. A single safety lock button, mounted on each operating wheel hub, will permit moving a carriage in either direction to create a new access aisle when pulled out (unlocked), or locking the carriage when pushed in.

F. Finishes:
1. Fabricated Metal Components And Assemblies: Manufacturer's standard powder coat paint finish.
2. End Panels, Accessible Ends: Plastic laminate, manufacturer's standard textures and patterns.

1.05 PERFORMANCE REQUIREMENTS

A. Design Requirements:
1. Limit overall height to 90 inches.
2. Limit overall length to 162 inches for SE35 and 102 inches for SE62.
3. Limit overall width to 216 inches for SE35 and 135 inches for SE62.

B. Ease of Movement: Provide mechanically assisted units capable of being moved by exerting a maximum horizontal force of 5 pounds on the operating wheel.

C. Seismic Performance: Provide mobile storage units capable of withstanding the effects of earthquake movement when required by applicable building codes.

1.06 SUBMITTALS

A. Product Data: Submit manufacturer's product literature and installation instructions for each type of shelving, track and installation accessory required. Include data substantiating that products to be furnished comply with requirements of the contract documents.

B. Shop Drawings: Show fabrication, assembly, and installation details including descriptions of procedures and diagrams. Show complete extent of installation layout including clearances, spacings, and relation to adjacent construction in plan, elevation, and sections. Indicate clear exit and access aisle widths; access to concealed components; assemblies, connections, attachments, reinforcement, and anchorage; and deck details, edge conditions, and extent of finish flooring within area where units are to be installed.
1. Show installation details at non-standard conditions. Furnish floor layouts, technical and installation manuals for every unit shipment with necessary dimensions for rail layout and system configuration at the project site. Include installed weight, load criteria, furnished specialties, and accessories.
2. Provide layout, dimensions, and identification of each unit corresponding to sequence of installation and erection procedures. Specifically include the following:
a. Location, position, and configuration of tracks on all floors.
b. Plan layouts of positions of carriages, including all required clearances.
c. Details of shelving, indicating method and configuration of installation in carriages.
3. Provide location and details of anchorage devices to be embedded in or fastened to other construction.
4. Provide installation schedule and complete erection procedures to ensure proper installation.

C. Samples: Provide minimum 3 inch (76MM) square example of each color and texture on actual substrate for each component to remain exposed after installation.

D. Selection Samples: For initial selection of colors and textures, submit manufacturer's color charts consisting of actual product pieces, showing full range of colors and textures available.

E. Warranty: Submit draft copy of proposed warranty for review by the Architect.

F. Maintenance Data: Provide in form suitable for inclusion in maintenance manuals for mobile storage units. Data shall include operating and maintenance instructions, parts inventory listing, purchase source listing, emergency instructions, and related information.
   1. Submit manufacturer's instructions for proper maintenance materials and procedures.
   2. Submit manufacturer's printed instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated use conditions. Include precautions against using materials and methods which may be detrimental to finishes and performance.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Engage an experienced manufacturer who is ISO 9001 certified for the design, production, installation and service of carriage mounted high-density mobile storage units and support rails. Furnish certificate attesting manufacturer’s ISO 9001 quality system registration.

B. Installer Qualifications: Engage an experienced installer who is a manufacturer's authorized representative for the specified products for installing carriages and anchoring shelving units to carriages.
   1. Minimum Qualifications: 1-year experience installing systems of comparable size and complexity to specified project requirements.
   2. Guaranteed 24-hour service response time.

1.08 DELIVERY, STORAGE AND HANDLING

A. Follow manufacturer’s instructions and recommendations for delivery, storage and handling requirements.

1.09 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions before fabrication. Indicate verified measurements on Shop Drawings. Coordinate fabrication and delivery to ensure no delay in progress of the Work.

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating mobile storage units. Coordinate construction to ensure actual dimensions correspond to established dimensions.

1.10 SEQUENCING AND SCHEDULING

A. Sequencing: Coordinate storage shelving system installation with other work to minimize possibility of damage and soiling during remainder of construction period.

B. Scheduling: Plan installation to commence after finishing operations, including painting have been completed.

C. Built-In Items: Provide components which must be built in at a time which causes no delays general progress of the Work.

D. Pre-installation Conference: Schedule and conduct conference on project site to review methods and procedures for installing mobile storage units including, but not limited to, the following:
   1. Review project conditions and levelness of flooring and other preparatory work performed under other contracts.
   2. Review and verify structural loading limitations.
   3. Recommended attendees include:
      a. Owner's Representative.
      b. Prime Contractor or representative.
      c. The Architect.
      d. Manufacturer's representative.

e. Subcontractors or installers whose work may affect, or be affected by, the work of this section.

1.11 WARRANTY

A. Provide a written warranty, executed by Contractor, Installer, and Manufacturer, agreeing to repair or replace units which fail in materials or workmanship within the established warranty period. This warranty shall be in addition to, and not a limitation of, other rights the Owner may have under General Conditions provisions of the Contract Documents.

B. Warrant the entire movable compact shelving installation against defects in materials and workmanship for a period of five years from date of acceptance by the Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. General: Products are based upon mobile shelving system products manufactured by Spacesaver Corporation. Contingent on meeting specification requirements, other acceptable manufacturers may be included.

B. Supplier: Southwest Solutions Group;

C. Jim Deller

D. (425)-419-6100

E. jdeller@southwestsolutions.com

2.02 BASIC MATERIALS

A. General: Provide materials and quality of workmanship which meet or exceed established industry standards for products specified. Material thicknesses/gauges are manufacturer's option unless indicated otherwise.

B. Plastic Laminates: NEMA LD-3, GP-28, Vertical Grade.

2.03 GROUT

A. General: Provide non-shrink, non-staining hydraulic cement compound conforming to the following requirements, based on the performance of the test specimens at room temperature and in laboratory air.
   1. Linear Movement: No shrinkage while setting; maximum expansion limited to .002 inches per linear inch.
   2. Compressive Strength: Based on two inch cubes made following ASTM standards, tested on a Balding-Southward machine of 60,000 pounds capacity, meet or exceed the following:
      a. Age: 1 hour ---- 4,500 psi
      b. 7 days ---- 8,000 psi

2.04 MANUFACTURED COMPONENTS

A. Rails:
   1. Material: ASTM/AISI Type 1035 or 1045 steel, manufacturer's selection.
   2. Capacity: 1,000 pounds per lineal foot (1385kg/M) of carriage.
   3. Minimum Contact Surface: 5/8 inch (16MM) wide.
   4. Provide rail sections in minimum 6 foot (1.83M) lengths.
   5. Rail configuration shall permit attachment to top of structural floor system with provision for leveling rails to compensate for variations in floor surface level.
   6. Provide rail connections designed to provide horizontal and vertical continuity between rail sections, to gradually transfer the concentrated wheel point load to and from adjoining rail sections. Butt joints are not permitted.
   7. Anti-Tip Rail Form Covers: Manufacturer shall provide for protection if required to prevent damage to rails during concrete back pours and when anti-tip devices are installed.

B. Floor / Ramp:

1. Floor/Ramp Sheathing: Minimum 3/4 inch (19MM), 5-ply underlayment grade plywood. Particle board sheathing materials are not permitted.
2. Provide fire retardant treated floor/ramp materials when required by code.
3. Finished flooring materials shall be provided by the general contractor.

C. Carriages:
1. Provide manufacturer's design movable carriages fabricated of welded or bolted steel construction. Galvanized structural components and/or riveted carriages are unacceptable.
2. Provide fixed carriages of same construction and height as the movable carriages, anchored to rails. Setting fixed shelving directly on floors is not permitted.
3. When required, provide bolted carriage splices designed to maintain proper unit alignment and weight load distribution.
4. Design carriages to allow the shelving uprights to recess and interlock into the carriages a minimum of 3/4 inch (19MM). Top mount carriages are unacceptable.
5. Provide each carriage with two wheels per rail.

D. Drive / Guide System:
1. Design: Provide drive system which prevents carriage whipping, binding and excessive wheel/rail wear under normal operation.
   a. If line shafts are used, all wheels on one side of carriage shall drive.
   b. If synchronized drives are used, a minimum of one wheel assembly driving both sides of carriage at center location required. Drive shaft shall exhibit no play or looseness over the entire length of that assembly.
2. Shafts: Solid steel rod or tube.
3. Shaft Connections: Secured couplings.
4. Bearing Surfaces: Provide rotating load bearing members with ball or roller bearings. Provide shafts with pillow block or flanged self-aligning type bearings.

E. Wheels:
1. Capacity: Minimum load capacity per wheel: 3200 lbs (1455kg).
2. Size: Minimum 5 inches (127MM), outside diameter drive wheels.
3. Guides: Determined by manufacturer; minimum 2 locations.

F. Face Panels:
1. Materials: Plastic laminate clad particle board with plastic edging on vertical edges.
2. Finishes: Selected from manufacturer’s standard available colors and patterns by the Architect.

G. Accessories:
1. (Optional) Anti-Tip Devices: Provide manufacturer’s standard fixtures.
2. (Optional) Mechanical Sweep and Safety Stop (Non-Powered).
3. Every potential aisle shall be protected with a 3” (76 mm) high extruded aluminum safety sweep, hinged from the carriage using spring steel leaf springs, with the base edge maximum ¾” (19mm) from the floor. The carriage(s) shall stop when depressed at any location along the leading edge of the sweep surface. Activated safety sweep shall engage an impact- absorbing friction disk brake to protect occupants, stored media and the carriage system itself via a sheathed cable system comprised of aircraft-grade 3/64” (1.2mm) stainless steel core cables housed inside lined conduit. Safety sweep shall have bright, red and white safety identification tape applied full length marking its location. Safety sweep shall run the full length of both sides of each moveable carriage for full aisle coverage.
4. Mechanical safety sweep shall automatically reset to enable mobile system users to freely and safely back carriages away from aisle obstructions simply by reversing the direction of the rotating handle.
5. Safety sweep shall be operational when the carriages are not moving. Should a sweep be activated in an open aisle, the carriage with the activated sweep will not close on that aisle.

Safety sweep shall automatically reset if activated and then released when the carriages are not moving.

6. Safety sweep shall require no electrical power or batteries to operate.

2.05 FABRICATION

A. General: Coordinate fabrication and delivery to ensure no delay in progress of the Work.

B. Wheels: Provide precision machined and balanced units with permanently shielded and lubricated bearings.

C. Carriages: Fabricate to ensure no more than 1/4 inch (6MM) maximum deviation from a true straight line. Splice and weld to ensure no permanent set or slippage in any spliced or welded joint when exposed to forces encountered in normal operating circumstances.

D. Shelving, Supports and Accessories: See individual descriptions in “Shelving” paragraphs.

2.06 FINISHES

A. Colors: Selected from manufacturer’s standard available colors.

B. Paint Finish: Provide factory applied electrostatic powder coat paint. Meet or exceed specifications of the American Library Association.

C. Laminate Finish: Provide factory applied laminate panels at locations indicated on approved shop drawings.

D. Edgings: Provide preformed edging, color-matched to unit colors selected.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine floor surfaces with Installer present for compliance with requirements for installation tolerances and other conditions affecting performance of mobile storage units.

B. Verify that building structural system is adequate for installing mobile storage units at locations indicated on approved shop drawings.

1. For installations on existing floors, ensure that rail spacings indicated on shop drawings are in proper locations so existing load-bearing structural members are not over stressed.

C. Verify that intended installation locations of mobile storage units will not interfere with nor block established required exit paths or similar means of egress once units are installed.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to proper performance of mobile storage units, once installed.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Rails:

1. Lay out rails using full length units to the maximum extent possible. Use cut lengths only at ends to attain total length required. Locate and position properly, following dimensions indicated on approved shop drawings. Verify thickness of finished floor materials to be installed (by others) and install level 1/16 inch (0.6MM) above finished floor surfaces.
2. Verify level, allowing for a minimum 1/4 inch (6MM) of grout under high points. Position and support rails so that no movement occurs during grouting.
3. Set rails in full grout bed, completely filling any voids entire length of all rails including rail connectors. Trim up sides flush with rails to ensure proper load transfer from rail to supporting floor. Using shims in lieu of full grouting is not permitted.
4. Installation Tolerances: Do not exceed levelness of installed rails listed below:
   a. Maximum Variation From True Level Within Any Module: 3/32 inch (2.4MM).
   b. Maximum Variation Between Adjacent (Parallel) Rails: 1/16 inch (1.6MM), perpendicular to rail direction.
   c. Maximum Variation In Height: 1/32 inch (.8MM), measured along any 10 foot (3.05M) rail length.

5. Verify rail position and level; anchor to structural floor system with anchor type and spacings indicated on approved shop drawings.

B. Floors/Ramps:
   1. General: Finished elevation shall be 1/16 inch (1.6MM) below top of rails.
   2. Place floors and ramps to the extent indicated on approved shop drawings. Extend ramps under all movable ranges. Provide ramp at both ends of mobile system. Do not extend ramps beyond the ends of carriages.
   3. Construct floors and ramps to prevent warping or deformation of floor panels in a normal operating environment. Support panels on levelers at maximum 16 inches on center.
   4. Ramp Slope: Do not exceed the following:
      a. ADA Accessible Ramps: Maximum 1:12 slope (4.76 degrees).
      b. Other Ramps: Maximum 9 degree slope (1.9:12).
      c. Vertical Transition, Ramp edge to floor: Maximum 1/8 inch (3MM).

C. Shelving Units Installation:
   1. General: Follow layout and details shown on approved shop drawings and manufacturer's printed installation instructions. Position units level, plumb; at proper location relative to adjoining units and related work.
   2. Carriages:
      a. Place movable carriages on rails. Ensure that all wheels track properly and centering wheels are properly seated on centering rails. Fasten multiple carriage units together to form single movable base where required.
      b. Position fixed carriage units to align with movable units.
   3. Shelving Units:
      a. Permanently fasten shelving units to fixed and movable carriages with vibration-proof fasteners.
      b. Stabilize shelving units following manufacturer's written instructions. Reinforce shelving units to withstand the stress of movement where required and specified.

3.03 FIELD QUALITY CONTROL

A. Verify shelving unit alignment and plumb after installation. Correct if required following manufacturer’s instructions.

B. Remove components which are chipped, scratched, or otherwise damaged and which do not match adjoining work. Replace with new matching units, installed as specified and in manner to eliminate evidence of replacement.

3.04 ADJUSTING

A. Adjust components and accessories to provide smoothly operating, visually acceptable installation.

3.05 CLEANING

A. Immediately upon completion of installation, clear components and surfaces. Remove surplus materials, rubbish and debris resulting from installation upon completion of work and leave areas of installation in neat, clean condition.

3.06 DEMONSTRATION/TRAINING

A. Schedule and conduct demonstration of installed equipment and features with Owner's personnel.

B. Schedule and conduct maintenance training with Owner's maintenance personnel. Training session should include lecture and demonstration of all maintenance and repair procedures that end user personnel would normally perform.

3.07 PROTECTION

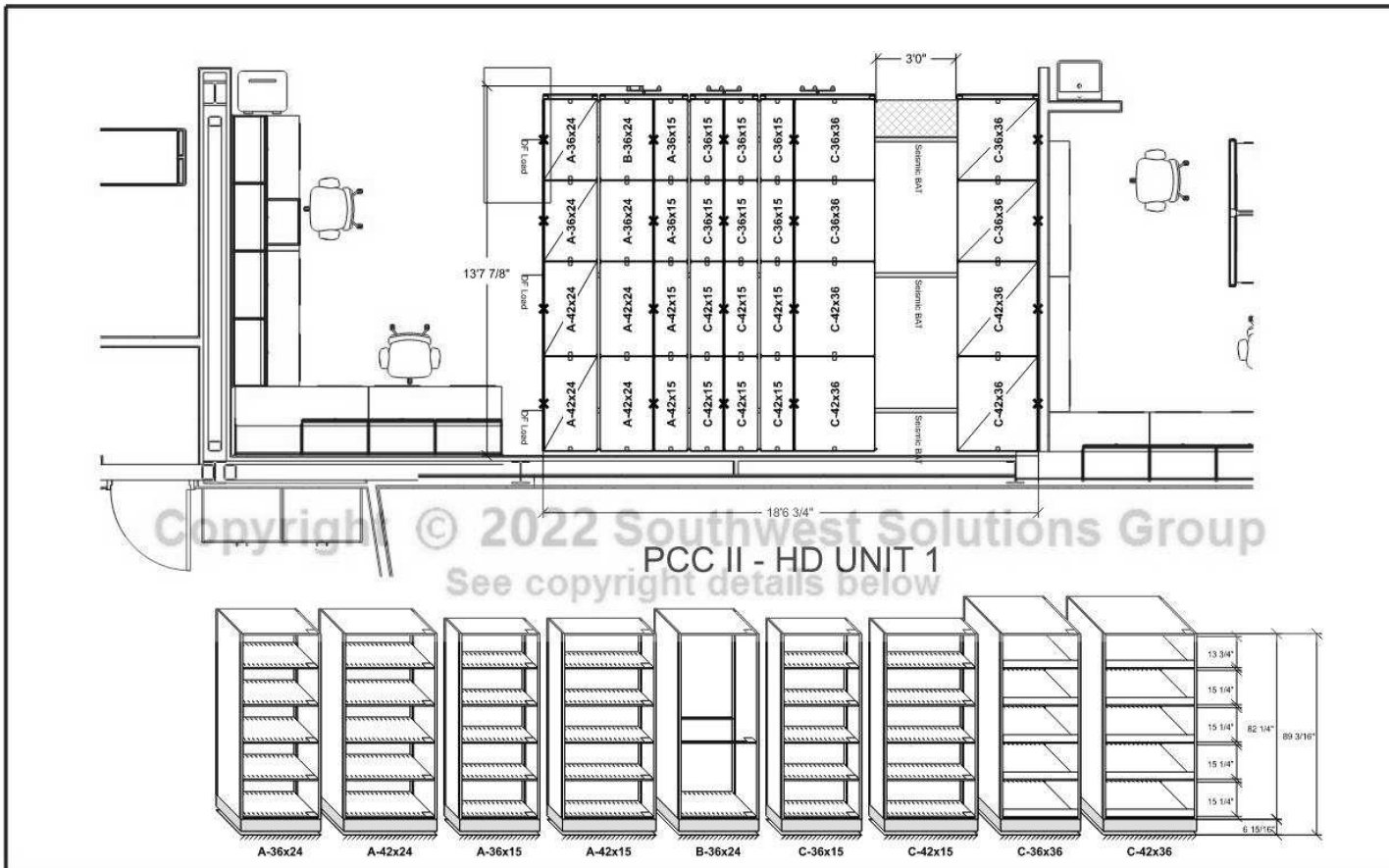
A. Protect system against damage during remainder of construction period. Advise Owner of additional protection needed to ensure that system will be without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 10 5620.01

MOBILE STORAGE – APPENDIX

TYPE MARK SE35



Customer's Approval: Date:

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Drawing Number: 112259-1	Revision:
Printed Date: 01/31/2022	Drawn By: V Asuncion
Scale: 1:61	Sheet: 1 of 2
Salesperson: DELLER,JIM	

Southcentral Foundation
PCC II West Expansion & Renovation
Anchorage, AK

File: E:\!Vergel Files\Rep Files\!Jim Deller\112259 - Southcentral Foundation\112259-1A

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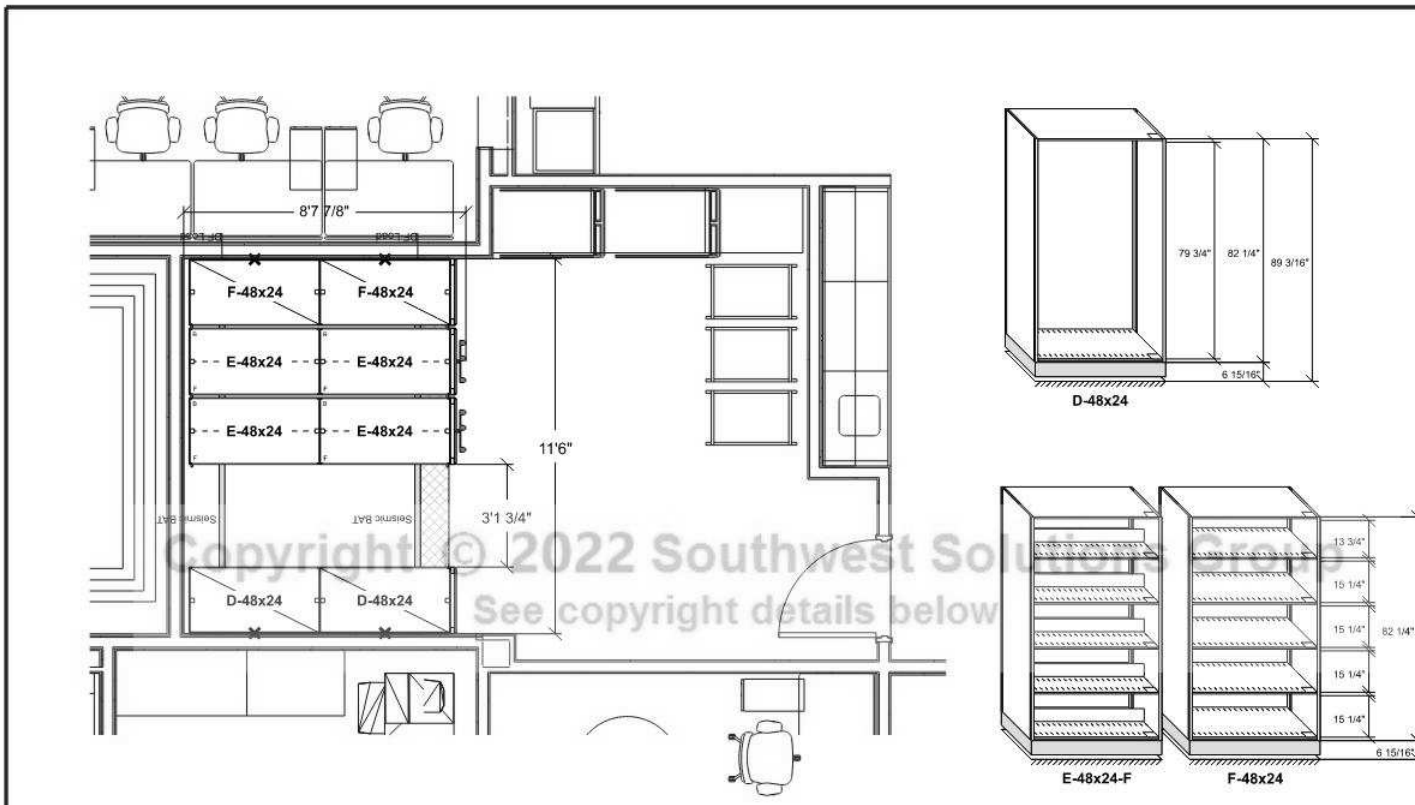

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Scale: 1:53	Sheet: 2 of 2
Salesperson: DELLER,JIM	

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END OF SECTION

SECTION 10 5723

CLOSET AND UTILITY SHELVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted wire closet shelving.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Blocking in walls for attachment of shelving or storage system.

B. Section 09 2116 - Gypsum Board Assemblies: Blocking in metal stud walls for attachment of standards or mounting rails.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Provide drawings prepared specifically for this project; show dimensions of shelving or storage system and attachment to substrates.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

C. Store flat to prevent warpage and bending.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty for wire shelving systems and laminated wood storage systems.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wire Storage Shelving:

2.02 WIRE STORAGE SHELVING SYSTEMS

A. Applications:

B. Wire Shelving: Factory-assembled coated wire mesh shelf assemblies for wall-mounting, with components and connections required to produce a rigid structure that is free of buckling and warping.

1. Construction: Cold-drawn steel wire with average tensile strength of 100,000 psi resistance welded into uniform mesh units, square, rigid, flat, and free of dents or other distortions, with wires trimmed smooth.
2. Coating: PVC or epoxy, applied after fabrication, covering surfaces.
3. PVC Coating: 9 to 11 mils thick.
4. Epoxy Coating: Nontoxic epoxy-polyester powder coating baked-on finish, 3 to 5 mils thick.
5. Standard Mesh Shelves: Cross deck wires spaced at 1 inch.

C. Wall-Mounted Standards for Wire Shelving: Vertically slotted channel standards with double-tab cantilever brackets to suit shelving; factory finished to match shelving.

D. Mounting Hardware for Wire Shelving: Provide manufacturer's standard mounting hardware; include support braces, wall brackets, back clips, end clips, poles, and other accessories as required for complete and secure installation; factory finished to match shelving.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect areas to receive shelving or storage system, to verify that spaces are properly prepared to receive shelf units, and are of dimensions indicated on shop drawings.

B. Verify appropriate fastening hardware.

C. Do not begin installation until substrates have been properly prepared.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install wire shelving in accordance with manufacturer's instructions, with shelf surfaces level.

B. Cap exposed ends of cut wire shelving.

C. Install wire shelving back clips, end clips at side walls, and support braces at open ends. Install intermediate support braces as recommended by manufacturer.

3.04 PROTECTION

A. Protect installed work from damage.

B. Touch-up, repair, or replace damaged products before Substantial Completion in a manner that eliminates evidence of replacement.

END OF SECTION

SECTION 11 1313
LOADING DOCK BUMPERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Loading dock bumpers of reinforced rubber pads with attachment frame.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on unit dimensions, method of anchorage, and details of construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Loading Dock Bumpers:
   1. Blue Giant Equipment Corporation; _____: www.bluegiant.com/#sle.

2.02 COMPONENTS

A. Loading Dock Bumpers: Fabric reinforced rubber pads, ozone resistant, laminated and compressed in position using two galvanized steel rods with threaded ends, washers, and nuts between 3 inch high by 2-1/2 inch wide by 1/4 inch thick galvanized steel angle end plates.
   1. Projection From Wall: 4-1/2 inches.
   2. Vertical Height: 10 inches.
   3. Width: 24 inches.
   4. Profile: Rectangular.

B. Attachment Hardware: 3/4 inches diameter galvanized bolts with expansion shields.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install dock bumpers in accordance with manufacturer's instructions.

B. Set plumb and level.

C. Epoxy anchored.
   1. Coordinate connection detail with Architect.

END OF SECTION

SECTION 11 3013
RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Kitchen appliances.

1.02 REFERENCE STANDARDS

A. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.

C. Provide ten (10) year manufacturer warranty on magnetron tube of microwave ovens.

D. Provide ten (10) year manufacturer warranty on tub and door liner of dishwashers.

PART 2 PRODUCTS

2.01 KITCHEN APPLIANCES

A. All appliances per Appliance Schedule in drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify utility rough-ins are provided and correctly located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Anchor built-in equipment in place.

3.03 ADJUSTING

A. Adjust equipment to provide efficient operation.

3.04 CLEANING

A. Remove packing materials from equipment and properly discard.

B. Wash and clean equipment.

END OF SECTION

SECTION 11 5313
LABORATORY FUME HOODS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Standard laboratory fume hoods.

B. Work surfaces.

C. Service fittings and outlets.

D. Airflow indicators and alarms.

1.02 REFERENCE STANDARDS

A. ASHRAE Std 110 - Methods of Testing Performance of Laboratory Fume Hoods; 2016.

B. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2020a.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

D. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2020.

E. SEFA 1 - Laboratory Fume Hoods; 2010.

1.03 ADMINISTRATIVE REQUIREMENTS

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide fume hood exterior and interior dimensions and construction, utility and service requirements and locations, and _____.

C. Shop Drawings: Indicate locations, large scale plans, elevations, cross sections, rough-in and anchor placement dimensions and tolerances, clearances required, locations and types of service fittings, and _____.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements. Provide documentation of successful Factory Acceptance Testing.

E. Operation Data: Include description of equipment operation and required adjusting and testing.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

G. Project Record Documents: Record actual locations of concealed utility connections.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.

C. Preconstruction Testing: Factory-test each type of hood as per referenced standard.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or another suitable material.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide one year manufacturer warranty for manufacturer's standard items (listed by part number in manufacturer's official publication).

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Laboratory Fume Hoods:
1. Kewaunee Scientific Corp; ____: www.kewaunee.com/#sle.
2. Mott Manufacturing Ltd; ____: www.mott.ca/#sle.
3. Multilab; ____: www.multilab.net/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 VARIABLE AIR VOLUME (VAV) FUME HOODS

A. Restricted-Bypass Fume Hoods:
1. Provide an electronic control unit designed to use input from a sensor that monitors face velocity or sash position to modulate a dedicated exhaust damper in order to maintain a near-constant fume hood face velocity.
a. Provide control unit with a manual-override switch that allows the operator to fully open the exhaust damper.
b. Provide control unit with outputs for interfacing with building's HVAC control system.

2.03 PERFORMANCE REQUIREMENTS

A. Fume hoods complying with the following when tested in accordance with ASHRAE Std 110:
1. As-Manufactured (AM) Rating: AM 0.01 (0.01 ppm).
2. As-Installed (AI) Rating: AI 0.10 (0.10 ppm).
3. Average Face Velocity: 100 FPM (0.51 m/s) plus or minus 10 percent with sashes fully open.
4. Face-Velocity Variation: Not more than 10 percent of average face velocity across the face opening with sash(es) fully open.
5. Release Rate: 4.0 L/min.
6. Static-Pressure Loss: Not more than 1/2-inch w.g. (124 Pa) at 100 FPM (0.51 m/s) face velocity with sash fully open when measured at four locations 90 degrees apart around the exhaust duct and at least three duct diameters downstream from duct collar.

2.04 FUME HOODS

A. General Requirements:
1. Comply with SEFA 1.

B. Type ___, Fume Hood:
1. Ventilation: Variable Air Volume (VAV).
2. Configuration: Standing-height; bench mounted.
3. Nominal Interior Height: 48 inches.
4. Sash Type: Vertical rising.
a. Leak-free enclosure box, manufacturer's standard construction, for vertical rising sash.
b. Glazing: Laminated safety glass.
c. Sash Guides: Corrosion-resistant polyvinyl chloride (PVC) track.
d. Vertical Sash mechanism: Designed to prevent sash drop in case of mechanism failure.
1) Cable: Minimum 3/32 inch (2 mm) thick stainless steel of construction standard with the manufacturer.
e. Vertical Sash Pull: Type 316 stainless steel, with No.4 finish.
5. Top Front Panel: Standard integral grille stamped into panel of same materials as fume hood exterior.
6. Exterior: Sheet steel.
7. Interior Lining: Polypropylene.

8. Service Fittings and Fixtures:
9. Access Panels: Provide removable panels on both sides hood exterior and interior lining panels.
10. Work Surface:

C. Fume Hood Base Cabinets:
1. Exterior construction: Metal cabinets.
2. Material: Sheet steel.
3. Color/Finish: As indicated on drawings.

D. Light Fixtures: UL labeled, vaporproof, one-tube, T-5 fluorescent light fixtures. Number and length of fixtures as necessary for fume hood width. Mounted above sealed safety glass panel. White baked-enamel finish on fixture interior.

2.05 FABRICATION

A. General: Assemble fume hoods in factory to greatest extent possible. Disassemble fume hoods only as necessary for shipping and handling limitations, or as necessary to permit movement through a 35 inches by 79 inches clear door opening.

B. Stainless-Steel Exterior: Fabricated from stainless-steel sheet, 0.050 inch thick, with component parts screwed together to allow removal of end panels, front fascia, and airfoil, and to allow access to plumbing lines and service fittings.

C. Ends: Fabricated with double-wall end panels. Close area between double walls at front of fume hood and as needed to house sash counterbalance weights, utility lines, and remote-control valves.

D. Lining Assembly: Unless otherwise indicated, assembled with stainless-steel fasteners or epoxy adhesive, concealed where possible. Joints sealed by filling with chemical-resistant sealant during assembly.
1. Punched fume hood lining side panels for service fittings and remote controls. Removable plug buttons for holes not used for indicated fittings.

E. Rear Baffle: Same material as fume hood lining, unless otherwise indicated, at rear of hood with openings at top and bottom, with corrosion-resistant fasteners. Fabricated for removal to facilitate cleaning behind baffle.

F. Exhaust Plenum: Full width of fume hood, sized and configured to provide uniform airflow, of same material as hood lining, and with duct stub for exhaust connection.
1. Duct-Stub Material: Epoxy-coated steel, unless otherwise indicated.

G. Airfoil: At bottom of fume hood face opening, with 1 inch gap between bottom of airfoil and work top. Sash to close on top of airfoil. Designed to direct airflow across work.
1. Fabricated from 14 gauge, 0.0781 inch stainless steel with No.4 finish.

H. Filler Strips: As needed to close spaces between fume hoods and/or fume hood base cabinets and adjacent building construction. Fabricated from same material and with same finish as fume hoods or fume hood base cabinets, as applicable. Flange, notch, and reinforce filler strips. Fabricate to form well-fitting closures, free from oil-canning.

I. Demonstration (teaching) Fume Hoods: Single chamber fume hood, with independently-operable sashes on opposite faces of fume hood. Construction similar to standard models.

J. Comply with requirements of other sections for factory installation of water and laboratory gas service fittings, piping, electrical devices, and wiring. Securely anchor fittings, piping, and conduit to fume hoods, unless otherwise indicated.

2.06 MATERIALS

A. Steel Sheet: Cold-rolled, commercial steel (CS) sheet, complying with ASTM A1008/A1008M; matte finish; suitable for exposed applications.

B. Stainless-Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.

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. Fasteners: Stainless-steel, where exposed to fumes.

2.07 ACCESSORIES

A. Airflow Monitors/Indicators and Alarms: Provide each fume hood with a airflow monitor/indicator complete with an audible and visual alarm that activates when airflow sensor reading is outside of preset range.
   1. Source: Fume hood manufacturer.
   2. Airflow Monitor/Indicator Functionality:
   3. Airflow Alarm functionality: Audible (85 dB @ 4 inch distance), and visual alarm that activates when airflow sensor reading is outside of preset range.
      a. Reset and test mode.
      b. Programmable Switch: Designed to silence audible alarm and automatically reset when airflow returns to within preset range. Warning light to stay on when alarm is silenced.
      c. Capability for integration with BAS (Building Automation System) via BACnet.

2.08 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Factory testing of each type of fume hood.

C. Non-Complying Work: See Section 01 4000.

PART 3 EXECUTION

3.01 EXAMINATION

A. Locate concealed framing, blocking, and reinforcements that support fume hoods by field measurements before being enclosed, and indicate measurements on Shop Drawings.

B. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of fume hoods.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Install fume hoods according to manufacturer's written instructions. Install level, plumb, and true; shim as required, using concealed shims, and securely anchor to building and adjacent laboratory casework. Securely attach access panels but provide for easy removal and secure reattachment. Where fume hoods abut other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

B. Comply with indicated requirements for installing water and laboratory gas service fittings, and electrical and telecommunications devices.

3.03 FIELD QUALITY CONTROL

A. Field test fume hoods as specified below.
   1. General: Test fume hoods as installed to assess airflow velocity. Perform tests with static mode (set sash position) conditions. Conduct testing as outlined below for _____ hoods provided in the Project.

3.04 CLEANING

A. Clean finished surfaces, including both sides of glass; touch up as required; and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

3.05 DEMONSTRATION

A. Demonstrate proper operation of fume hoods and their accessories to Owner's designated representative.

END OF SECTION

SECTION 11 5353

BIOLOGICAL SAFETY CABINETS

PART 1 - GENERAL

1.01 REFERENCE STANDARDS

A. NSF 49 - Biosafety Cabinetry: Design, Construction, Performance, and Field Certification; 2016.

PART 2 - PRODUCTS

2.01 BIOLOGICAL SAFETY CABINETS - CLASS II, TYPE A2

A. General: Enclosed, ventilated cabinet designed to offer personnel, product and/or environmental protection, while limiting cross-contamination between biological agents inside the cabinet and in surrounding environment.

B. Biological Safety Cabinet Type _____ Classification: Class II, Type A2.

C. Performance Specifications: NSF 49.

D. Nominal Size: 6 foot.

E. Cabinet Style: Benchtop/Console with base stand.

F. Work Zone: Provide minimum dimensions complying with performance specifications of specified unit.
   1. Width: 70-3/8 inches.
   2. Height: 60-7/8 inches___ inches.
   3. Front-to-Back (Measured at 10 inches Window Height): 28-1/2 inches.

G. Front View Window Opening Height: Fully-closed to 21 inches high opening.

H. Work Access Opening Height:
   1. Biological Safety Cabinet Type _____: 8 inches.

I. Controls: Microprocessor-based control system with cleanable membrane touch-screen control panel mounted on the front of the cabinet and facing down towards operator while seated.
   1. Audible alarm and flashing LED to indicate unsafe condition.
   2. Alarm mute switch on the front of the cabinet to allow a brief time for equipment loading in the work zone. Automatic reactivation of audible alarm after five minutes if the viewscreen sash remains at the improper height. The visible alarm to stay on until safe conditions are reestablished.
   3. Delay-Off Timer: For lights, outlets and optional ultraviolet lights. Capable of 15-minute interval settings.

J. Illumination: Externally-mounted fluorescent lighting fixture with solid state ballasts producing an average of 100 footcandles at work surface.

K. Filters: One supply and one exhaust, scan-tested, zero-probe HEPA Filter, 99.99 percent efficient on 0.3 micron particles by DOP test, serviceable and removable from front of unit. Exhaust filter also accessible from top of unit. Air balancing damper in filter housing with external control.

L. Electrical Requirements: Dedicated 115V, 20 amp, 60 Hz single phase circuit required. Pre-wired cabinet with a 14 foot power cord terminated with a NEMA 5-20P plug.

M. Bulkhead Fittings: Connectors with easily and cleanly removable and reusable elastomeric seals. Penetrations using applied sealants are not permitted. Seal standard blank-out plugged penetrations for future fittings gas-tight.

N. Gaskets: Manufacturer's standard closed cell Neoprene, forming airtight seals to suit installation conditions and cabinet function.

O. Drain Pan: Unitized pan with radius corners on all sides to facilitate cleaning. Removable work surface and supports facilitating cleaning of the drain pan. Stainless ball valve at drain outlet.

END OF SECTION

SECTION 12 2400

WINDOW SHADES - MECHOSHADE SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manual roller shades and accessories.

B. Motorized roller shades and accessories.

C. Motor controls, interfaces, and accessories.

1.02 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

C. WCMA A100.1 - Safety of Window Covering Products; 2018.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Where motorized shades are to be controlled by control systems provided under other sections, coordinate the work with other trades to provide compatible products.
   2. Coordinate the work with other trades to provide rough-in of electrical wiring as required for installation of hardwired motorized shades.

B. Sequencing:
   1. Do not fabricate shades until field dimensions for each opening have been taken with finished conditions in place. "Hold to" dimensions are not acceptable.
   2. Do not install shades until final surface finishes and painting are complete.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product to be used including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
   1. Motorized Shades: Include power requirements and standard wiring diagrams solely for the specified products.

C. Shop Drawings: Include shade schedule indicating size, location and keys to details.
   1. Motorized Shades: Include one-line diagrams, wire counts, coverage patterns, and physical dimensions of each item. Include location plan showing all switch and control zones, switches, sensors and other control accessories.

D. Selection Samples: Include fabric samples in full range of available colors and patterns.

E. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.

F. Project Record Documents: Record actual locations of control system components and show interconnecting wiring.

G. Operation and Maintenance Data: List of all components with part numbers, and operation and maintenance instructions; include copy of shop drawings.

H. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Motorized Shades: Comply with NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

C. Installer Qualifications: Company specializing in performing work of this type with minimum ten years of documented experience with shading systems of similar size, type, and complexity; manufacturer's authorized representative.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's standard, non-depreciating warranty, for interior shading only, covering the following:
   1. Shade Hardware: 10 years unless otherwise indicated.
   2. Shade Fabric: 10 years unless otherwise indicated.
   3. Electric Motors, Controls, and Accessories: Five years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: MechoShade Systems LLC; www.mechoshade.com/#sle.

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ROLLER SHADES

A. General:
   1. Provide shade system components that are capable of being removed or adjusted without removing mounted shade brackets or cassette support channel.
   2. Provide shade system that operates smoothly when shades are raised or lowered.
   3. Electrical Components: Listed, classified, and labeled as suitable for the purpose intended. Individual testing of components will not be acceptable in lieu of system testing. Where applicable, system components to be FCC compliant.

B. Roller Shades Type WS-1, WS-3 - Basis of Design: MechoShade Systems LLC; Mecho/5 System; www.mechoshade.com/#sle.
   1. (WS-1) Description: Single roller, manually operated fabric window shades.
      a. Fabric: Eurotwill 6000 Series 3%; Slate.
      b. Drop Position: Regular roll.
      c. Mounting: Recess mounted in ceiling pocket.
      d. Size: As indicated on drawings.
   2. (WS-2) Designation not used.
   3. (WS-3) Description: Double roll, manually operated fabric window shades.
      a. Fabric: Eurotwill 6000 series 3%; slate and room darkening
      b. Drop Position: Regular roll.
      c. Mounting: Recess mounted in ceiling pocket.
      d. Size: As indicated on drawings.
   4. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
      a. Material: Steel, 1/8 inch thick.
      b. Double Roller Brackets: Configured for light-filtering and room-darkening shades in one opening.
         1) Light-Filtering Fabric: Room-side of opening.
         2) Room-Darkening Fabric: Glass-side of opening.

c. Multiple Shade Band Operation: Provide hardware as necessary to operate more than one shade band using a single clutch operator.

5. Roller Tubes:
   a. Material: Extruded aluminum.
   b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
   c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge. Shade band to be removable and replaceable without removing roller tube from brackets or inserting spline from the side of the roller tube.
   d. Roller tubes to be capable of being removed and reinstalled without affecting roller shade limit adjustments.
6. Hembars: Designed to maintain bottom of shade straight and flat.
   a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.
7. Clutch Operator: Manufacturer's standard material and design integrated with bracket/brake assembly.
   a. Provide a permanently lubricated brake assembly mounted on a oil-impregnated hub with wrapped spring clutch.
   b. Brake must withstand minimum pull force of 50 pounds in the stopped position.
   c. Mount clutch/brake assembly on the support brackets, fully independent of the roller tube components.
8. Drive Chain: Continuous loop stainless steel beaded ball chain, 95 pound minimum breaking strength. Provide upper and lower limit stops.
   a. Chain Retainer: Chain tensioning device complying with WCMA A100.1.
9. Managed Lift: Required lifting force of 3 pounds to a maximum of 8.5 pounds for single band or multi-band shades up to 5 bands and a maximum of 30 pounds hanging weight.
10. Accessories:
    a. Fascia: Removable extruded aluminum fascia, size as required to conceal shade mounting, attachable to brackets without exposed fasteners; baked enamel finish.
       1) Provide single fascia to accommodate regular roll shades.
       2) Color: Selected from manufacturer full line.
       3) Profile: Square.
    b. Ceiling Pockets: Premanufactured metal shade pocket with removable closure panel and ceiling tile support, for recess mounting in acoustical tile or drywall ceilings; size and configuration as indicated on drawings.
    c. Ceiling Pockets with Prewired Raceway: UL 325 listed, extruded aluminum shade pocket with removable closure panel and ceiling tile support, for recess mounting in acoustical tile or drywall ceilings; size and configuration as indicated on drawings.
       1) Designed to accommodate installation of motor control and wiring accessories within pocket including, but not limited to, line voltage disconnect modular connector, MechoNet Wireless Controller, IQ2 Dual Splitter, and non-plenum rated daisy chain wiring.
    d. Room-Darkening Channels, Standard: Extruded aluminum side and center channels with brush pile edge seals, SnapLoc mounting base, and concealed fasteners. Channels to accept one-piece exposed blackout hembar to assure side light control and sill light control.

C. Roller Shades Type WS-1E - Basis of Design: MechoShade Systems LLC; ElectroShade with WhisperShade IQ2 EDU, line voltage (120 VAC); www.mechoshade.com/#sle.
   1. Description: Single roller, motor operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.
      a. Drop Position: Regular roll.
      b. Mounting: Recess mounted in ceiling pocket.
      c. Size: As indicated on drawings.
      d. Fabric: Eurotwill 6000 Series 3%; Slate

D. Roller Shades Type WS-3E - Basis of Design: MechoShade Systems LLC; ElectroShade with WhisperShade IQ2 EDU, line voltage (120 VAC); www.mechoshade.com/#sle.
   1. Description: Double roller, motor operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.
      a. Drop Position: Regular roll.
      b. Mounting: Recess mounted in ceiling pocket.
      c. Size: As indicated on drawings.
      d. Fabric: Eurotwill 6000 Series 3%; Slate
      e. Fabric: Room darkening.

E.
   1. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
      a. Double Roller Brackets: Configured for light-filtering and room-darkening shades in one opening.
         1) Light-Filtering Fabric: Room-side of opening.
         2) Room-Darkening Fabric: Glass-side of opening.
      b. Multiple Shade Operation: Provide hardware as necessary to operate more than one shade using a single motor.
   2. Roller Tubes:
      a. Material: Extruded aluminum.
      b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
      c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge. Shade band to be removable and replaceable without removing roller tube from brackets or inserting spline from the side of the roller tube.
   3. Hembars: Designed to maintain bottom of shade straight and flat.
      a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.
   4. Accessories:
      a. Fascia: Removable extruded aluminum fascia, size as required to conceal shade mounting, attachable to brackets without exposed fasteners; baked enamel finish.
         1) Fascia to be capable of installation across two or more shade bands in one piece.
         2) Color: Selected from manufacturer full line.
         3) Profile: Square.
      b. Ceiling Pockets: Premanufactured metal shade pocket with removable closure panel, for recess mounting in acoustical tile or drywall ceilings; size and configuration as indicated on drawings.
      c. Ceiling Pockets with Prewired Raceway: UL 325 listed, extruded aluminum shade pocket with removable closure panel and ceiling tile support, for recess mounting in acoustical tile or drywall ceilings; size and configuration as indicated on drawings.
         1) Designed to accommodate installation of motor control and wiring accessories within pocket including, but not limited to, line voltage disconnect modular connector, MechoNet Wireless Controller, IQ2 Dual Splitter, and non-plenum rated daisy chain wiring.
         2) Product: MechoShade Systems LLC; ElectroPocket; Model _____; www.mechoshade.com/#sle.
      d. Room-Darkening Channels, Standard: Extruded aluminum side and center channels with brush pile edge seals, SnapLoc mounting base, and concealed fasteners. Channels to accept one-piece exposed blackout hembar to assure side light control and sill light control.

2.03 INTELLIGENT ENCODED ELECTRONIC DRIVE SYSTEM

A. Electronic Drive Unit (EDU) System - General Requirements:

1. System to be certified and labelled as a UL 325 listed solution. Recognized component certification is not acceptable in lieu of system testing. Listing label and motor rating to be readily visible for inspection without requiring dismounting of shade assembly for motor or EDU to be removed from shade roller tube.
2. EDU size and configuration to be as recommended by manufacturer for the type, size, and arrangement of shades to be operated.
3. Conceal EDU inside shade roller tube.
4. Use EDU's rated at the same nominal speed for shades in the same room.
5. Total hanging weight of shade band not to exceed 80 percent of rated lifting capacity of shade EDU and tube assembly.
6. Provide EDU with capability of upgrading firmware from anywhere on network without touching the motor.

B. Line Voltage EDU (120 VAC):
1. Basis of Design: MechoShade Systems LLC; WhisperShadeIQ2 System; www.mechoshade.com/#sle.
2. Description: Tubular, asynchronous (non-synchronous), with integral AC motor and reversible capacitor operating at 120 VAC, single phase, 60 Hz; temperature Class B, thermally-protected, totally enclosed, maintenance-free; powered by line voltage power supply connection equipped with locking disconnect plug assembly furnished with EDU.
3. Audible Noise: 46 dBA or less measured 3 feet from the motor unit, depending on motor torque.
4. Nominal Speed: Minimum of 34 RPM; does not vary due to load/lift capacity.
5. EDU to provide isolated, low voltage power supply for powering external accessories connected to either the dry contact port or the network port. Products that require accessories to be powered by a plug-in or externally-supplied power supply are not acceptable.

C. Modes of Operation:
1. Uniform Mode: Allows for shades to move only to defined intermediate stop positions in order to maintain aesthetic uniformity.
2. Normal Mode: Allows for shades to move to defined intermediate stop positions plus any position between defined upper and lower limits.
3. Maintenance Mode: Prevents shade from moving to newly commanded positions via dry contact or network control commands until EDU has been serviced and/or Maintenance Mode has been cleared/disabled.

D. Control Methods: Support both local isolated dry contact input and network control.
1. Local Isolated Dry Contact Inputs:
   a. Supports local switch control and third party system integration without separate interface.
   b. Supports moving EDU/shade to upper and lower limits and to local switch preset positions.
   c. Allows for configuration of upper and lower limits, custom presets, and key modes of operation without requiring a PC or similar microprocessor-based tools.
   d. Supports configuration under protected sequences to prevent changes by casual user.
   e. Switch Personalities: Allows for configuration of the dry contact control port over network such that virtually any type of dry contact keypad/third-party interface and actuation methodology (maintained and/or momentary actuation) can be used to operate shade. Dry contact control connection options to include:
      1) 1-button.
      2) 2-button.
      3) 3-button with ability to support configuring limits, presets, and key operating modes (default).

4) 3-button without configuration capability in order to prevent accidental changes in settings.

E. Alignment Positions:
1. Each EDU to support positioning commands from 0 to 100 percent in 1 percent increments and 32 customizable presets, including three intermediate dry contact presets resulting in repeatable and precisely aligned shade positions and limits.
2. Shades on the same switch circuit or with the same network group address with the same opening height to align at each limit or preset (intermediate stopping position) when traveling from any position, up or down.
3. Shades of differing heights to be capable of custom, aligned intermediate stop positions when traveling from any position, up or down.
4. Alignment of standard shade bands mechanically aligned on the same EDU not to exceed plus/minus 0.125 inch when commanded to the same alignment position.
5. Alignment of standard shades on adjacent EDU's not to exceed plus/minus 0.25 inch when commanded to the same alignment position.

F. Local Switch Presets:
1. Provide a minimum of three customizable preset positions accessible over the local dry contact control inputs and over the network connection.
2. Preset positions to be customizable to any position between and including the defined upper and lower limits (initially defaults to 25, 50, and 75 percent of shade travel).
3. Support configuration of custom preset positions using either a handheld removable program module/configurator or a local switch.

2.04 MOTOR CONTROLS

A. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the control intent indicated.

B. Provide all components and connections necessary to interface with other systems as indicated.

C. Low-Voltage Wall Controls; IQ Switch:
1. Momentary dry contact switch enables manual local control or network control of any individual shade motor or shade group/sub-group on MechoNet network.
2. Control Functions:
a. Open: Automatically open controlled shade(s) to fully open position when button is pressed.
b. Close: Automatically close controlled shade(s) to fully closed position when button is pressed.
c. Presets: For selection of predetermined shade positions.
3. Finish: White.

2.05 ROLLER SHADE FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window stool.
2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.

C. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 SYSTEM STARTUP

A. Motorized Shade System: Provide services of a manufacturer's authorized representative to perform system startup.

3.05 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. See Section 01 7900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.

3.07 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair or replace damaged products before Substantial Completion.

3.08 MAINTENANCE

A. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

3.09 SCHEDULE

A. WS-1:
   1. Break Room(s) west corner windows, ICT of Pharmacy, all windows on existing curved exterior wall both stories.

B. WS-2:
   1. Not used.

C. WS-3:
   1. Traditional Healing exterior spaces. Rooms 139,141,143,145,147,149,151,153,155.

D. WS-1E
   1. Second Floor ICT

E. WS-3E:
   1. First Floor all Traditional healing along entire length of south curtainwall system

END OF SECTION

SECTION 12 3200
MANUFACTURED WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured standard and custom casework, with cabinet hardware.

B. Special purpose units.

C. Countertops.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Blocking and nailers for anchoring casework.

B. Section 07 9200 - Joint Sealants: Sealing joints between casework and countertops and adjacent walls, floors, and ceilings.

C. Section 08 8000 - Glazing: Methods for shop-glazing of casework.

D. Section 09 2116 - Gypsum Board Assemblies: Reinforcements in metal-framed partitions for anchoring casework.

E. Section 22 4000 - Plumbing Fixtures: Sinks and fittings installed in casework.

F. Section 26 2726 - Wiring Devices: Switches, receptacles installed in casework.

1.03 DEFINITIONS

A. Exposed: Portions of casework visible when drawers and cabinet doors are closed, including end panels, bottoms of cases more than 42 inches above finished floor, tops of cases less than 72 inches above finished floor and all members visible in open cases or behind glass doors.

B. Semi-Exposed: Portions of casework and surfaces behind solid doors, tops of cases more than 72 inches above finished floor and bottoms of cabinets more than 30 inches but less than 42 inches above finished floor.

C. Concealed: Sleepers, web frames, dust panels and other surfaces not generally visible after installation and cabinets less than 30 inches above finished floor.

1.04 REFERENCE STANDARDS

A. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015.

B. ASTM C1036 - Standard Specification for Flat Glass; 2016.

C. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

D. AWI (QCP) - Quality Certification Program; Current Edition.

E. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

F. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2017, with Errata (2019).

G. BHMA A156.9 - American National Standard for Cabinet Hardware; 2015.

H. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

I. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Keying Conference: Conduct conference prior to ordering keys. Incorporate conference decisions into keying submittal.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Component dimensions, configurations, construction details, joint details, attachments.

C. Shop Drawings: Indicate casework types, sizes, and locations, using large scale plans, elevations, and cross sections. Include rough-in and anchors and reinforcements, placement dimensions and tolerances, clearances required, and keying information.

D. Samples for Finish Selection: Fully finished, for color selection. Minimum sample size: 6 inches by 6 inches.
   1. Wood samples for color and species selection.
   2. Plastic laminate samples, for color, texture, and finish selection.
   3. Thermally fused laminate samples, for color, texture, and finish selection.

E. Casework Samples: Representative of types in the project.
   1. Base Cabinet: Cabinet with drawer and door and specified hardware. Type indicated on drawings.
   2. Tall Cabinet: Cabinet with shelves and supports, door and specified hardware. Type indicated on drawings.
   3. Wall Cabinet: Cabinet with shelves and supports, door and specified hardware. Type indicated on drawings.
   4. Display Casework.

F. Manufacturer's Installation Instructions.

G. Installer's Qualification Statement.

H. Maintenance Data: Manufacturer's recommendations for care and cleaning.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
   1. See Section 01 6000 - Product Requirements for additional provisions.

J. Finish touch-up kit for each type and color of materials provided.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of experience.

B. Quality Certification: Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section.
   1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   2. This AWI (QCP) project is registered as project number _____.
   3. Provide designated labels on shop drawings as required by certification program.
   4. Provide designated labels on installed products as required by certification program.
   5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
   6. Replace, repair, or rework all work for which certification is refused.

C. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience and approved by manufacturer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect items provided by this section, including finished surfaces and hardware items during handling and installation. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.

B. Acceptance at Site:
   1. Do not deliver or install casework until the conditions specified under Part 3, Examination Article of this section have been met. Products delivered to sites that are not enclosed

and/or improperly conditioned will not be accepted if warping or damage due to unsatisfactory conditions occurs.

C. Storage:
1. Store casework in the area of installation. If necessary, prior to installation, temporarily store in another area, meeting the environmental requirements specified under Part 3, "Site Verification of Conditions" Article of this section.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion, at no additional cost to Owner. Defects include, but are not limited to:
1. Ruptured, cracked, or stained finish coating.
2. Discoloration or lack of finish integrity.
3. Cracking or peeling of finish.
4. Delamination of components.
5. Failure of adhesives.
6. Failure of hardware.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Plastic Laminate Casework:
1. Case Systems; ____: www.casesystems.com/#sle.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Obtain casework of each type from single source and manufacturer, unless otherwise indicated.

2.02 CASEWORK, GENERAL

A. Quality Standard: AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Types: More than one type is required. See drawings for location of each type of casework.

C. Wood Veneer Faced Cabinets: Premium Grade.

D. Plastic Laminate Faced Cabinets: Premium Grade.

2.03 FABRICATION

A. Assembly: Shop assemble casework items for delivery to site in units easily handled and to permit passage through building openings.

B. Construction: As required for selected grade.

C. Structural Performance: Safely support the following minimum loads:
1. Base Units: 500 pounds per linear foot across the cabinet ends.
2. Suspended Units: 300 pounds static load.
3. Drawers: 125 pounds, minimum.
4. Hanging Wall Cases: 300 pounds.
5. Shelves: 100 pounds, minimum.

D. Seismic Performance: Casework, including attachments to other work, able to withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. Component Importance Factor: 1.0.

E. Glazing for Doors and Other Cabinet Components: Clear tempered glass.
1. Glazing: With gaskets and removable stops; minimize rattling and vibration.

F. Fittings and Fixture Locations: Cut and drill components for fittings and fixtures.

G. Hardware Application: Factory-machine casework members for hardware that is not surface applied.

H. Access Panels: Where indicated, for maintenance of utility service and mechanical and electrical components.

I. Fixed panels at backs of open spaces between base cabinets.
   1. Provide cutouts for power and data receptacles where indicated on drawings.

J. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

K. Scribes and Fillers: Panels of matching construction and finish, for locations where cabinets do not fit tight to adjacent construction.

L. Matching Wood Grain: Comply with requirements of quality standard for specified grade and as follows:
   1. Provide balance matched panels at each elevation.

M. Apron Frames: Construction similar to other cabinets, with modifications.
   1. Frames fabricated from panels standard with the manufacturer. Include front and back panels, with drawer suspension framing mechanically fastened to support channels spanning between them.
   2. Apron Drawers: Manufacturer's standard drawer construction and size for apron installation. Single drawer for aprons up to 48 inches wide, two drawers for wider aprons.

N. Countertop Panel-Type Supports: Materials similar to adjacent casework, 1-1/2 inch in width, with front-to-back and toe space dimensions matching base cabinet. Designed to be secured in a concealed fashion to countertop material. Include two leveling devices per support panel.

2.04 PLASTIC-LAMINATE-CLAD CASEWORK

A. Plastic-Laminate-Clad Casework: Solid wood and wood panel construction; each unit self-contained and not dependent on adjacent units or building structure for rigidity; in sizes necessary to avoid field cutting except for scribes and filler panels. Include adjustable levelers for base and tall cabinets.
   1. Style: Flush overlay. Ease doors and drawer fronts slightly at edges.
   2. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings
      a. Lockers: Per drawings.
   3. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline.
      a. Surface Color and Pattern: Wilsonart, Natural Recon 7996-38..
      b. Exposed Interior Surfaces: Thermally fused laminate.
         1) Color: White.
      c. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
         1) Matching Wood Grain Pattern: Comply with requirements of quality standard for specified grade and as follows:
            (a) Provide sequence matching across each elevation.
      d. Cap exposed plastic laminate finish edges with material of same finish and pattern.

2.05 COUNTERTOPS

A. Solid Surfacing Countertops: Solid surfacing over continuous substrate.
   1. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
   2. Manufacturer: Corian.
      a. Color/Pattern:
         1) SS1:Corian, Cameo White.
   3. Standard configuration for exposed edges, back and end splashes.
   4. Fabricate in accordance with manufacturer's standard requirements.

2.06 SPECIAL PURPOSE UNITS

A. Display Units.

1. Style: Flush overlay. Ease doors and drawer fronts slightly at edges.
2. Primary Construction: Plastic-laminate clad units, with out countertops.
   a. Cabinet Hardware: Recessed standard and Rakks style bracket system inside box. Gloss white.
   b. Shelving: 1/4" tempered glass.
3. Open Display Units: Sizes and configurations indicated on drawings.
4. (Display-1):
   a. Manufacturer: Rakks
   b. Type: Recessed standard and Raaks bracket.
   c. Color: Standard and bracket, Gloss White.
   d. Location(s): Room 125.
   e. Size: Per drawings.
5. (Display-2):
   a. Manufacturer: B&N Industries.
   b. Type: Puck.
   c. Color: White backer board. Stainless steel hardware.
   d. Location(s): 165A and 165B.
   e. Size: Per drawings.
6. (Display-3):
   a. Manufacturer: B&N Industries.
   b. Type: Cable and Rod.
   c. Counters: Corian, Cameo White.
   d. Cabinets: Oak on Ash LBB.
   e. Location(s): 165A.
   f. Size: Per drawings.

2.07 CABINET HARDWARE

A. Comply with BHMA A156.9 requirements.
   1. Acceptable base materials for plated finishes include steel.

B. Label Holders: Manufacturer's standard, sized to hold standard label cards, bright chromium plated over nickel on base material.

C. Locks: Provide locks on casework drawers and doors where indicated. _____.

D. Locks: Provide locks on all cabinets except within PCCIII Break Rooms 1263, 1163, 3263 and lockers within Locker Room.
   1. Manufacturer: Codelocks
   2. Model: KL1000 Classic Kitlock Locker Lock, wireless.
   3. Locations:
   4. Framed Sliding Doors: Plunger-type sliding showcase lock, satin chromium plated over nickel on base material.
   5. Tall Hinged Doors: Three-point latching system.
   6. Keying: Key locks alike within a space; key each room separately.
   7. Master Key System: All locks operable by master key.

E. Shelves in Cabinets:
   1. Shelf Standards and Rests: Vertical standards with rubber button fitted rests, satin chromium plated over nickel on base material.

F. Swinging Doors: Hinges, pulls, and catches.
   1. Hinges: Concealed, number as required by referenced standards for width, height, and weight of door.
      a. Concealed Hinges: Installed in cabinet edge, and on door back, satin chromium plated over nickel on base material.
         1) European-Style Hinges for Overlay Doors: 120 degree opening angle.
            (a) Soft-close

2. Pulls:
   a. 4" recessed pull - satin stainless
3. Catches: Magnetic.

G. Drawers: Pulls and slides.
1. Pulls: same as elsewhere in this section recessed, 4" inches wide.
2. Slides: self-close; soft-close; concealed; heavy-duty - Blum Movento or equal

2.08 MATERIALS

A. Wood-Based Materials:
1. Solid Wood: Air-dried to 4.5 percent moisture content, then tempered to 6 percent moisture content before use.

B. Solid Wood: Clear, dry, sound, plain sawn, selected for compatible species, grain and color, no defects.

C. Hardwood Edgebanding: Use solid hardwood edgebanding matching species, color, grain, and grade for exposed portions of cabinetry.

D. Glass: Fully tempered float; ASTM C1036, Type 1, Quality Q3; ASTM C1048, tempered using horizontal tempering and complying with ANSI Z97.1; 1/4 inch thick minimum; exposed edges ground, and cut or drilled to receive hardware; clear.

2.09 ACCESSORIES

A. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
1. Color: Match laminate.
2. Use at exposed edges.

B. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized finish in concealed locations and stainless steel finish in exposed locations.

C. Grommets: Standard painted metal grommets for cut-outs, in color to match adjacent surface.

PART 3 EXECUTION

3.01 PREPARATION

A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

3.02 EXAMINATION

A. Site Verification of Environmental Conditions:
1. Do not deliver casework until the following conditions have been met:
   a. Building has been enclosed (windows and doors sealed and weather-tight).
   b. An operational HVAC system that maintains temperature and humidity at occupancy levels has been put in place.
   c. Ceiling, overhead ductwork, piping, and lighting have been installed.
   d. Installation areas do not require further “wet work” construction.

B. For Base Cabinets Installation: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 1/2 inch leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.

C. For Wall Cabinets Installation: Examine wall surfaces in installation space. Do not proceed with installation if the following conditions are encountered:

D. Verify adequacy of support framing and anchors.

E. Verify that service connections are correctly located and of proper characteristics.

3.03 INSTALLATION

A. Perform installation in accordance with manufacturer's instructions.

B. Use anchoring devices to suit conditions and substrate materials encountered. Use concealed fasteners to the greatest degree possible. Use exposed fasteners only where allowed by approved shop drawings, or where concealed fasteners are impracticable.

C. Set casework items plumb and square, securely anchored to building structure.

D. Align cabinets to adjoining components, install filler and/or scribe panels where necessary to close gaps.

E. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:
   1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
   2. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
   3. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
   4. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.

F. Secure wall and floor cabinets to concealed reinforcement at gypsum board assemblies.

G. Base Cabinets: Fasten cabinets to service space framing and/or wall substrates, with fasteners spaced not more than 16 inches on center. Bolt adjacent cabinets together with joints flush, tight, and uniform.
   1. Where base cabinets are installed away from walls or service space framing, anchor to floor at toe space at not more than 24 inches on center, and at sides of cabinets with not less than two fasteners per side.

H. Wall Cabinets: Fasten to hanging strips, and/or wall substrates. Fasten each cabinet through back, near top, at not less than 16 inches on center.

I. Install hardware uniformly and precisely.

J. Countertops: Install countertops intended and furnished for field installation in one true plane, with ends abutting at hairline joints, and no raised edges.

K. Replace units that are damaged, including those that have damaged finishes.

3.04 ADJUSTING

A. Adjust operating parts, including doors, drawers, hardware, and fixtures to function smoothly.

3.05 CLEANING

A. Clean casework and other installed surfaces thoroughly.

3.06 PROTECTION

A. Do not permit finished casework to be exposed to continued construction activity.

B. Protect casework and countertops from ongoing construction activities. Prevent workmen from standing on, or storing tools and materials on casework or countertops.

C. Repair damage, including to finishes, that occurs prior to Date of Substantial Completion, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION

SECTION 12 5000
FURNITURE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specialty furniture items for Pharmacy Department

B. Specialty furniture items for Audiology Department

C. Specialty furniture items for Traditional Healing Department

1.02 RELATED REQUIREMENTS

A. Section 26 0533.13 - Conduit for Electrical Systems.

B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 PRICE AND PAYMENT PROCEDURES

A. Allowances: See Section 01 2100 - Allowances, for cash allowances affecting this section.

1.04 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. System components.
   2. Accessories.
   3. Substrate preparation instructions and recommendations.
   4. Storage and handling requirements and recommendations.
   5. Installation methods.
   6. Specimen warranty.

C. Shop Drawings: Indicate location, type, and layout of furniture items, including lengths, heights, and aisle layout, and relationship to adjacent construction.
   1. Indicate location and configuration of all items.
   2. Indicate method of installation and configuration for shelving/casework mounted on walls.
   3. Provide location and details of anchorage devices to be embedded in or fastened to the structure.
   4. Provide location and configuration of power and data connections.

D. Selection Samples: For each finish product specified, provide color chips representing manufacturer's full range of available colors and finishes.

E. Design Data: Provide design calculations, bearing seal and signature of structural engineer licensed to practice in the State in which the Project is located, showing loads at points of attachment to the building structure.

F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Inspect for dents, scratches, or other damage. Replace damaged components.

B. Store in manufacturer's unopened packaging until ready for installation.

C. Store under cover and elevated above grade.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide one year manufacturer warranty covering defects of manufacturing and workmanship and rust and corrosion.

PART 2 PRODUCTS

2.01 PRODUCTS

A. Basis of Design: See drawings.

B. Supplier:
1. Think Office, Joe Schroeder
2. 1320 E 68th Avenue | Suite 101
3. Anchorage, AK 99518
4. (907) 338-4465
5. joe@thinkofficellc.com

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that substrate is in proper condition to install rails and flooring system per manufacturer's requirements.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

A. General: Install system components and accessories in accordance with manufacturer's printed instructions.

B. Position system components level and plumb within manufacturer's specified tolerances.

C. Anchor floor system to structure as indicated on drawings.

D. Install shelving with shelf surfaces level and vertical supports plumb

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

3.04 CLEANING

A. Clean furniture and surrounding area after installation.

3.05 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. See Section 01 7900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

3.06 PROTECTION

A. Protect installed system from subsequent construction operations.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 13 4823.11

SOUND CONTROL ASSEMBLIES WITH COMPOSITE PANEL FACINGS - LIFE SCIENCE PRODUCTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sound control assemblies with composite panel facings. System designed for high acoustical performance, vibration dampening, faced with smooth, cleanable panels.

1.02 ABBREVIATIONS AND ACRONYMS

A. STC: Sound Transmission Class.

1.03 REFERENCE STANDARDS

A. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2018.

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

C. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

D. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2020.

E. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

F. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016, with Editorial Revision (2021).

G. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015, with Editorial Revision (2017).

H. GA-216 - Application and Finishing of Gypsum Panel Products; 2016.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Include fabrication and installation details. Distinguish between shop and field work.
   2. Indicate verified field dimensions.
   3. Indicate material descriptions and dimensions, profiles, and finishes of individual components.
   4. Include details for through penetrations of assemblies to demonstrate methods of elimination of sound flanking paths.
   5. Include details of interface with doors and vision lights frames.
   6. Include details of terminations of assemblies at adjoining construction.

C. Warranty Documentation: Submit manufacturer's and installer's joint executed warranty, and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 DELIVERY, HANDLING AND STORAGE

A. Deliver materials and products in manufacturer's original containers, dry, undamaged, with seal and labels intact.

B. Do not deliver until project spaces to receive them are clean, dry, closed in, and ready for installation.

C. Maintain ambient conditions required by manufacturer in storage spaces.

1.06 WARRANTY

A. Correct defective work within a two year period after Date of Substantial Completion.

PART 2 PRODUCTS:

2.01 MANUFACTURERS

A. Substitutions: Not permitted.

2.02 ASSEMBLY COMPONENTS

A. Provide system components sourced from a single manufacturer.

B. Framing System Components: 1; galvanized sheet steel, of size and properties necessary to comply with 2 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf lateral load; 20 gauge, 0.041 inch, minimum.
   1. Size: 4 inches.

C. Acoustic Insulation: ASTM C665; preformed glass fiber, friction-fit type, Kraft-faced.
   1. Thickness: 3 1/2 inches.

D. Gypsum Wallboard: Type X paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces, unless otherwise indicated.
   2. Thickness:
      a. Vertical Surfaces: 5/8 inch.

E. Mass Loaded Vinyl (MLV) Sound Control Barriers: Limp, dense sheet, manufactured from viscoelastic polyvinylchloride; loaded with inert material of manufacturer's choice as required to achieve specified density.
   1. Color: Black.
   2. Surface: Smooth.
   3. Density: ASTM D412; 96 pounds per cubic foot.
   4. Layer 1 Thickness: 1/8 inch.
   5. Layer 2 Thickness: 1/4 inch.
   6. Accessories: MLV manufacturer's recommended joint sealer and tape.

F. Composite Panel Facing: Manufacturer's Bio/CR-3 panels.
   1. Description: Polymer, metal, and fiberglass composite facing panel. Exposed face composed of resin-saturated reinforcing fabric, with a consistently smooth face and visible fiberglass reinforcing.
   2. Physical Properties:
      a. Color: White.
      b. Finish: Polyester gel coat smooth, manufacturer's standard gloss.
      c. Overall Thickness: 0.47 inches.
   3. Fabrication: Rout vertical edges to form a modified recessed ship-lap design that allows for direct fastening to substrates.

G. Joint Adhesive/Sealant: 100 percent solids urethane adhesive.
   1. Physical Properties:
      a. Appearance: Gloss and color matching facing panels.
      b. Hardness, Shore D: ASTM D2240; 70 to 80.

H. Outside Corner Guards:
   1. Material: Type 304 stainless steel, No. 4 finish, 16 gauge, 0.0625 inch thick.
   2. Width of Wings: 3 inches.
   3. Corner: Radiused, 1/8 inch.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine installation areas to assure satisfactory physical and environmental readiness installation conditions.

B. Field Measurements: Verify field measurements are as indicated on shop drawings. Do not proceed with installation until needed dimensions are verified.

C. Proceed with installation only after correction of unsatisfactory conditions.

3.02 PREPARATION

A. Clean surfaces of components and substrates thoroughly prior to installation. Prepare surfaces using the methods recommended by the manufacturer.

3.03 INSTALLATION

A. Install components in accordance with manufacturer's recommendations, approved submittals, and in proper relationships to adjacent construction.

B. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.
   1. Check with the composite facing panel manufacturer to determine the exact stud spacing within the wall. Install metal studs to match panel sizing indicated on shop drawings.

C. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

D. Install housings and sound damping materials in strict accordance with manufacturer’s instructions. Use manufacturer-supplied brackets and fasteners recommended for application.

E. Gypsum Board: Comply with ASTM C840, GA-216, and manufacturer's instructions.

F. Acoustic Sealant: Install in accordance with manufacturer's instructions.

G. Composite Panel Facings:
   1. Apply adhesive to the entire back side of the panel, all the way to edges, prior to panel placement. Follow manufacturers recommendations for application and “open times” of the adhesive. Place firmly against substrate.
   2. If necessary, apply pressure to the center of the panel until adhesive cures.
   3. Mask the panel edges for protection, and fill the vertical seams between panels with urethane adhesive/sealant. Fill to a plane that will fill the seam flush with the adjacent panel surface. Tool the adhesive/sealant and remove the masking before the adhesive has set.
   4. Inside Corners: Form 1/2 inch radius smoothed, coved inside corners using urethane sealant.
   5. Outside Corners: Install corner guards with urethane adhesive.

3.04 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.05 PROTECTION

A. Protect installed products from damage, abuse, dust, dirt, stain, or paint until completion of project. Do not permit use during construction.

END OF SECTION

SECTION 14 9100

FACILITY CHUTES

PART 2 PRODUCTS

1.01 FACILITY CHUTES

1.02 COMPONENTS

A. Chute: Factory-fabricated to the greatest extent possible, with continuously welded or lock-seamed joints and smooth, nonsnag interior; no protruding bolts, rivets, or hardware and no sharp edges or corners.
   1. Sheet Metal Thickness: 16 gauge, 0.06 inch.
   2. Fire Rating: In compliance with local building code requirements.
   3. Throat Sections: Provide sloped throat sections for chute intake doors, of same material and construction as chute.
   4. Fabricate with support frames at each floor with sound isolator pads and expansion joints in chute between each support point.
      a. Sound Isolator Pads: Provide manufacturer's standard; 1/4 inch top and bottom waffle design, oil resistant, neoprene with 3/8 inch close grained cork core

B. Chute Intake Doors: Factory-assembled, UL (DIR) listed and labeled door and frame, with self- or automatic-closing and positive latching; frame designed for chase construction, and flush-mounted.
   1. Material: Stainless steel, brushed or satin finish.
   2. Fire Rating: In compliance with local building code requirements.
   3. Pulls: Provide single action door hardware that is operable without pinching or twisting; polished stainless steel finish.

C. Chute Discharge Doors: Factory-assembled, UL (DIR) listed and labeled door and frame, with self- or automatic-closing and positive latching, upon activation of smoke detector or fusible link; style as required for facility chute configuration indicated.
   1. Material: Aluminum-coated steel.
   2. Fire Rating: In compliance with local building code requirements.

D. Chute Access Doors: Provide same construction and fire rating as chute intake doors with locks; provide wherever equipment requiring maintenance is located inside chute, including sprinklers, plumbing, and electrical connections.

E. Chute Intake and Access Door Locks: Mortise or rim cylinder locks keyed alike; key removable only when door is locked.

F. Roof Vent: Full diameter, extending at least 48 inches above roof level, with roof deck flange.
   1. Material: Manufacturer's standard.
   2. Provide counterflashing and clamping ring of nonferrous metal compatible with chute material; see Section 07 6200.
   3. Top Unit: Screened vent.

G. Fire Suppression Sprinklers: Comply with requirements of NFPA 82 and NFPA 13; provide 1/2 inch NPS sprinkler heads mounted inside chute intake throats at following locations:
   1. At or above top intake opening.
   2. At lowest intake opening.
   3. In buildings of more than two stories, at every other floor.

H. Spray Cleaning Equipment:
   1. Flushing Spray Unit: Solenoid controlled 3/4-inch NPS spray head mounted above top intake door; see Section 22 1005 for water piping connections and Section 26 0583 for wiring connections.

I. Electrical Controls: 110 VAC; see Section 26 0583 for wiring connections.

END OF SECTION

SECTION 21 0500

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wet Pipe Sprinkler System.

B. System Design, Materials, Installation, and Certification.

C. System Supervision Alarms.

1.02 SCOPE DESCRIPTION

A. Demolish and replace the automatic fire sprinkler system throughout the remodel area. Systems protecting areas that are not being remodeled shall be connect to the new sprinkler system mains.

B. Provide a complete wet automatic fire sprinkler system, hydraulically calculated to protect the entire remodel, complete and in operating order. This fire protection system shall be in compliance with the contract documents, applicable codes and standards, as well as the Authority having jurisdiction. Sprinklers shall be installed throughout the building, including outside roof canopies, and attic areas, utilizing systems compatible with the specific application.

1.03 RELOCATION OF EXISTING INSTALLATIONS

A. There are portions of the existing fire protection systems, which shall remain in use to serve the occupied portion of the building. By actual examination at the site, each bidder shall determine those portions of the remaining present installations, which must be relocated to avoid interference with the installations of new work of the Contractors particular trade and that of all other trades. All such existing installations, which interfere with new installations, shall be relocated by the Contractor.

B. See Architectural plans for phasing. Coordinate fire protection demolition and temporary services to maintain occupancy of the building during the project.

C. Existing Fire Protection System: Maintain existing system in service during construction in occupied areas and exit paths out of occupied areas. Disable system only to make switchovers and connections. Obtain permission from Owner at least 72 hours before partially or completely disabling system. Make temporary connections to maintain service in areas adjacent to work area.

1.04 SPECIAL REQUIREMENTS

A. Provide complete interface with electrical/transformer rooms and areas in compliance with the NEC. Apply the following practices:

1. Route no piping through electrical rooms with the following exceptions:

    a. Branch piping supplying sprinklers protecting the electrical room. Note: This branch piping shall not exit the electrical room to supply additional sprinklers outside the room.

2. No piping shall be routed above electrical panels in compliance with the NEC.

B. Provide complete interface with building smoke and fire alarm system.

1.05 CODES AND STANDARDS

A. IBC Latest Adopted Edition.

B. NEC Latest Adopted Edition.

C. UPC Latest Adopted Edition.

D. IMC Latest Adopted Edition.

E. IFC Latest Adopted Edition.

F. NFPA 13 Standard for the Installation of Sprinkler Systems, latest adopted edition.

G. NFPA 25 Water-Based Fire Protection Systems, latest adopted edition.

H. ASCE Standard 7, Minimum Design Loads for Buildings and Other Structures, latest adopted edition.

1.06 RELATED WORK

A. Section 09 9000 - Painting and Coating.

B. Section 22 0500 - Common Work Results for Plumbing.

C. Section 23 0500 - Common Work Results for HVAC.

D. Section 28 4600 - Fire Detection and Alarm.

1.07 REFERENCES

A. AWWA C510 Backflow Prevention Devices reduced pressure type and double check valve type.

B. USC University of Southern California: Foundation for Cross-connection Control and Hydraulic Research.

1.08 QUALITY ASSURANCE

A. Unless otherwise noted, this is substantially a "performance" specification.

B. Minimum qualifications of the contractor/subcontractor shall include the following:

1. Specialist Firm: Company specializing in automatic fire protection/sprinkler systems, possessing a minimum of three years' experience with systems similar in nature to the type specified herein.

2. Design Certification: Shop drawings shall be prepared by a person with a minimum certification of level II designer, supervised by a Licensed Professional Engineer or a level III or IV Fire Sprinkler Designer, certified by the National Institute for Certification in Engineering Technologies (NICET), in Fire Protection Engineering Technology Automatic Fire Sprinkler System Layout.

3. Equipment and components: Bear the "UL" label or the "FM" approval marking.

4. Maintain a complete stock of replacement parts.

5. Remain on 24 hour call for emergency service.

6. Maintain an office and telephone, with authorized representatives of the Fire Protection Contractor's firm, including the Designated Project Mechanical Sprinkler Supervisor, with a physical presence and address in Alaska.

7. Bids of wholesalers, contractor or any firm whose principal business is not that of manufacturing and/or installing fire protection systems is not acceptable.

C. Backflow Prevention: Installation and testing by a certified backflow assembly tester, in accordance with the Uniform Plumbing Code (UPC).

1.09 SUBMITTALS

A. Submit under provisions of Division 01.

B. Submit contractor's qualifications, proof of 3 years' experience under this contractor's firm name, and references for at least 5 projects in Alaska of similar type, size, and complexity.

C. Submit a copy of designer's NICET certification and resume', or Alaska P.E. license number.

D. Submit shop drawings and hydraulic calculations concurrently to the engineer and the MOA Fire Marshal for review. Submit one set of stamped approved shop drawings and hydraulic calculations to the Architect/Engineer when available from AHJ. Engineer will retain 1 set of "stamped approved" shop drawings. These sets must include the NICET certification or stamp of a licensed professional engineer as described above.

E. Submit all written reviews and contractor responses to reviews to the Architect/Engineer.

F. Submit product data, and sprinkler head layout. Sprinkler head layout shall be reviewed by the Architect/Engineer. All other approvals shall be secured prior to materials fabrication. Additional sprinklers as required shall be added at no additional cost to the contract.

G. Shop Drawings shall include the following information in compliance with NFPA 13:

1. Name of Owner, occupant and Building Permit Number.
2. Location, including street address and legal description.
3. Point of compass.
4. Fire Department Connections.
5. All necessary controlling equipment.
6. Location of water source, type, routing, depth of bury and size of supply piping. Identify location and size of city main and whether it is dead-end or circulating loop, and distance to the flow data test hydrant.
7. All distribution system piping and outlets. Include pipe and fitting types.
8. Reflected ceiling plan showing ceiling heights, construction type, proposed location and type of sprinkler heads, and other ceiling devices such as HVAC diffusers, loud speakers, type and location of light fixtures, etc.
9. Interference control between sprinkler system and other trades.
10. Full height cross section.
11. Location of partitions. Identification of full height walls and draft stops.
12. Location and size of unsprinklered concealed spaces.
13. Identification of unheated areas.
14. Water Flow Test Results; include testing agency; time, date and location of test; actual pitot reading at flow hydrant; and equipment used to perform the test.
15. Make, model, Type, orifice, finish and Temperature rating of sprinklers and their respective locations.
16. On systems that are hydraulically calculated, indicate the square footage area protected by each system.
17. Hydraulic node points.
18. Make, model, and size of all fire protection control valves, alarm valves, and check valves.
19. Identify low point drain and inspector test stations.
20. Indicate the type and location of all piping hangers and equipment supports.
21. Indicate the type and location of all seismic bracing and restraint.
22. Make, model, size, and locations of all pipe couplings, fittings and flanges.
23. Make, model, size, power requirement, and location of alarm bells, buzzers, detectors, and/or alarm panels.
24. Provisions for flushing.
25. When the equipment to be installed is an addition or renovation to an existing sprinkler system, enough of the existing system shall be shown on the shop drawings to indicate the total number of sprinklers and the total square foot area protected by the entire system.
26. Name, address and telephone number of the contractor. If design is by a separate firm, include the name address and telephone number of the design facility.
27. Complete legend of all abbreviations and symbols indicated.

28. Complete schedule of all room occupancies.
29. Location of all unit heaters.
30. Location of all structural penetrations.
31. Note the location of all "exposed" piping.
32. Valve Supervision Alarm:
    a. Make and model on all supervisory switches, alarm and monitoring panel.
    b. Shop drawing and wire diagram of alarm system.
    c. Location of alarm annunciator, or remote monitoring method to be utilized for offsite monitoring.

1.10 MAINTENANCE INFORMATION AND RECORD DRAWINGS

A. Submit under provisions of Division 01.

B. Provide a complete building floor plan showing all system control valves, drain stations, air compressors, alarm and control panels, test valves, and other primary fire protection devices. Indicate all sprinkler zones, boundaries, and types of systems. Submit this plan prior to substantial completion for review by the mechanical engineer.

C. Include step by step instructions to place the fire protection system in service as well as to take it out of service. Provide complete maintenance information of all primary fire protection equipment, including valves, fittings, sprinklers. Identify equipment indicating whether devices are replacement items or repairable. Provide parts list and suppliers for repairable items. Include complete detailed "Record Drawings" and record calculations of the fire protection sprinkler system.

D. Install one copy of the record hydraulic calculations and shop drawings in a metal sleeve box on the wall near the fire sprinkler riser.

E. Provide 1 ***original*** copy of NFPA 25 in each O&M manual.

F. The contractor shall maintain current and up-to-date "Record Drawings" of the fire protection system at the job site, in accordance with Division 01. Significant changes in piping due to onsite coordination with other trades will require recalculation to confirm adequate pipe sizing.

1.11 REVIEWS, APPROVALS, AND PERMITS

A. Obtain written review and/or approval of the entire fire protection system design and arrangement from the following authorities:
    1. Architect/Engineer.
    2. Municipality of Anchorage Fire Marshal.
    3. Owner's Insurance Underwriters.

B. Comply with all review comments, revising the system design as required, and resubmitting in a timely manner, so as not to hinder the construction schedule.

C. Obtain and pay for all required permits, inspections, tests, and approvals as required by authorities having jurisdiction.

1.12 WATER FLOW INFORMATION, HYDRAULIC CALCULATIONS, SEISMIC CALCULATIONS

A. Obtain and verify the water supply Static Pressure, Residual Pressure. Identify the source of the water supply data.

B. Hydraulic Calculations shall be accomplished in compliance with the procedures established in NFPA 13. In addition to minimum NFPA 13 standards, a minimum 15% pressure buffer is required to be designed into the system. Where local authorities require additional buffer, the contractor shall comply with the more demanding requirement.

C. Hydraulic Calculations accomplished by computer program for submittal shall be accompanied by a complete legend of the abbreviations, nodes, and symbols utilized on the computer readout.

D. Hydraulic Calculations shall clearly identify the following:

1. System type, sprinkler "K" factor, and "C" factor.
2. Pipe and fittings type.
3. Fitting Equivalent Length chart which complies with the "C" factor and pipe type.
4. NFPA hazard designation, Design Density and size of the Design Remote Area.
5. The Elevation of the "highest" sprinkler.
6. The available water supply and system demand at the point of connection to the water supply, indicated on a logarithmic graph. Include hose demands.

E. Seismic Calculations shall clearly identify the following:

1. Type, length and size of brace.
2. Angle allowed of brace.
3. Maximum horizontal load of brace.
4. Brace attachment to structure and load rating.
5. Brace attachment to pipe and load rating.
6. Calculated load to be braced.

1.13 COORDINATION REQUIRED

A. The contractor shall examine the structural, architectural, mechanical, electrical and all other drawings relating to the building and plan his work accordingly. He shall check and verify all dimensions at the site before fabricating any portion of the system. Any discrepancies in piping and head locations resulting from failure to do so shall be corrected expeditiously to provide proper coordination of all trades.

B. Coordinate work with that of other trades to ensure that adequate space is provided for all work, including requirements for serviceability and accessibility. Locate sprinkler heads to avoid conflict with light fixtures and other installed equipment.

C. Structural penetrations for piping shall be identified and details of those penetrations shall be submitted to the structural engineer for approval, in a timely manner. Structural members which are damaged cut or penetrated without approval shall be replaced at no additional expense to the Owner.

1.14 MATERIALS HANDLING AND STORAGE

A. Deliver, store, protect, and handle products to the site under provisions of Division 01. Deliver and store valves in manufacturer packaging with labeling in place. Prior to installation, piping onsite shall be wrapped with protective wrapping. Valves, piping, materials, and equipment shall be clean and new when system is accepted by the Owner.

PART 2 PRODUCTS

2.01 GENERAL

A. Provide only new materials and equipment, which are standard products of a manufacturer regularly engaged in the manufacture of fire protection equipment.

B. All products shall bear the "UL" label or "FM" listing and be specifically approved for fire protection application where they are used.

2.02 PIPING

A. Wet Pipe Sprinkler Systems:

1. Black steel piping, ASTM A135 schedule 10 or ASTM A795 schedule 40, UL Listed or FM Approved for fire sprinkler service.
2. Piping may be roll-grooved, threaded, flanged, or welded for connection. All threaded pipe shall be schedule 40. No plain-end piping fitting connections are allowed.

2.03 GROOVED FITTINGS, COUPLINGS, AND MECHANICAL TEES

A. Grooved Fittings shall be Victaulic, Gruvlok, or equal. Galvanized fittings shall accompany galvanized piping. Couplings and mechanical tees shall be standard painted Victaulic, Gruvlok, or equal.

B. Slip-Fit fittings and couplings utilized for joining branch piping to new main piping shall not be allowed.

C. Contractor shall follow the manufacturer's suggested methods to prepare, carefully, the ends for these fittings to prevent leakage or system breakdown.

2.04 THREADED PIPE FITTINGS

A. Threaded pipe fitting for this system shall be cast iron 125# ANSI B16.4 or malleable iron 150# ANSI B16.3.

B. CPVC: Fitting shall be same manufacture as piping, CPVC ASTM F438 schedule 40 for up to

2.05 PIPE FLANGES

A. Pipe flanges for this system shall be Cast Iron Class 125# ANSI B16.5.

2.06 PIPING HANGERS AND SUPPORTS

A. Pipe hangers shall conform to NFPA 13 standards.

2.07 FLEXIBLE SPRINKLER HOSE FITTINGS

A. FM approved and UL listed for use in fire protection service.

B. Seismically qualified for use pursuant to ICC-ES AC-156 Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems.

C. Composition: 100% Type 304 Stainless Steel. 175 or 300 PSI minimum rated pressure as appropriate for installed system.

D. Fully welded non-mechanical fittings, braided, leak-tested with minimum 1 inch true-bore internal corrugated hose diameter.

E. Ceiling bracket of G90 galvanized steel with snap-on clip ends positively attached to the ceiling using tamper-resistant screws. Flexible hose attachment shall be removable hub type with set screw.

2.08 ACCEPTABLE MANUFACTURERS FIRE PROTECTION VALVES AND EQUIPMENT

A. Reliable.

B. Tyco.

C. Potter Electric.

D. Notifier.

E. Victaulic.

F. Potter Roemer.

G. Croker.

H. Viking.

2.09 VALVES AND ALARMS ASSEMBLIES

A. Fire Protection Valves:

1. Control Valves: All Fire protection system control valves shall be supervised with switches compatible with the fire alarm system.

a. OS&Y Gate Valves: Minimum working pressure 175 PSI non-shock cold water. UL listed for fire protection Victaulic Series 771 or equal.

b. Butterfly Valves: UL listed for fire protection 175 PSI non-shock cold water, with integrated supervisory switch. Grooved, threaded, or wafer type acceptable. Victaulic Firelock Series 705 or 707 or equal.

c. Swing Check Valves: UL listed for fire protection 175 PSI non-shock cold water, ductile iron body, stainless steel clapper assembly. Grooved, flanged, or wafer type acceptable. Victaulic Firelock Series 717 or equal.

B. Wet Pipe Sprinkler Systems:

1. Alarm Check Valve Assemblies.

a. Provide sprinkler alarm valve assemblies, appropriate to the system, complete with all trimmings and accessories for proper alarm initiation and interface with fire alarm system. Include inlet and outlet pressure gauges, and main drain with discharge to the outside.

2. Water Flow Detectors:

a. Provide water flow detectors installed at each system or zone control and for the main system header for multiple zone systems. Potter Electric, model VSR-F.

C. All electrical alarm and control wiring shall be provided in accordance with Division 26.

2.10 SPRINKLERS

A. Provide sprinklers as required by NFPA 13 standards and in compliance with the IBC chapter 9 for the entire project. Sprinkler finish and style as follows:

1. In all areas with surface mounted light fixtures attached to finished suspended ceilings, provide standard spray pendant sprinklers, and extended escutcheons to position the sprinkler deflector below the light fixture. Sprinklers and escutcheons to be white finish. Tyco TY-FRB or equal.

2. In all areas with recessed lighting flush to the suspended ceiling finish, provide concealed sprinklers shall be used. Cover plate shall screw over the recessed sprinkler head and be almost flush with the ceiling. Cover plate shall be white.

3. Sprinklers above ceilings and mechanical service areas shall be bronze finish, standard spray, upright or pendant type as required by the drawings.

4. Sidewall sprinklers shall be bronze finish in all service areas, and white throughout all public areas.

5. Dry pendant sprinklers protecting entry vestibules and outside overhangs shall be chrome finish Tyco DS-1 recessed or equal. Dry pendant sprinklers protecting unheated areas and piped from wet pipe systems shall have an "A Length" dimension of not less than 18".

6. Sprinkler Guards shall be of the same manufacturer and finish as the sprinkler which they are to be installed on. Red guards are acceptable for bronze sprinklers only. Chrome finish guards are required for chrome sprinkler heads.

7. Sprinklers of correct temperature rating shall be installed according to NFPA 13.

8. Provide sprinkler wrenches for each type of sprinkler.

9. Spare sprinkler cabinet to be red sheet steel manufactured by the same company that made the sprinklers. Size the cabinet in accordance with NFPA 13 standards. Provide sprinklers for the cabinet representative of the assortment provided for the system. Mount cabinet on the wall within 60" of the sprinkler control riser.

PART 3 EXECUTION

3.01 CONTRACTOR COORDINATION

A. The fire protection contractor shall coordinate his work with the work of all other trades to assure timely installation and efficient use of mechanical areas including but not limited to boiler rooms, fan rooms, and ceiling spaces.

B. Any work installed without proper coordination shall be promptly removed and reinstalled in a manner to allow for a good practical arrangement of all items which need to be installed by all crafts involved.

C. In case of coordination dispute, the Architect/Engineer shall be consulted and his decision shall be binding.

D. All costs associated with coordination and arranging or rearranging of the fire protection system shall be borne by the affected contractor, without causing any additional expense to the Owner.

3.02 PIPING INSTALLATION

A. Install piping to conserve building space and route piping around access panels and openings. Piping shall not restrict any access opening.

B. Install low point drain stations in accordance with NFPA 13 standards. Identify the location of drain and test stations with signs on access panels, ceiling panels, or walls adjacent to the station, visible from the floor. Discharge all test pipes and system main drain to outside. Coordinate discharge point with Owner's field representative.

C. Provide seismic protection for the piping system in accordance with NFPA 13 standards. Attach bracing to structure with through bolts, washers, and nuts. Provide clearance at all structural penetrations. Provide oversized escutcheon plates or flexible connections where sprinklers penetrate non-frangible ceiling membranes.

D. Piping shall be concealed in all areas with finished ceilings.

E. Piping concealed in walls shall be secured to studs 48" - 60" above the floor.

F. Pipe penetrations through rated fire walls shall be sealed by a "UL" listed system utilizing fire rated caulking. Submit data under paragraph 1.8 (Submittals) of this specification.

G. When piping is supported from manufactured structural members, the Installation of pipe hangers shall comply with truss manufacturer's recommendations for hanger attachments and loading.

H. When pipe hangers are attached to bar joist with wood top and bottom chords, chords shall be predrilled for fasteners, and fasteners shall maintain a minimum distance of 0'-6" from truss "panel points".

I. Pipe hangers shall be "Rod and Ring" type hangers throughout. Piping hangers shall have a minimum of ½" of adjustment on each side of the hanger ring nut, to allow for piping grade adjustment in the future.

J. All "beam clamp" type fasteners shall be installed with retainer straps and locking nuts.

K. All Trapeze members shall be fastened to truss chords or structural members.

L. Provide isolation mounts for air compressor.

M. Installation of all valves and equipment shall comply with manufacturer's suggested installation practices and directions.

N. Provide service access around all equipment.

3.03 SYSTEM TEST

A. Hydrostatically test the entire system in accordance with NFPA 13 standards.

B. Test all system alarm actuations and alarms.

C. Trip test dry pipe system to confirm system discharge time.

D. Perform main drain test.

E. 48-hour advance notice required for all tests to allow Owner's field representative to witness these tests.

3.04 PAINTING

A. Refer to Division 09.

3.05 PROJECT CLOSEOUT

A. The fire protection contractor shall submit a written affidavit at the completion of the system, stating that the fire protection system as installed complies with all referenced codes and standards, Local Fire Marshal's Office, and the Owner's Insurance Underwriters.

B. Furnish Written Guarantee to the Owner, that materials installations are free from mechanical defects and guaranteeing to replace and repair any and all unsatisfactory and defective work and items, to the satisfaction of the Owner, in a timely manner, for a period of one year after final acceptance of the building by the Owner, and to be responsible for any damage caused to the premises for any such unsatisfactory work.

C. The contractor shall respond within reasonable time, not to exceed 15 days to repair or replace latent or hidden defects at such time as they are discovered.

D. Provide hydraulic placard on system riser. Placard shall indicate sprinkler demand and hose demand as separate numbers.

E. Post the results of the original main drain test and date performed on the system riser in a permanent fashion.

F. Contractor shall fully train the Owner's designated maintenance engineer in the operation and maintenance of the entire fire protection system.

END OF SECTION

SECTION 22 0500

COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.01 SCOPE

A. All provisions of the Contract including the General and Supplementary Conditions and the General Requirements apply to this work.

1.02 WORK INCLUDED

A. The work to be included in these and all other plumbing subsections shall consist of providing, installing, adjusting and setting into proper operation complete and workable systems for all items shown on the drawings, described in the specifications or reasonably implied. This shall include the planning and supervision to coordinate the work with other crafts and to maintain a proper time schedule for delivery of materials and installation of the work.

B. Division 01 of the specifications is to be specifically included as well as all related drawings.

1.03 RELATED WORK

A. Related Work Specified Elsewhere:

1. Fire Suppression Specifications: Division 21.
2. Heating, Ventilating and Air Conditioning (HVAC) Specifications: Division 23.
3. Electrical Specifications: Division 26.
4. Motors and Connections: Division 26.
5. Starters and Disconnects: Division 26.

B. Unless otherwise indicated on the electrical drawings or the electrical schedules, provide all plumbing equipment motors, motor starters, thermal overload switches, control relays, time clocks, thermostats, motor operated valves, float controls, damper motors, electric switches, electrical components, wiring and any other miscellaneous Division 22 controls. Disconnect switches are included in the electrical work, unless specifically called out on mechanical plans.

C. Carefully coordinate all work with the electrical work shown and specified elsewhere.

1.04 REFERENCED CODES - LATEST ADOPTED EDITION

A. NFPA 13 Installation of Sprinkler Systems.

B. NFPA 70 National Electrical Code (NEC).

C. IMC International Mechanical Code.

D. UPC Uniform Plumbing Code.

E. IECC International Energy Conservation Code.

F. IFC International Fire Code.

G. IFGC International Fuel Gas Code.

H. IBC International Building Code.

1.05 PROJECT RECORD DRAWINGS

A. In addition to other requirements of Division 01, mark up a clean set of drawings as the work progresses to show the dimensioned location and routing of all mechanical work which will become permanently concealed. Show routing of work in concealed blind spaces within the building. Show exact dimensions of buried piping off of columns or exterior walls.

B. Maintain record documents at job site in a clean, dry and legible condition. Keep record documents available for inspection by the Project Manager.

C. Show the location of all valves and their appropriate tag identification.

D. At completion of project, deliver these drawings to the Architect and obtain a written receipt.

1.06 SUBMITTALS

A. See General Conditions and the General Requirements in Division 01 regarding submittals.

B. Submit by specification section complete and all at one time; partial submittals will not be considered. Submittals shall be provided in electronic PDF Format. The data in the electronic file shall be arranged and indexed under basic categories in order of the Specification Sections. An index shall be included with bookmarks and identifying tabs between sections and references to sections of specifications.

C. Catalog sheets shall be complete and the item or model to be used shall be clearly marked, and identified as to which item in the specifications or on the drawings is being submitted and with drawing fixture number where applicable.

D. Only submit on items specifically required by each specification section. If a submittal has not been requested, it will not be reviewed.

1.07 OPERATING AND MAINTENANCE MANUALS

A. See General Conditions and the General Requirements in Division 01 regarding Operating and Maintenance Manuals.

B. Submit maintenance manuals to the Engineer covering all equipment, fixtures, devices, etc. installed by the Contractor.

C. The operation and maintenance manuals shall be submitted by specification section complete and all at one time; partial operations and maintenance manual submittals will not be considered. The Operation and maintenance manuals shall be provided in electronic PDF Format. The data in the electronic file shall be arranged and indexed under basic categories. An index shall be included with bookmarks and identifying tabs between sections and references to sections of specifications. The manual shall contain, but not limited to, the following types of information:

1. Cover sheet with name, address, telephone number of Contractor, General Contractor and major equipment suppliers.
2. Catalog cuts of all equipment, fixtures, etc. installed (Marked to identify the specific items used).
3. Manufacturer's maintenance and overhaul instruction booklets including exploded views.
4. Identification numbers of all parts and nearest sources for obtaining parts and services.
5. A copy of valve schedule and reduced scale drawings showing valve locations.
6. Written summary of instructions to Owner.
7. All manufacturers' warranties and guarantees.
8. Contractors Warranty Letter.

D. A periodic maintenance form that includes all of the equipment shall be provided with the maintenance manual. The form shall list each piece of equipment and how often maintenance is required (daily, weekly, monthly, annually). Opposite each task shall be squares for check-off for a full year (initials) to verify that the tasks are being done.

1.08 HANDLING

A. See General Conditions and the General Requirements in Division 01 regarding material handling.

B. Deliver packaged materials to job site in unbroken packages with manufacturer's label, and store to facilitate inspection and installation sequence. All items must be labeled and identified as to make, size and quality.

1.09 SUBSTITUTIONS

A. See General Conditions and the General Requirements in Division 01 for substitution request procedures.

B. In accordance with the General Conditions and the General Requirements in Division 01, Substitution and Product Options, all substitute items must fit in the available space, and be of equal or better quality including efficiency performance, size, and weight, and must be compatible with existing equipment. The Architect/Engineer shall be the final authority regarding acceptability of substitutes.

1.10 DIMENSIONS

A. Before ordering any material or doing any work, the Contractor shall verify all dimensions, including elevations, and shall be responsible for the correctness of the same. No extra charge or compensation will be allowed on account of differences between actual dimensions and measurements indicated on the drawings.

B. Any differences, which may be found, shall be submitted to the [Owner]Architect/Engineer for consideration before proceeding with the work.

1.11 MANUFACTURER'S DIRECTIONS

A. All manufactured articles shall be applied, installed and handled as recommended by the manufacturer, unless specifically called out otherwise. Advise the Architect/Engineer of any such conflicts before installation.

1.12 PERMITS, FEES, ETC.

A. The Contractor under each Division of these specifications shall arrange for a permit from the local authority. The Contractor shall pay for any inspection fees or other fees and charges required by ordinance, law, codes and these specifications.

1.13 TESTING

A. The Contractor under each section shall perform the various tests as specified and required by the Architect, Engineer and as required by applicable code, the State and local authorities. The Contractor shall furnish all labor, fuel and materials necessary for making tests.

1.14 TERMINOLOGY

A. Whenever the words "furnish", "provide", "furnish and install", "provide and install", and/or similar phrases occur, it is the intent that the materials and equipment described be furnished, installed and connected under this Division of the Specifications, complete for operation unless specifically noted to the contrary.

B. Where a material is described in detail, listed by catalogue number or otherwise called for, it shall be the Contractor's responsibility to furnish and install the material.

C. The use of the word "shall" conveys a mandatory condition to the contract.

D. "This section" refers to the section in which the statement occurs.

E. "The project" includes all work in progress during the construction period.

F. In describing the various items of equipment, in general, each item will be described singularly, even though there may be a multiplicity of identical or similar items.

1.15 SCHEDULE OF WORK

A. The work under the various sections must be expedited and close coordination will be required in executing the work. The various trades shall perform their portion of the work at such times as directed so as to meeting scheduled completion dates, and to avoid delaying any other trade. The Architect will set up completion dates. Each contractor shall cooperate in establishing these times and locations and shall process work so as to ensure the proper execution of it.

1.16 COOPERATION AND CLEANING UP

A. The Contractor for the work under each section of the specifications shall coordinate the Contractors work with the work described in all other sections of the specifications to the end that, as a whole, the job shall be a finished one of its kind, and shall carry on the work in such a manner that none of the work under any section of these specifications shall be handicapped, hindered or delayed at any time.

B. At all times during the progress of the work, the Contractor shall keep the premises clean and free of unnecessary materials and debris. The Contractor shall, on direction at any time from the Architect, clear any designated areas or area of materials and debris. On completion of any portion of the work, the Contractor shall remove from the premises all tools and machinery and all debris occasioned by the work, leaving the premises free of all obstructions and hindrances.

1.17 WARRANTY

A. Unless a longer warranty is hereinafter called for, all work, materials and equipment items shall be warrantied for a period of one year after acceptance by the Owner. All defects in labor and materials occurring during this period, as determined by the Architect/Engineer, shall be repaired and/or replaced to the complete satisfaction of the Architect/Engineer. Warranty shall be in accordance with Division 01.

1.18 COMPLETION REQUIREMENTS

A. In accordance with the General Conditions and the General Requirements in Division 01, Project Closeout; before acceptance and final payment, the Contractor shall furnish:

1. Accurate project record drawings, shown in red ink on prints, showing all changes from the original plans made during installation of the work.
2. Contractors One Year Warranty.
3. All Manufacturers' Guarantees.
4. Operation and Maintenance Manuals.

1.19 INSPECTION OF SITE - REMODEL PROJECTS

A. The accompanying plans do not indicate completely the existing plumbing and mechanical installations. The bidders for the work under these sections of the specifications shall inspect the existing installations and thoroughly acquaint themselves with conditions to be met and the work to be accomplished in removing and modifying the existing work, and in installing the new work in the present building and underground serving to and from that structure. Failure to comply with this shall not constitute grounds for any additional payments in connection with removing or modifying any part of the existing installations and/or installing any new work.

1.20 RELOCATION OF EXISTING INSTALLATIONS

A. There are portions of the existing plumbing, mechanical and electrical systems, which shall remain in use to serve the finished building in conjunction with the indicated new installations. By actual examination at the site, each bidder shall determine those portions of the remaining present installations, which must be relocated to avoid interference with the installations of new work of the Contractors particular trade and that of all other trades. All such existing installations, which interfere with new installations, shall be relocated by the Contractor.

1.21 SALVAGE MATERIALS

A. The Contractor shall remove existing equipment, piping, controls and other items associated with the mechanical systems where no longer required for the project. Where such items are exposed to view or uncovered by any cutting or removal of general construction and has no continuing function (as determined by the Architect/Engineer), they shall be removed.

B. All items or materials removed from the project shall be made available for the Owner's inspection. The Owner retains the option to claim any item or material. Contractor shall deliver any claimed item or material in good condition to the place designated by the Owner. All items not claimed become the property of the contractor and shall be removed from the site.

PART 2 PRODUCTS

2.01 MATERIALS

A. All equipment shall be regularly cataloged items of the manufacturer and shall be supplied as a complete unit in accordance with the manufacturer's standard specifications along with any optional items required for proper installation unless otherwise noted. Maintain manufacturer's identification, model number, etc. on all equipment at all times.

B. Where more than one of an item is to be provided, all of the items shall be identical manufacture, make, model, color, etc.

2.02 RESTRICTED MATERIALS

A. No materials containing asbestos in any form shall be allowed.

B. No solder or flux containing lead shall be used on this project.

C. Any pipe or plumbing fitting or fixture, any solder, or any flux utilized on this project shall be "lead free" in accordance with the Safe Drinking Water Act, Section 1417. "Lead free" materials utilized in domestic water system shall not contain more than 0.2 percent lead when used with respect to solder and flux; and not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures. All materials utilized in domestic water system shall be certified by an ANSI accredited organization to conform to ANSI/NSF Standard 61.

D. Where materials or equipment provided by this Contractor are found to contain restricted materials, such items shall be removed and replaced with non-restricted materials items. Entire cost of restricted materials removal and disposal and cost of installing new items shall be the responsibility of the Contractor for those restricted materials containing items installed by the Contractor.

2.03 ELECTRICAL MOTORS

A. Motors: Furnish electric motors designed for the specific application and duty applied, and to deliver rated horsepower without exceeding temperature ratings when operated on power systems with a combined variation in voltage and frequency not more than + 10% of rated voltage. Motors for pumps and fans shall be selected to be non-overloading.

B. Verify from the drawings and specifications the available electrical supply characteristics and furnish equipment that will perform satisfactorily under the conditions shown and specified.

C. All motors for use with equipment with variable frequency drives shall be inverter ready motors. Verify compatibility and sizing of motor with variable frequency drive.

D. Size motors for 1.15 service factor and not to exceed 40º C temperature rise above ambient.

E. Fractional horsepower motors to have self-resetting thermal overload switch.

F. Provide Premium Efficiency, motors for all three phase motors one horsepower and larger. Standard efficiency motors will not be acceptable.

PART 3 EXECUTION

3.01 DRAWINGS

A. The drawings are partly diagrammatic, not necessarily showing all offsets or exact locations of piping, unless specifically dimensioned. The contractor shall provide all materials and labor necessary for a complete and operable system. Complete details of the building which affect the mechanical installation may not be shown. For additional details, see Architectural, Structural, Civil and Electrical Drawings. Coordinate work under this section with that of all related trades.

3.02 INSTALLATION

A. All work shall comply with the latest adopted applicable codes and ordinances including, but not limited to, the IMC, UPC, IBC, NEC, NFPA, IECC, IFGC and IFC Standards; all local and state amendments to all codes and standards.

B. Obtain and pay for all inspection fees, connection charges and permits as a part of the Contract.

C. Compliance with codes and ordinances shall be at the Contractor's expense.

3.03 MEASUREMENTS

A. Verify all measurements on the job site.

B. Locate all equipment and fixtures on the centers of walls, openings, spaces, etc., unless specified otherwise.

C. Check all piping, equipment, etc. to clear openings.

D. Rough-in dimensions shall be per manufacturer's recommendations and in compliance with current ADA and ANSI 117.1 standards.

3.04 OPERATING INSTRUCTIONS

A. Before the facility is turned over to the Owner, instruct the Owner or Owner's personnel in the operation, care and maintenance of all systems and equipment under the jurisdiction of the Plumbing Division. These instructions shall also be included in a written summary in the Operating Maintenance Manuals.

B. The Operation and Maintenance Manuals shall be utilized for the basis of the instruction. Provide a minimum of four hours of onsite instruction to the owner designated personnel.

C. When required by individual specification sections provide additional training on plumbing systems and equipment as indicated in the respective specification section.

D. Provide schedule for training activities for review prior to start of training.

3.05 SYSTEM ADJUSTING

A. Each part of each system shall be adjusted and readjusted as necessary to ensure proper functioning of all plumbing systems. Test all plumbing equipment, fixtures and piping for proper water distribution, drainage, pressure and flow, adjust systems as required to eliminate splashing, noise and vibration.

3.06 CUTTING, FITTING, REPAIRING, PATCHING AND FINISHING

A. Arrange and pay for all cutting, fitting, repairing, patching and finishing of work by other trades where it is necessary to disturb such work to permit installation of mechanical work. Perform work only with craftsmen skilled in their respective trades.

B. Avoid cutting, insofar as possible, by setting sleeves, frames, etc. and by requesting openings in advance. Assist other trades in securing correct location and placement of rough-frames, sleeves, openings, etc. for piping.

C. Cut all holes neatly and as small as possible to admit work. Include cutting where sleeves or openings have been omitted. Perform cutting in a manner so as not to weaken walls, partitions or floors. Drill holes required to be cut in floors without breaking out around holes.

3.07 PAINTING

A. Perform all of the following painting in accordance with provisions of Division 09 with colors as selected by the Architect. Provide the following items as a part of plumbing work:

1. Factory applied prime and finish coats on plumbing equipment.
2. Factory applied prime coat on access doors.
3. Pipe identification where specified.

B. If factory finish on any equipment furnished is damaged in shipment or during construction, refinish to equal original factory finish.

3.08 INSTALLATION OF EQUIPMENT

A. Unless otherwise indicated, mount all equipment and install in accordance with manufacturer's recommendations and approved submittals.

B. Maintain manufacture recommended minimum clearances for access and maintenance.

C. Where equipment is to be anchored to structure, furnish and locate necessary anchoring and vibration isolation devices.

D. Furnish all structural steel, such as angles, channels, beams, etc. required to support all piping, equipment and accessories installed under this Division. Use structural supports suitable for equipment specified or as indicated. In all cases, support design will be based upon data contained in manufacturer's catalog. Provide Seismic Restraint in Accordance with Specification Section 22 0548.

E. Openings: Arrange for necessary openings in buildings to allow for admittance and reasonable maintenance or replacement of all equipment furnished under this Contract.

F. Access Doors: Provide as necessary for reasonable maintenance of all equipment valves, controls, etc.

END OF SECTION

SECTION 22 0505
SELECTIVE DEMOLITION FOR PLUMBING

PART 1 GENERAL

1.01 DESCRIPTION

A. Work specified in this Section includes the demolition, removal, and disposition of certain mechanical work.

B. Drawings, the provisions of the Agreement, and Administrative Specification Sections apply to all work of this Section.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.01 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of conditions as satisfactory.

3.02 DEMOLITION, REMOVAL AND DISPOSITION

A. Saw-cut concrete as shown or required.

B. Piping and Equipment to Be Removed: Remove all piping and equipment as indicated on the Drawings.

C. Piping Removed: Drawings do not show all existing piping which is to be removed. Unless indicated otherwise, where existing equipment has been removed, or its use replaced by new equipment, remove connecting piping back to the branch in the main so that there will be no dead ends or unused pipe lines in mechanical spaces at completion.

D. Piping, Equipment, and Control Wiring to Be Removed: Remove all piping, equipment, and control wiring as indicated. Drawings do not show all existing piping, equipment, and control wiring which is to be removed. Unless indicated otherwise, where existing equipment has been removed, or its use replaced by new equipment, remove connecting piping back to the branch in the main so that there will be no dead ends or unused pipe lines in mechanical spaces at completion.

E. Materials to Owner: All items or materials removed from the project shall be made available for the Owner's inspection. The Owner retains the option to claim any item or material. The Contractor shall deliver any claimed item or material in good condition to the place designated by the Owner. All items not claimed become the property of the Contractor and shall be removed from the site by the Contractor.

F. Materials to Owner: As indicated on the Drawings.

G. Re-use of Materials: Only where indicated on Drawings.

H. Materials to Contractor: Materials shown or specified to be removed, other than the materials indicated to be turned over to Owner.

I. Protect any active piping and/or wiring encountered; remove, plug or cap utilities to be abandoned. Notify the Architect of utilities encountered whose service is not known.

J. Debris Removal: Existing materials removed and not reinstalled or turned over to the Owner shall be immediately removed from the site and disposed of by the Contractor.

K. Repairs: Any portion of the facility damaged, cut back or made inoperable by this Contractor shall be repaired with similar materials as the existing structure and/or damaged item as instructed by the Architect.

END OF SECTION

SECTION 22 0529

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Piping and equipment hangers, supports, and associated anchors.

B. Equipment bases and supports.

C. Sleeves and seals.

D. Flashing.

1.02 PRODUCTS FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Furnish hanger and support sleeves for placement into formwork.

1.03 RELATED WORK

A. Assemblies.

B. Division 09 - Painting.

C. Section 22 0500 - Common Work Results for Plumbing.

D. Section 22 0548 - Vibration and Seismic Controls for Plumbing Piping and Equipment.

E. Section 22 0553 - Identification for Plumbing Piping and Equipment.

F. Section 22 0700 - Plumbing Insulation.

G. Section 22 1000 - Plumbing Piping.

H. Section 22 4000 - Plumbing Fixtures.

1.04 REFERENCES

A. ASME B31.1 - Power Piping.

B. ASME B31.9 - Building Services Piping.

C. ASTM F708 - Design and Installation of Rigid Pipe Hangers.

D. ANSI/MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.

E. ANSI/MSS SP69 - Pipe Hangers and Supports - Selection and Application.

F. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable code for support of plumbing piping.

1.06 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: Provide manufacturers catalog data including load capacity. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

PART 2 PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

A. Acceptable Manufacturers:

1. Anvil.
2. B-Line Systems, Inc.
3. Erico.
4. PHD Manufacturing, Inc.
5. Tolco.

B. Plumbing Piping - DWV:

1. Conform to ANSI/MSS SP58.
2. Hangers for Pipe Sizes ½ to 1-½ Inch: Malleable iron or carbon steel, adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
7. Vertical Support: Steel riser clamp.
8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated with neoprene isolation pad.

C. Plumbing Piping - Water:

1. Conform to ANSI/MSS SP58.
2. Hangers for Pipe Sizes ½ to 1-½ Inch: Malleable iron or carbon steel, adjustable swivel, split ring.
3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.
5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
6. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
7. Vertical Support: Steel riser clamp.
8. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
10. Copper Pipe Support: Carbon steel ring, adjustable, copper plated with neoprene isolation pad.
11. Design hangers to allow installation without disengagement of supported pipe.
12. Copper Plating: All hanger elements in metal-to-metal contact with copper pipe, except hanger rings with factory-applied 1/16 inch minimum thick plastic or tape cushion strip over all contact surfaces.
13. Strut Type Pipe Hanging System: Unistrut P-1000 series; framing members shall be No. 12 gage formed steel channels, 1-5/8 inch square, conforming to ASTM A 570 GR33, one side of channel shall have a continuous slot with inturned lips; framing nut with grooves and spring 1/2 inch size, conforming to ASTM 675 GR60; screws conforming to ASTM A 307; fittings conforming to ASTM A 575; all parts enamel painted or electro-galvanized.

D. Shield for Insulated Piping 1-½ Inches and Smaller: 18 gauge galvanized steel shield over insulation in 180º segments, minimum 12 inches long at pipe support.

E. Shield for Insulated Piping 2 Inches and Larger: Hard block, calcium silicate insert, 180° segment, 12 inch minimum length, block thickness same as insulation thickness, flame resistant vapor barrier covering and 18 gauge galvanized shield.

F. Shields for Vertical Copper Pipe Risers: Galvanized steel pipe.

2.02 HANGER RODS

A. Steel Hanger Rods: Mild steel, threaded both ends, threaded one end, or continuous threaded. Minimum Hanger Rod Sizes:

PIPE AND TUBE SIZE (INCHES)	ROD SIZE (INCHES)
¼-4	3/8
5-8	1/2
10-12	5/8

2.03 INSERTS

A. Inserts: Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.04 ANCHOR BOLTS

A. Anchor (Expansion) Bolts: Shall be carbon steel to ASTM A 307; nut shall conform to ASTM A194; shall be drilled-in type. Design values for shear and tension shall be not more than 80 percent of the allowable load.

2.05 FLASHING

A. Metal Flashing: 26 gauge minimum galvanized steel.

B. Metal Counter Flashing: 22 gauge minimum galvanized steel.

C. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.

D. Curb Caps: Steel, 22 gauge minimum; 16 gauge at fire resistant elements.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install pipe hangers in accordance with ANSI/MSS-SP-69.

3.02 PIPE HANGERS AND SUPPORTS

A. Support plumbing piping in accordance with the latest adopted edition of the UPC.

B. Support horizontal piping as follows:

MATERIALS	TYPES OF JOINTS	HORIZONTAL	VERTICAL
Cast-Iron Hub-less	Shielded Coupling	Every other joint, unless over 4 feet then support each joint [1,2,3.4]	Base and each floor, not to exceed 15 feet
Copper Tube and Pipe	Soldered or Brazed	1 ½ inches and smaller, 6 feet; 2 inches and larger, 10 feet	Each floor, not to exceed 10 feet[5]
Schedule 40 PVC and ABS DWV	Solvent Cemented	All sizes, 4 feet; allow for expansion every 30 feet [3,6]	Base and each floor' provide mid-story guides; provide for expansion every 30 feet[6]
CPVC	Solvent Cemented	1 inch and smaller, 3 feet; 1 ¼ inches and larger, 4 feet	Base and each floor; provide mid-story guides[6]
PEX	Cold Expansion, Insert and Compression	1 inch and smaller, 32 inches; 1 ¼ inches and larger, 4 feet	Base and each floor; provide mid-story guides

MATERIALS	TYPES OF JOINTS	HORIZONTAL	VERTICAL
Polypropylene (PP)	Fusion weld (socket, butt, saddle, electrofusion), threaded (metal threads only), or mechanical	1 inch and smaller, 32 inches; 1 ¼ inches and larger, 4 feet[7]	Base and each floor; provide mid-story guides[7]

Notes:

[1] Support adjacent to joint, not to exceed 18 inches.

[2] Brace not to exceed 40 foot intervals to prevent horizontal movement.

[3] Support at each horizontal branch connection.

[4] Hangers shall not be placed on the coupling.

[5] Vertical water lines shall be permitted to be supported in accordance with recognized engineering principles with regard to expansion and contraction, where first approved by the Authority Having Jurisdiction.

[6] See the appropriate IAPMO Installation Standard for expansion and other special requirements.

[7] See manufacturer installation instructions for additional requirements.

C. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.

D. Place a hanger within 12 inches of each horizontal elbow.

E. Use hangers with 1-½ inch minimum vertical adjustment.

F. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

G. Support riser piping independently of connected horizontal piping.

H. Design hangers for pipe movement without disengagement of supported pipe.

I. Provide copper plated hangers and supports for copper piping.

J. Prime coat exposed steel hangers and supports. Refer to Division 09. Hangers and supports located in crawlspace, pipe shafts, and suspended ceiling spaces are not considered exposed.

3.03 INSERTS

A. Provide inserts for placement in concrete formwork.

B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

D. Where concrete slabs form finished ceiling, provide inserts to be flush with slab surface.

E. Where inserts are omitted, drill through concrete slab from below and provide thru-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

3.04 FLASHING

A. Provide flexible flashing and metal counter-flashing where piping penetrates weather or waterproofed walls, floors, and roofs. For pipes through outside walls, turn flanges back into wall and caulk, metal counter-flash and seal.

B. Seal floor drains watertight to adjacent material.

C. Flash vent pipes projecting 3 inches minimum above finished roof surface with pre-manufactured butyl boot.

END OF SECTION

SECTION 22 0548

VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section provides minimum acceptance requirements for vibration isolation and seismic/wind restraints for all plumbing equipment and piping.

1.02 GENERAL

A. The requirements for seismic protection measures to be applied to plumbing equipment and systems specified herein are in addition to any other items called for in other sections of these specifications.

1.03 PLUMBING EQUIPMENT AND PIPING

A. New and existing plumbing equipment shall include the following items to the extent required on plans or in other sections of these specifications.

1. Domestic Water Piping.
2. Drain, Waste and Vent Piping.

1.04 RELATED WORK SPECIFIED ELSEWHERE

A. Seismic restraints for fire suppression systems are provided in Division 21.

B. Vibration isolation and seismic/wind restraints for heating, fuel and ventilation systems are specified elsewhere in Division 23.

C. Vibration isolation and seismic restraints for electrical systems are provided in Division 26.

1.05 QUALITY ASSURANCE

A. The following codes and standards will apply:

1. International Building Code.
2. American Society of Civil Engineers (ASCE) 7-16.

B. Manufacturer's Qualifications: Firms regularly engaged in manufacture of vibration control and wind restraint products of type, size, and capacity required, whose products have been in satisfactory use in similar service for not less than 5 years.

C. The following guides may be used for supplemental information on typical seismic installation practices:

1. Federal Emergency Management Agency (FEMA) manuals 412, Installing Seismic Restraints for Mechanical Equipment and 414, Installing Seismic Restraints for Ductwork and Pipe.
2. Sheet Metal and Air-conditioning Contractors' National Association's (SMACNA) Seismic Restraint Manual Guidelines for Mechanical Systems.
3. American Society for Heating, Refrigerating and Air-conditioning Engineers' (ASHRAE) A Practical Guide to Seismic Restraint.
4. Manufacturers Standardization Society of the Valve and Fittings Industry MSS SP-127-2014a, Bracing for Piping Systems, Seismic - Wind - Dynamic, Design, Selection, Application.

1.06 COMPONENT IMPORTANCE FACTOR

In order to identify systems requiring seismic restraint and to define those from which restraints may be excluded, utility components are assigned an ASCE 7 Importance Factor (Ip) on the basis of the following:

Ip = 1.5 Natural gas piping.

Ip = 1.0 All other components.

1.07 SUBMITTALS

A. Submit shop drawings and manufacturer's data in accordance with Division 01.

B. Provide calculations for selection of seismic/wind restraints in accordance with IBC and ASCE 7, certified by a qualified professional engineer, licensed in the state of the project.

C. Submit adequate number of City Plan Review department set of shop drawings and seismic calculations for their review. Submit to City plan review and owner concurrently. Submit plan review approved set to Engineer when available. The submittals must include a licensed engineer's stamp and signature and shall be provided as deferred submittal.

D. Provide Shop drawings along with catalog cuts, templates and erection and installation details, as appropriate, for the items listed. Submittals shall be complete in detail; shall indicate thickness, type, grade, class of metal; and dimensions; and shall show construction details, reinforcement, anchorage, and installation with relation to the building construction.

1. Sway Braces.
2. Snubbers.
3. Flexible Couplings and Joints.
4. Vibration Isolators.
5. Seismic Cable Restraint.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Vibration isolators and Seismic Restraint shall be manufactured by:

1. Amber/Booth.
2. Cooper Industries.
3. International Seismic Application Technology.
4. Kinetics Noise Control.
5. Mason Industries.
6. Vibro-Acoustics.
7. Substitutions: Items of same function and performance are acceptable in conformance with Division 01.

2.02 SEISMIC BRACING AND SUPPORT OF SYSTEMS AND COMPONENTS

A. General:

1. Seismic restraint designer shall coordinate all attachments with the structural engineer of record.
2. Design analysis shall include calculated dead loads, static seismic loads, and capacity of materials utilized for the connection of the equipment or system to the structure.
3. Analysis shall detail anchoring methods, bolt diameter, and embedment depth.
4. All seismic restraint devices shall be designed to accept without failure the forces calculated per the applicable building code and as summarized in installation requirements.
5. The total height of the structure (h) and the height of the system to be restrained within the structure (z) shall be determined in coordination with architectural plans and the General Contractor.

B. Friction from gravity loads shall not be considered resistance to seismic forces.

2.03 SEISMIC BRACING COMPONENTS

A. Steel strut shall be 1-5/8 inch wide in varying heights and mig-welded combinations as required to meet load capacities and designs indicated. A material heat code, part number, and manufacturer's name shall be stamped on all strut and fittings to maintain traceability to material test reports.

1. Material for epoxy painted strut: ASTM A1011, SS, Grade 33.
2. Material for pre-galvanized strut: ASTM A653, SS, Gr. 33.
3. Material for Hot-Dip Galvanized strut: ASTM A1011, SS, Grade 33 and hot-dip galvanized after fabrication in accordance with ASTM A123.
4. Material for fittings and accessories: ASTM A907 Gr. 33, Structural Quality or ASTM A1011, SS. Gr.33.
5. Fittings and accessories: Products shall be of the same manufacturer as strut and designed for use with that product.

PART 3 EXECUTION

3.01 GENERAL

A. Coordinate size, doweling, and reinforcing of concrete equipment housekeeping pads and piers with vibration isolation and seismic restraint device manufacturer to ensure adequate space and prevent edge breakout failures. Pads and piers must be adequately doweled in to structural slab.

B. Coordinate locations and sizes of structural supports with locations of vibration isolators and seismic/wind restraints (e.g., roof curbs, cooling towers, air-cooled chillers, etc.).

C. Isolated and restrained equipment and piping located on roofs must be attached to the structure. Intermediate supports between the restraint and structure that are not attached to the structure must be approved by the restraint manufacturer.

3.02 SEISMIC/WIND RESTRAINTS

A. General:

1. All equipment and piping shall be restrained to resist seismic/wind forces per the applicable building code(s) as a minimum. Restraint attachments shall be made by bolts, welds or a positive fastening method. Friction shall not be considered. All attachments shall be proven capable of accepting the required wind load by calculations. Additional requirements specified herein are included specifically for this project.
2. Install seismic and wind restraint devices per the manufacturer's submittals. Any deviation from the manufacturer's instructions shall be reviewed and approved by the manufacturer.
3. Attachment to structure for suspended equipment and pipe: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
4. Wall penetrations may be used as bracing locations provided the wall can provide adequate resistance without significant damage.
5. Coordinate sizes and locations of cast-in-place inserts for post-tensioned slabs with seismic restraint manufacturer.
6. Provide hanger rod stiffeners where indicated or as required to prevent buckling of rods due to seismic forces.
7. Where rigid restraints are used on equipment or piping, support rods for the equipment or piping at restraint locations must be supported by anchors rated for seismic use. Post-installed concrete anchors must be in accordance with ACI 355.2.
8. Ensure housekeeping pads have adequate space to mount equipment and seismic restraint devices and shall also be large enough to ensure adequate edge distance for restraint anchor bolts to avoid housekeeping pad breakout failure.

B. Concrete Anchor Bolts:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid pre- or post-tensioned tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Mechanical Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.

C. Piping Systems:

1. For projects with a Seismic Design Category of C, provide seismic cable restraints on the following:
    a. All piping systems assigned a component importance factor, Ip, of 1.5 with a nominal pipe diameter greater than 2" (50 mm) or trapeze-supported piping with combined operating weight over 10 lbs/ft (15 kg/m).
2. For projects with a Seismic Design Category of D, E or F, provide seismic cable restraints on the following:
    a. All piping greater than 3" (75 mm) nominal diameter.
    b. All piping systems assigned a component importance factor, Ip, of 1.5 with a nominal pipe diameter greater than 1" (25 mm) or trapeze-supported piping with combined operating weight over 10 lbs/ft (15 kg/m).
3. "12-inch rule", where pipe can be exempted from seismic restraint based on the length of the support rods, is accepted if one of the following conditions are met:
    a. Hangers are detailed to avoid bending of the hangers and their attachment; and provisions are made for piping to accommodate expected deflections. The maximum stress due to combined loading including bending in the hangers must be less than 21.6 ksi.
    b. Isolation hangers are added to hanger rod to provide swivel joint and to prevent bending moment in hanger.
4. Restraint spacing:
    a. For ductile piping, space lateral supports a maximum of 40' (12 m) o.c., and longitudinal supports a maximum of 80' (24 m) o.c.
    b. For non-ductile piping (e.g., cast iron, PVC) space lateral supports a maximum of 20' (6 m) o.c., and longitudinal supports a maximum of 40' (12 m) o.c.
    c. For piping with hazardous material inside (e.g., natural gas, medical gas) space lateral supports a maximum of 20' (6 m) o.c., and longitudinal supports a maximum of 40' (12 m) o.c.
    d. For pipe risers, restrain the piping at floor penetrations using the same spacing requirements as above.
5. Brace a change of direction longer than 12' (3.7 m).

6. Longitudinal restraints for single pipe supports shall be attached directly to the pipe, not to the pipe hanger.
7. For supports with multiple pipes (trapezes), secure pipes to trapeze member with clamps approved for application.
8. Piping on roller supports shall include a second roller support located on top of the pipe at each restraint location to provide vertical restraint.

D. Install restraint cables so they do not bend across edges of adjacent equipment or building structure.

E. Install flexible metal hose loops in piping which crosses building seismic joints, sized for the anticipated amount of movement.

F. Install flexible piping connectors where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment.

G. Coordinate seismic restraints with thermal expansion compensators, guides and anchor points. Thermal expansion anchor points shall be designed to accommodate seismic forces.

3.03 INSPECTION AND CERTIFICATION

A. After installation, arrange and pay for the vibration isolation product manufacturer, or representative, to visit the site to verify that the vibration isolation systems are installed and operating properly, and shall submit a certificate so stating. Verify that isolators are adjusted, with springs perpendicular to bases or housing, adjustment bolts are tightened up on equipment mountings, and hangers are not cocked.

B. After installation, arrange and pay for the seismic restraint product manufacturer, or representative, to visit the site to verify that the seismic and wind restraint systems are installed properly, and shall submit a certificate so stating.

END OF SECTION

SECTION 22 0553
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes identification of plumbing piping and equipment installed under Division 22.

B. Related Sections:

1. Division 09 - Painting and Coating: Execution requirements for painting specified by this section.

1.03 REFERENCES

A. ANSI/ASME A13.1 - Scheme for the Identification of Piping Systems.

1.04 SUBMITTALS

A. Submit product data under provisions of Division 01.

1.05 QUALITY ASSURANCE

A. Conform to ASME A13.1 for color scheme for identification of piping systems and accessories.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Seton.

B. Marking Services Inc.

C. Craftmark Identification Systems.

D. Substitutions: Under provisions of Division 01.

2.02 MATERIALS

A. Color: Unless specified otherwise, conform with ANSI/ASME A13.1.

B. Plastic Nameplates: Laminated three-layer plastic with engraved black or white letters on contrasting background color. Plate size minimum ¾" X 2-½".

C. Plastic Tags: Laminated three-layer plastic with engraved black or white letters on contrasting background color. Tag size minimum 1-½ inch square.

D. Metal Tags: Brass with stamped letters; tag size minimum 1-½ inch diameter with smooth edges.

E. Stencils: With clean cut symbols and letters of following size:

Outside Diameter of Insulation or Pipe	Length of Color Field	Size of Letters
¾" - 1-¼"	8"	½"
1-½" - 2"	8"	¾"
2-½" - 6"	12"	1-¼"
Equipment	------	2-½"

F. Stencil Paint: Semi-gloss enamel, colors and lettering size conforming to ASME A13.1.

G. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and fluid being conveyed. Larger sizes may have maximum sheet size with spring fastener.

H. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

I. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape of not less than 6 inch wide by 4 mil thick, manufactured for direct burial service.

J. Valve Chart Frame: Aluminum frame with plastic windows.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Division 09 for stencil painting.

3.02 INSTALLATION

A. Apply stencil painting in accordance with Division 09.

B. Install identifying devices after completion of coverings and painting.

C. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.

D. Install labels with sufficient adhesive for permanent adhesion and seal with clear lacquer. For unfinished canvas covering, apply paint primer before applying labels.

E. Install tags using corrosion resistant chain. Number tags consecutively by location.

F. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

G. Identify water heaters, pumps, tanks, and water treatment devices with plastic nameplates [or stencil painting]. Identify in-line pumps and other small devices with tags.

H. Identify control panels and major control components outside panels with plastic nameplates.

I. Identify valves in main and branch piping with tags showing service and valve number.

J. Identify piping, concealed or exposed, with plastic pipe markers or stenciled painting. Tags may be used on small diameter piping. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

K. Locations: Nameplates shall be located so as to be readily visible to maintenance personnel. Motor nameplates shall be readily visible on accessible, three phase motors, otherwise a duplicate motor nameplate shall be permanently affixed to the driven machinery in a visible locations.

END OF SECTION

SECTION 22 0700
PLUMBING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping Insulation.

B. Equipment Insulation.

C. Jackets and Accessories.

1.02 RELATED WORK

A. Division 09 - Painting: Painting Insulation Jacket.

B. Section 22 0500 - Common Work Results for Plumbing.

C. Section 22 0529 - Hangers and Supports for Plumbing Piping and Equipment.

D. Section 22 0553 - Identification for Plumbing Piping and Equipment.

E. Section 22 1000 - Plumbing Piping.

F. Section 22 4000 - Plumbing Fixtures.

1.03 REFERENCES

A. ASTM B209 - Aluminum and Aluminum-alloy Sheet and Plate.

B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

C. ANSI/ASTM C533 - Calcium Silicate Block and Pipe Thermal Insulation.

D. ANSI/ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

E. ASTM C450 - Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.

F. ANSI/ASTM C547 - Mineral Fiber Preformed Pipe Insulation.

G. ANSI/ASTM C552 - Cellular Glass Block and Pipe Thermal Insulation.

H. ANSI/ASTM C553 - Mineral Fiber Blanket and Felt Insulation.

I. ANSI/ASTM C578 - Preformed, Block Type Cellular Polystyrene Thermal Insulation.

J. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).

K. ANSI/ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.

L. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

M. ASTM C1427 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

N. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Tim of Burning of Plastics in a Horizontal Position.

O. ASTM E84 - Surface Burning Characteristics of Building Materials.

P. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

Q. NFPA 255 - Surface Burning Characteristics of Building Materials.

R. UL 723 - Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS

A. Submit product data under provisions of Division 01.

B. Include product description, thickness for each service, and locations.

C. Submit manufacturer's installation instructions.

1.05 QUALITY ASSURANCE

A. Applicator: Company specializing in piping insulation application with three years minimum experience.

B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.

C. Materials: Flame spread/smoke developed rating of 25/50 in accordance with UL 723, ASTM E84, or NFPA 255.

D. Factory fabricated fitting covers manufactured in accordance with ASTM C450.

1.06 DELIVERY STORAGE AND HANDLING

A. Division 01 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

C. Shipment of materials from manufacturer to installation location shall be in weather tight transportation.

D. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.

1.08 FIELD MEASURMENTS

A. Verify field measurements prior to fabrication.

1.09 WARRANTY

A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Armacell.

B. Certain-Teed.

C. IMCOA.

D. Johns Manville.

E. Knauf.

F. Owens-Corning.

G. Manson.

H. Nomaco.

I. K-Flex USA.

J. Armstrong.

K. TRUEBRO.

L. Substitutions: Under provisions of Division 01.

2.02 INSULATION - PIPING

A. Type A: Glass fiber, rigid, molded, non-combustible insulation; ANSI/ASTM C547; 'k' value of 0.23 at 75º F, rated from 0º F to 850º F, vapor retarder jacket of Kraft paper bonded to aluminum foil, self-sealing lap and butt strips; Johns Manville "Micro-Lok" or approved equal.

B. Type B: Cellular glass; ANSI/ASTM C552; 'k' value of 0.29 at 75º F; 7.3 lbs./cu. ft. density; Pittsburgh Corning "Foamglass ONE" or approved equal.

C. Type C: Expanded polystyrene; ANSI/ASTM C578; rigid closed cell; maximum water vapor transmission rating of 0.1 perms; 'k' value of 0.23 at 75º F.

D. Type D: Flexible unicellular polyolefin; ASTM C1427; 'k' value of 0.25 at 75º F ASTM C518; moisture vapor transmission of zero perm-inch ASTM E96; rated to 210º F; IMCOA “Imcolock” or approved equal.

E. Type F: ADA insulation; preformed cellular foam, preformed for P-trap and hot water angle stop and supply tube at handicap sinks and lavatories; in compliance with the Americans with Disability Act (ADA); burning characteristics per ASTM D635; TRUEBRO “Lav Guard 2” or approved equal.

F. Type G: ADA plumbing enclosure skirt; preformed high-impact stain resistant rigid PVC, stainless steel screws and wall anchors; in compliance with the Americans with Disability Act (ADA); burning characteristics per ASTM D635 TRUEBRO “Lav Shield” or approved equal.

2.03 FIELD APPLIED JACKET

A. Vapor Barrier Jackets: Kraft reinforced foil vapor barrier with self-sealing adhesive joints.

B. PVC Jackets and solvent welding adhesive: One piece, pre-molded type, Johns Manville “Zeston 2000”, fitting covers and jacketing material. Johns Manville “Perma-Weld” solvent welding adhesive.

C. Aluminum Jackets: ASTM B209; 0.016 inch thick; corrugated or textured finish, longitudinal slip joints.

D. Stainless Steel Jackets: Type 304 stainless steel; 0.010 inch thick; corrugated finish.

E. Re-Wettable Canvas Jacketing: Fiberglass cloth made from texturized yarns, impregnated throughout with an inorganic fire retardant asbestos free adhesive; 20x14 thread count, 14.5 oz./sq.yd, 0.04 inch thickness, 1,000º F upper temperature limit; GLT Products “Style 1989” or approved equal.

2.04 INSULATION ACCESSORIES

A. Adhesives: Waterproof and fire-retardant type.

B. Canvas Lagging Adhesive: Fire resistive to NFPA 255.

C. Impale Anchors: Galvanized steel, 12 gauge, self-adhesive pad.

D. Joint Tape: Glass fiber cloth, open mesh.

E. FSK Joint Tape; ASTM C1136 Foil-Scrim-Kraft (FSK) lamination coated with solvent acrylic pressure sensitive adhesive; capable of adhering to fibrous and sheet metal surfaces; tri-directionally reinforced 2x3 squares per inch fiberglass scrim; 9.5 mils thick, -40 to 240º F service temperatures; Venture Tape “1525CW” or approved equal.

F. Tie Wire: Annealed steel, 16 gauge.

G. Insulated pipe supports: Calcium silicate with galvanized steel jacket (min. 24 gauge); ANSI/ASTM C533; rigid white; 'k' value of 0.37 at 100º F, rated to 1,200º F; Thermal Pipe Shields “T-1000 Calsil” or equal.

PART 3 EXECUTION

3.01 PREPARATION

A. Install materials after piping and equipment has been tested and approved.

B. Clean surfaces for adhesives.

C. Prepare surfaces in accordance with manufacturer's recommendations.

3.02 INSTALLATION - PIPING

A. Install materials in accordance with manufacturer's recommendations, building codes and industry standards.

B. Continue insulation vapor barrier through penetrations except were prohibited by code.

C. Locate insulation and cover seams in least visible locations.

D. Neatly finish insulation at supports, protrusions, and interruptions.

E. Provide insulated cold pipes conveying fluids below ambient temperature with vapor retardant jackets with self-sealing laps. Insulate complete system, including under fitting jackets.

F. For insulated pipes conveying fluids above ambient temperature, secure jackets with self-sealing lap or outward clinched, expanded staples. Bevel and seal ends of insulation at equipment, flanges, and unions. Insulate complete system, including under fitting jackets.

G. Provide insulated piping supports on piping 1-½" inches diameter to 3" diameter. Insulated piping supports shall not be less than the following lengths:

1-½" to 2-½" pipe size	10" long
3" to 6" pipe size	12" long

H. Fully insulate all piping including all spaces under jacketing.

I. Jackets:

1. Indoor, Concealed Applications: Insulated pipes shall have vapor barrier jackets, factory-applied. Vapor barrier PVC fittings may also be used provided joints are sealed with solvent welding adhesive approved by the jacket manufacturer.
2. For pipe exposed in mechanical equipment rooms or in finished spaces below 10 feet above finished floor, finish with PVC jacket and fitting covers or metal jacket.
3. Insulate all exposed trap arms, drains, and hot water supplies for handicap protection on handicap accessible fixtures.

3.03 SCHEDULE – PIPING

PIPING	TYPE	PIPE SIZE Inch	MINIMUM INSULATION THICKNESS Inch
Domestic Cold Water	A, C, D ,	All Sizes	1"
Domestic Hot Water Supply – Mains	A, C, D,	All Sizes	1"
Domestic Hot Water Supply – Branch Lines	A, C, D,	All Sizes	1"
Domestic Hot Water Recirculating	A, C, D ,	All Sizes	1"
Rain Leaders	A, D	All Sizes	1"
Roof Drain Sumps	A, D	All Sizes	2"
Cold Condensate Drains	A, C, D,	All Sizes	1/2"
Vent Through Roof	A, C, D,	All Sizes	1"
Handicap lavatories, sinks @ waste and supply	F, G	All Sizes	½"

END OF SECTION

SECTION 22 1000
PLUMBING PIPING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Sanitary Sewer Piping.

B. Water Piping.

C. Storm Drain Piping.

D. Valves.

E. Backflow Preventers.

F. Water Hammer Arrestors.

G. Dielectric Connections.

H. Cleanouts.

I. Trap Primer Valves.

1.02 RELATED WORK

A. Division 02 - Excavating, Backfilling, Trenching.

B. Section 22 0500 - Common Work Results for Plumbing.

C. Section 22 0529 - Hangers and Supports for Plumbing Piping and Equipment.

D. Section 22 0553 - Identification for Plumbing Piping and Equipment.

E. Section 22 0700 - Plumbing Insulation.

F. Section 22 4000 - Plumbing Fixtures.

1.03 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body.

B. Any pipe or plumbing fitting or fixture, any solder, or any flux utilized on this project shall be “lead free” in accordance with the Safe Drinking Water Act, Section 1417. “Lead free” materials utilized in domestic water system shall not contain more than 0.2 percent lead when used with respect to solder and flux; and not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures. All materials utilized in domestic water system shall be certified by an ANSI accredited organization to conform to ANSI/NSF Standard 61.

1.04 SUBMITTALS

A. Submit product data under provisions of Division 01.

B. Include data on pipe materials, pipe fittings, valves and accessories.

1.05 WARRANTY

A. Polypropylene pipe and fittings shall be covered by a factory warranty for 30 years to be free of defects in materials or manufacturing.

1.06 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 and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.01 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 service weight. Fittings: Cast iron. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.

B. Cast Iron Pipe: CISPI 301, hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies, Husky Series 4000 or approved equal.

C. Copper Tubing: ASTM B306, DWV. Fittings: ASME B16.3, cast bronze, or ASME B16.29, wrought copper. Joints: ASTM B32, solder, Grade 95TA; Flux: ASTM B813.

2.02 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies, Husky Series 4000 or approved equal.

B. Copper Pipe: ASTM B306, DWV. Fittings: ASME B16.3, cast bronze, or ASME B16.29, wrought copper. Joints: ASTM B32, solder, Grade 95TA; Flux: ASTM B813.

2.03 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Tubing: ASTM B42, Type K, annealed. Fittings; ANSI/ASME B16.22, wrought copper. Joints: AWS A5.8, BCuP silver braze; Flux: ASTM B813.

B. PEX Tubing: Tubing shall be cross-linked high-density polyethylene. Tubing shall be produced using silane method of cross-linking and shall meet the dimension and performance specifications of ASTM F876/F877 and CSA B137.5. Tubing shall also comply with ANSI/NSF 61 as suitable for use with potable water. Temperature and pressure ratings shall be 160 psi at 73 degrees F, 100 psi at 180 degrees F, and 80 psi at 200 degrees F.

C. High Density Polyethylene Pipe: ASTM D 3350 HDPE designation code of PE 4710 or PE 3608. The material shall meet the requirements of and shall have a minimum cell classification of PE445474C for PE 4710 and PE345464C for PE 3608. In addition, the pipe shall be listed as meeting NSF-61 and AWWA C901. Fittings: ASTM D3261 Butt Fusion Fittings. ASTM F1055 Electrofusion Fittings. ASTM D 3261 Flanged and Mechanical Joint Adapters.

2.04 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tubing: ASTM B88, Type L, hard drawn. Fittings: ASME B16.18, cast copper alloy, or ASME B16.22, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA; Flux: ASTM B813 or Press-Fit.

2.05 STORM DRAIN PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 service weight. Fittings: Cast iron. Hub-and-Spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.

B. Cast Iron Pipe: CISPI 301, hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies, Husky Series 4000 or approved equal.

2.06 STORM DRAIN PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies, Husky Series 4000 or approved equal.

2.07 INTERIOR TRENCH EXCAVATION AND BACKFILL

A. General

1. This section describes general requirements, products, and methods of execution relating to excavation, back-fill, and compaction of inside trenches for mechanical work. Inside trenches are those which occur within an arbitrary, imaginary boundary five feet beyond the outside perimeter of the structure.

2. Provide all trench work for mechanical work of every description and of whatever substance encountered to the depth indicated, or to provide pipe slopes and elevations shown on the drawings. Excavate and backfill utility trenches. Place and compact bedding material. Compact backfill material.

B. Bedding Material

1. Select bedding material from trench excavation using care to separate it from unsuitable material. If suitable bedding material is not available from trench excavation, import it from sources approved by the Owner.

2. Use granular material, free from large stones, boulders, debris, and frozen material. Maximum aggregate size ¾" minus to have less than 6% passing through a #200 sieve. Maintain moisture content within a range that will allow specified compaction.
3. Do not use any frost susceptible materials.

C. Trench Backfill

1. Backfill material shall be 3/8" pea gravel of smaller. In the case of cast iron drain, waste and vent piping, the backfill material shall be ¾" gravel and earth or smaller.

2.08 FLANGES, UNIONS, AND COUPLINGS

A. Pipe Size 2 Inches and Under: 150 psig malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.

B. Pipe Size Over 2 Inches: 150 psig forged steel slip-on flanges for ferrous piping; bronze flanges for copper piping: 1/16 inch thick preformed neoprene bonded to fiber.

C. Grooved and Shouldered Pipe End Couplings: Malleable iron housing clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; "C" shape composition sealing gasket; steel bolts, nuts, and washers; galvanized couplings for galvanized pipe.

2.09 ACCEPTABLE MANUFACTURERS - DIELECTRIC CONNECTIONS

A. Elster Perfection - Clearflow.

B. Substitutions: Under provisions of Division 01.

2.10 DIELECTRIC CONNECTIONS

A. Dielectric Connections: Dielectric waterway fitting shall have zinc electroplated steel casing with polypropylene inner lining to provide a dielectric waterway. The fitting shall be designed to meet requirements of ASTM F1545 for continuous use at temperatures up to 225°F and for pressures up to 300 psi. IAPMO, UPC and NSF-61 listed for use with potable water.

2.11 ACCEPTABLE MANUFACTURERS - ALL VALVE TYPES

A. Apollo.

B. FNW.

C. Hammond.

D. Milwaukee.

E. NIBCO.

F. Red-White Valve Corp.

G. Substitutions: Under provisions of Division 01.

2.12 GATE VALVES

A. Not permitted. Use ball or butterfly valves for isolation service.

2.13 GLOBE VALVES

A. Not permitted. Use ball or butterfly valves for throttling service.

2.14 BALL VALVES

A. Up to 2 Inches: 600 PSI CWP Lead free bronze two piece body, full port, forged lead free brass ball, Teflon seats and adjustable packing, lever handle, solder, threaded or press-fit ends.

B. Over 2 Inches: Cast steel, two piece body, full port chrome plated steel ball, Teflon seat and stuffing box seals, lever handle [or gear drive handwheel for sizes 10 inches and over], flanged, solder, threaded or press-fit ends.

2.15 BUTTERFLY VALVES

A. Over 2 Inches: 200 PSI CWP Ductile iron body, aluminum bronze disc, EPDM seat for service to 180º F, lug ends, [10 position lever handle] [infinite position lever handle with memory stop].

2.16 SWING CHECK VALVES

A. Up to 2 Inches: 200 PSI CWP lead free bronze swing with PTFE disc, solder, screwed or press-fit ends.

B. Over 2 Inches: 285 PSI CWP ductile iron body, stainless steel trim, swing disc, renewable disc and seat, flanged ends.

2.17 SPRING LOADED CHECK VALVES

A. Up to 2 inches: 250 PSI CWP Lead free bronze spring loaded with PTFE seat, solder, screwed or press fit ends.

B. Over 2 inches: 200 PSI CWP Cast iron body, bronze trim, spring loaded, renewable composition disc, wafer, flanged ends.

C. ASME certified and labeled, NPT ends.

2.18 BALANCE VALVE

A. Straight pattern, calibrated balance valve for 400 psig maximum working pressure, with NSF 61 compliant lead free brass body, type 304 stainless steel ball, glass and carbon filled TFE seat rings, brass and EPT check valves, EPDM stem o-ring, plastic wheel handle for shut-off service, and lockshield key cap with set screw memory bonnet for balancing service. NPT or sweat ends. Bell & Gossett Circuit Setter Plus, NIBCO PC/T/S-1805-LF or approved equal.

2.19 ACCEPTABLE MANUFACTURERS - WATER HAMMER ARRESTORS

A. J.R. Smith.

B. Zurn.

C. Mifab.

D. Substitutions: Under provisions of Division 01.

2.20 WATER HAMMER ARRESTORS

A. ANSI A112.26.1; sized in accordance with PDI WH-201, pre-charged suitable for operation in temperature range -100ºF to 300ºF and maximum 250 psig working pressure; Series 5000 manufactured by J.R. Smith or approved equal.

2.21 DRAIN VALVES

A. Bronze body, chrome plated brass ball, RPTFE seals and stuffing box ring, stainless steel handle with vinyl cover. 3/4” NPT x 3/4” Hose thread, with duct cover and chain, sweat ends. Apollo 78-100 Series or approved equal.

2.22 ACCEPTABLE MANUFACTURERS - CLEANOUTS

A. J.R. Smith.

B. Zurn.

C. Mifab.

D. Substitutions: Under provisions of Division 01.

2.23 CLEANOUTS

A. Exterior Surfaced Areas: Round cast iron access frame and non-skid cover, bronze plug, vandal resistant screws. J.R. Smith Model 4251 or approved equal.

B. Interior Finished Floor Areas: Enamel paint coated cast iron, two piece body with double drainage flange, weep holes, reversible clamping collar, bronze plug, and adjustable round nickel bronze scoriated cover in service areas and round with depressed cover to accept floor finish in finished floor areas. J.R. Smith Model 4021 or approved equal.

C. Interior Finished Wall Areas: Line type with lacquered cast iron body and round epoxy coated gasketed cover, bronze plug, and round stainless steel access cover secured with machine screw. J.R. Smith Model 4022 or approved equal.

D. Interior Unfinished Accessible Areas: Caulked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.24 ACCEPTABLE MANUFACTURERS – TRAP PRIMER VALVES

A. Precision Plumbing Products, Inc.

B. Mifab.

C. Zurn.

D. Substitutions: Under provisions of Division 01.

2.25 ELECTRONIC TRAP PRIMER VALVE

A. Electronic Trap Primer: Prime-time Trap Primer as manufactured by Precision Plumbing Products or equal. Recessed [Surface] mounted in NEMA-1 cabinet with cover plate. UL listed. Provide manifold with number of connections as indicated on the drawings. Precision Plumbing Products, Inc. Model PT or approved equal.

2.26 MANUAL TRAP PRIMER VALVE

A. Valve: Machined of brass, containing no springs or diaphragms. “O” rings acceptable for –40°F to +450°F operation. Distribution Unit: Brass fitting with copper water reservoir. Clear plastic cover. Tappings for up to four drain taps. Precision Plumbing Model Prime-Rite or approved equal.

2.27 ACCEPTABLE MANUFACTURERS - MIXING VALVES

A. Powers.

B. Watts Regulator.

C. Lawler Manufacturing Company.

D. Symmons Industries Inc.

E. Substitutions: Under provisions of Division 01.

2.28 LAVATORY TEMPERING VALVE

A. Lead free brass construction and chrome finish, adjustable temperature selection with threaded cap and adjustment tool, thermal actuator, corrosion resistant internal components, integral checks. Mounting bracket for secure installation. Provide with tee fitting for cold and hot water faucet connections.

B. Construction

1. Body: DZR Brass.
2. Springs: Stainless Steel.
3. Internal Cap: Brass.
4. Piston: Engineered Polymer.
5. Inlet Strainer Screens: Stainless Steel.

C. Performance:

1. Factory set to 105°F.
2. Maximum Operating Pressure: 230 psi.
3. Hot Water Inlet Temperature Range: 120ºF – 180°F.
4. Cold Water Inlet Temperature Range: 40ºF – 80°F.
5. Temperature Adjustment Range: 100ºF – 120°F.
6. Minimum Flow: 0.25 GPM.
7. Listing: ASSE 1070, CSA, IAPMO.
8. Approval: ASSE 1070, CSA B125.7, NSF 61 Certified.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

B. Route piping in orderly manner and maintain gradient.

C. Install piping to conserve building space and not interfere with use of space.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Provide clearance for installation of insulation and access to valves and fittings.

G. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.

H. Establish elevations of buried piping outside the building to ensure not less than 10 ft. of cover.

I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

J. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting. Refer to Division 09.

K. Establish invert elevations, slopes for drainage to 1/4” per foot, 1/8” per foot if 4" or over, minimum. Maintain gradients.

L. Install valves with stems upright or horizontal, not inverted.

M. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with Teflon™ based thread lubricate. Ensure clearance at cleanout for rodding of drainage system.

N. Encase exterior cleanouts in concrete flush with grade.

O. Install water hammer arrestors complete with accessible isolation valve.

P. Support all piping in accordance with Uniform Plumbing Code and Manufacturer installation instructions. Where there is a conflict between requirements of the Uniform Plumbing Code and Manufacturer installation instructions, the more restrictive requirement shall apply.

Q. Polypropylene piping shall not be installed in any locations used as a return air plenums. Transition to copper or steel piping prior to routing piping through a return air plenum.

R. When polypropylene piping is installed in systems with pumps in excess of 7.5 HP, piping shall be protected from excessive heat generated by operating the pump at shut-off conditions. Where the possibility exists that the pump will operate with no flow, the protection method shall be a temperature relief valve or comparable level of protection, set to a maximum temperature of 185°F.

S. Fusion Welding of Joints for Polypropylene Piping:

1. Install fittings and joints using socket-fusion, elecrofusion, or butt-fusion as applicable for the fitting or joint type. All fusion-weld joints shall be made in accordance with the pipe and fitting manufacturer's specifications and product standards.
2. Fusion-weld tooling, welding machines, and electrofusion devices shall be as specified by the pipe and fittings manufacturer.
3. Prior to joining, the pipe and fittings shall be prepared in accordance with ASTM F 2389 and the manufacturer's specifications.
4. Joint preparation, setting and alignment, fusion process, cooling times and working pressure shall be in accordance with the pipe and fitting manufacturer's specifications.

3.03 APPLICATION

A. Install unions downstream of valves and at equipment connections.

B. Install ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

C. Install ball or balance valve valves for throttling, bypass, or manual flow control services. (No globe valves permitted.)

D. Provide spring loaded check valves on discharge of water pumps.

E. Use grooved mechanical couplings and fasteners only in accessible locations.

3.04 TESTING

A. Test all water piping in accordance with Section 609 of the UPC. Submit a signed statement to the Engineer stating testing dates, procedure and initials of tester. The test pressure for a hydrostatic test shall be 1.5 times the design pressure or 150 psi, whichever is greater, and for an air test shall be 1.1 times the design pressure or 150 psi, whichever is greater.

B. Test all sanitary sewer and vent piping in accordance with Section 712 of the UPC. Submit a signed statement to the Engineer stating testing dates, procedure and initials of tester.

C. Test all storm drainage piping in accordance with Section 1109 of the UPC. Submit a signed statement to the Engineer stating testing dates, procedure and initials of tester.

3.05 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Flush, clean and disinfect the potable water system in accordance with Section 609 of the UPC. Submit a signed statement to the Engineer stating disinfection dates, procedure and initials of tester.

3.06 INTERIOR TRENCH EXCAVATION AND BACKFILL

A. Excavation

1. Place all excavated material suitable for back-fill in an orderly manner, and in conformance with safety codes.
2. Dispose of all material not suitable for back filling.
3. Form bell holes so pipelines rest on continuous undisturbed soil. If larger rocks or boulders are encountered, remove them. If trenches are below specified grade, backfill to required depth with select granular materials free from debris, rock, or frozen material, and compact to proper grade before installing piping.

B. Location

1. Locate trenches to accommodate utilities shown on the drawings.
2. Excavate trench with adequate width to allow compaction equipment to be used at the sides of pipes.
3. Make trench side slopes conform to prevailing safety code requirements.

C. Dewatering

1. Perform whatever work is necessary to prevent the flow and accumulation of surface or ground water in the excavation.

D. Timing

1. Do not back-fill until underground mechanical system has been properly tested, inspected and approved.
2. Coordinate with the work of others, and complete all trench work in a timely manner.

E. Bedding

1. Place bedding material under, around, and over the pipe in lifts not exceeding six inch in depth.

2. Work material around pipe by hand methods, taking care to keep any oversize or sharp stones out of contact with the pipe, and to provide uniform support for the pipe.
3. Cover pipe with bedding material to building sub-grade or to a minimum 12 inch depth before adding other backfill.

F. Backfilling
1. Continue placing backfill material until trench is completely filled to building sub-grade, or as shown on the drawings.
2. Place backfill material in lifts not to exceed 12 inches in depth.

G. Compaction
1. Compact bedding material to at least 95 percent of maximum density, taking care not to damage the pipe.
2. Compact backfill under footings, slabs, and other structures to 95% of maximum density or more, if required by the Owner. Where 95% compaction cannot be achieved, fill remaining voids with concrete.
3. Compact other areas to preclude future settlement, or at least to 85% of maximum density.

H. Finishing
1. After completion of backfilling, dispose of excess material and smooth the surface to grade.
2. Do not allow heavy equipment to be used over backfilled work that does not have sufficient cover to prevent pipe damage.

I. Special Precautions
1. Avoid unauthorized and unnecessary excavations.
2. Minimize number and size of excavations under footings or bearing walls.
3. Support footings, foundations, and walls with timbers and jacks if there appears to be any possible change of damage, and keep such precautions in place until work is completed and sufficient backfill is in place to eliminate possible damage.
4. Avoid damage to all existing underground services, cables, conduit lines or foundations. Repair any existing underground work damaged at no additional cost to the Owner.
5. Protect excavated materials from moisture during the period prior to reinstallation.

END OF SECTION

SECTION 22 4000
PLUMBING FIXTURES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Water Closets.
B. Urinals.
C. Lavatories.
D. Sinks.
E. Wash Fountains.
F. Janitor, Service and Laundry Sinks.
G. Drinking Fountains.
H. Electric Water Coolers.
I. Washer Rough-In Boxes.
J. Ice Machine Rough-In Boxes.
K. Roof and Floor Drains.
L. Hose Bibbs.

1.02 RELATED WORK

A. Section 22 0500 - Common Work Results for Plumbing.
B. Section 22 0529 - Hangers and Supports for Plumbing Piping and Equipment.
C. Section 22 1000 - Plumbing Piping.
D. Section 22 3000 - Plumbing Equipment.

1.03 REFERENCES

A. ANSI/ASSE 1012 - Backflow Preventers with Immediate Atmospheric Vent.
B. ANSI/ASSE 1011 - Hose Connection Vacuum Breakers.
C. ANSI/ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types.
D. ANSI A112.21.1 - Floor Drains.
E. ANSI A112.21.2 - Roof Drains.

1.04 QUALITY ASSURANCE

A. Manufacturer: For each product specified, provide components by same manufacturer throughout.
B. Trim: By same manufacturer for each product specified throughout.

1.05 SUBMITTALS

A. Submit product data under provisions of Division 01.
B. Include sizes, rough-in requirements, service sizes, and finishes.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 01.
B. Include fixture trim exploded view and replacement parts lists.
C. Provide Manufacturer's parts list and maintenance information on specialties.

1.07 WARRANTY

A. Provide manufacturer's warranty under provisions of Division 01.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS –FIXTURES

A. Kohler.
B. American Standard.
C. Just.
D. Elkay.
E. Fiat.
F. Substitutions: Under provisions of Division 01.

2.02 ACCEPTABLE MANUFACTURERS - FLUSH VALVES

A. Sloan.
B. Zurn.
C. Delaney.
D. Substitutions: Under provisions of Division 01.

2.03 ACCEPTABLE MANUFACTURERS - WATER CLOSET SEATS

A. Kohler.
B. American Standard.
C. Bemis.
D. Substitutions: Under provisions of Division 01.

2.04 ACCEPTABLE MANUFACTURERS - FIXTURE CARRIERS

A. J.R. Smith.
B. Zurn.
C. Mifab.
D. Substitutions: Under provisions of Division 01.

2.05 ACCEPTABLE MANUFACTURERS -FIXTURE TRIM

A. Delta.
B. Moen.
C. Chicago.
D. Just.
E. Fiat.
F. Substitutions: Under provisions of Division 01.

2.06 ACCEPTABLE MANUFACTURERS - ELECTRIC WATER COOLERS

A. Haws.
B. Oasis.
C. Halsey Taylor.
D. Substitutions: Under provisions of Division 01.

2.07 PLUMBING FIXTURES

A. Refer to plumbing schedules on mechanical drawings for basis of design fixture model numbers. Provide specified model and accessories or equivalent product from the acceptable manufacturers listed.

2.08 P-TRAP

A. P-trap shall be chrome plated cast brass body, with 17 gauge seamless tubular wall bend, cast brass slip nuts. Reducing washers shall be used with reducing cast brass nut**,** chrome plated brass escutcheons.

2.09 ANGLE STOPS AND SUPPLY RISERS

A. Quarter-turn lead free brass ball valve with convertible loose key handle, chrome plated copper, or braided stainless supply risers and chrome plated brass escutcheons.

2.10 ACCEPTABLE MANUFACTURERS - ROOF DRAINS, FLOOR DRAINS, FLOOR SINKS, DRAINS, INTERCEPTORS AND ACCESSORIES

A. J.R. Smith.

B. Zurn.

C. Josam.

D. Mifab.

E. Substitutions: Under provisions of Division 01.

2.11 FLOOR DRAINS

A. Floor Drains: ANSI A112.21.1; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer and trap primer connection; Model 2005-A manufactured by J.R. Smith.

2.12 DOWNSPOUT NOZZLE

A. Bronze round with flange; Model 1770 manufactured by J.R. Smith.

2.13 ACCEPTABLE MANUFACTURERS - HOSE BIBBS/HYDRANTS

A. Woodford.

B. J.R. Smith.

C. Zurn.

D. Josam.

E. Mifab.

F. Substitutions: Under provisions of Division 01.

2.14 HOSE BIBBS/HYDRANTS

A. Exterior Hose Bibb (HB-1): ANSI/ASSE 1019; non-freeze, self-draining type with lockable recessed box hose thread spout, removable key, and vacuum breaker in conformance with ANSI/ASSE 1011; Model 65 manufactured by Woodford.

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate cutting of floor construction to receive drains to required invert elevations.

3.02 INSPECTION

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

B. Verify adjacent construction is ready to receive rough-in work of this Section.

3.03 INSTALLATION

A. Install each fixture with removable p-trap for servicing and cleaning.

B. Provide angle stop and supply risers at each fixture. Provide chrome plated escutcheons for both hot and cold water supplies and waste piping.

C. Install components level and plumb

D. Install and secure fixtures in place with wall or floor carriers, supports as per the manufacturers instructions.

E. Solidly attach floor mounted water closets to toilet flange with non-corroding t-bolts, washers and acorn nuts.

F. Seal fixtures to wall and floor surfaces with silicone sealant, color to match fixture.

G. Mount fixtures above finished floor in accordance with Architectural.

H. Install specialties in accordance with manufacturer's instructions to permit intended performance.

I. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

J. Encase exterior cleanouts in concrete flush with grade.

K. Install water hammer arrestors complete with accessible isolation valve.

3.04 ADJUSTING AND CLEANING

A. Adjust stops, valves or flow control valves for intended water flow rate to fixtures without splashing, noise, or overflow.

B. Remove and clean all aerators and filters from faucets and other plumbing fixtures after the domestic water system has been tested, flushed and disinfected as per Section 22 10 00.

C. At completion remove all visible stickers and tags not intended to be left in place, thoroughly clean all surfaces of plumbing fixtures.

END OF SECTION

SECTION 23 0500
COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.01 SCOPE

A. All provisions of the Contract including the General and Supplementary Conditions and the General Requirements apply to this work.

1.02 WORK INCLUDED

A. The work to be included in these and all other mechanical subsections shall consist of providing, installing, adjusting and setting into proper operation complete and workable systems for all items shown on the drawings, described in the specifications or reasonably implied. This shall include the planning and supervision to coordinate the work with other crafts and to maintain a proper time schedule for delivery of materials and installation of the work.

B. Division 01 of the specifications is to be specifically included as well as all related drawings.

1.03 RELATED WORK

A. Related Work Specified Elsewhere:

1. Fire Suppression Specifications: Division 21.
2. Plumbing Specifications: Division 22.
3. Electrical Specifications: Division 26.
4. Motors and Connections: Division 26.
5. Starters and Disconnects: Division 26.

B. Unless otherwise indicated on the electrical drawings or the electrical schedules, provide all mechanical equipment motors, motor starters, thermal overload switches, control relays, time clocks, thermostats, motor operated valves, float controls, damper motors, electric switches, electrical components, wiring and any other miscellaneous Division 23 controls. Disconnect switches are included in the electrical work, unless specifically called out on mechanical plans.

C. Carefully coordinate all work with the electrical work shown and specified elsewhere.

1.04 REFERENCED CODES - LATEST ADOPTED EDITION

A. NFPA 13 Installation of Sprinkler Systems.

B. NFPA 70 National Electrical Code (NEC).

C. IMC International Mechanical Code.

D. UPC Uniform Plumbing Code.

E. IECC International Energy Conservation Code.

F. IFC International Fire Code.

G. IFGC International Fuel Gas Code.

H. IBC International Building Code.

1.05 PROJECT RECORD DRAWINGS

A. In addition to other requirements of Division 01, mark up a clean set of drawings as the work progresses to show the dimensioned location and routing of all mechanical work which will become permanently concealed. Show routing of work in concealed blind spaces within the building. Show exact dimensions of buried piping off of columns or exterior walls.

B. Maintain record documents at job site in a clean, dry and legible condition. Keep record documents available for inspection by the Project Manager.

C. Show the location of all valves and their appropriate tag identification.

D. At completion of project, deliver these drawings to the [Owner]Architect and obtain a written receipt.

1.06 SUBMITTALS

A. See General Conditions and the General Requirements in Division 01 regarding submittals.

B. Submit by specification section complete and all at one time; partial submittals will not be considered. Submittals shall be provided in electronic PDF Format. The data in the electronic file shall be arranged and indexed under basic categories in order of the Specification Sections. An index shall be included with bookmarks and identifying tabs between sections and references to sections of specifications.

C. Catalog sheets shall be complete and the item or model to be used shall be clearly marked, and identified as to which item in the specifications or on the drawings is being submitted and with drawing fixture number where applicable.

D. Only submit on items specifically required by each specification section. If a submittal has not been requested, it will not be reviewed.

1.07 OPERATING AND MAINTENANCE MANUALS

A. See General Conditions and the General Requirements in Division 01 regarding Operating and Maintenance Manuals.

B. Submit maintenance manuals to the Engineer covering all equipment, fixtures, devices, etc. installed by the Contractor.

C. The operation and maintenance manuals shall be submitted by specification section complete and all at one time; partial operations and maintenance manual submittals will not be considered. The Operation and maintenance manuals shall be provided in electronic PDF Format. The data in the electronic file shall be arranged and indexed under basic categories. An index shall be included with bookmarks and identifying tabs between sections and references to sections of specifications. The manual shall contain, but not limited to, the following types of information:

1. Cover sheet with name, address, telephone number of Contractor, General Contractor and major equipment suppliers.
2. Catalog cuts of all equipment, fixtures, etc. installed (Marked to identify the specific items used).
3. Manufacturer's maintenance and overhaul instruction booklets including exploded views.
4. Identification numbers of all parts and nearest sources for obtaining parts and services.
5. Reduced scale drawings of the control system and a verbal description of how these controls operate.
6. A copy of the final test and balance report.
7. A copy of valve schedule and reduced scale drawings showing valve locations.
8. Written summary of instructions to Owner.
9. All manufacturers' warranties and guarantees.
10. Contractors Warranty Letter.

D. A periodic maintenance form that includes all of the equipment shall be provided with the maintenance manual. The form shall list each piece of equipment and how often maintenance is required (daily, weekly, monthly, annually). Opposite each task shall be squares for check-off for a full year (initials) to verify that the tasks are being done.

1.08 HANDLING

A. See General Conditions and the General Requirements in Division 01 regarding material handling.

B. Deliver packaged materials to job site in unbroken packages with manufacturer's label, and store to facilitate inspection and installation sequence. All items must be labeled and identified as to make, size and quality.

1.09 SUBSTITUTIONS

A. See General Conditions and the General Requirements in Division 01 for substitution request procedures.

B. In accordance with the General Conditions and the General Requirements in Division 01, Substitution and Product Options, all substitute items must fit in the available space, and be of equal or better quality including efficiency performance, size, and weight, and must be compatible with existing equipment. The [Owner]Architect/Engineer shall be the final authority regarding acceptability of substitutes.

1.10 DIMENSIONS

A. Before ordering any material or doing any work, the Contractor shall verify all dimensions, including elevations, and shall be responsible for the correctness of the same. No extra charge or compensation will be allowed on account of differences between actual dimensions and measurements indicated on the drawings.

B. Any differences, which may be found, shall be submitted to the [Owner]Architect/Engineer for consideration before proceeding with the work.

1.11 MANUFACTURER'S DIRECTIONS

A. All manufactured articles shall be applied, installed and handled as recommended by the manufacturer, unless specifically called out otherwise. Advise the Architect/Engineer of any such conflicts before installation.

1.12 PERMITS, FEES, ETC.

A. The Contractor under each Division of these specifications shall arrange for a permit from the local authority. The Contractor shall pay for any inspection fees or other fees and charges required by ordinance, law, codes and these specifications.

1.13 TESTING

A. The Contractor under each section shall perform the various tests as specified and required by the Architect, Engineer and as required by applicable code, the State and local authorities. The Contractor shall furnish all labor, fuel and materials necessary for making tests.

1.14 TERMINOLOGY

A. Whenever the words "furnish", "provide", "furnish and install", "provide and install", and/or similar phrases occur, it is the intent that the materials and equipment described be furnished, installed and connected under this Division of the Specifications, complete for operation unless specifically noted to the contrary.

B. Where a material is described in detail, listed by catalogue number or otherwise called for, it shall be the Contractor's responsibility to furnish and install the material.

C. The use of the word "shall" conveys a mandatory condition to the contract.

D. "This section" refers to the section in which the statement occurs.

E. "The project" includes all work in progress during the construction period.

F. In describing the various items of equipment, in general, each item will be described singularly, even though there may be a multiplicity of identical or similar items.

1.15 SCHEDULE OF WORK

A. The work under the various sections must be expedited and close coordination will be required in executing the work. The various trades shall perform their portion of the work at such times as directed so as to meeting scheduled completion dates, and to avoid delaying any other trade. The Architect will set up completion dates. Each contractor shall cooperate in

establishing these times and locations and shall process work so as to ensure the proper execution of it.

1.16 COOPERATION AND CLEANING UP

A. The Contractor for the work under each section of the specifications shall coordinate the Contractors work with the work described in all other sections of the specifications to the end that, as a whole, the job shall be a finished one of its kind, and shall carry on the work in such a manner that none of the work under any section of these specifications shall be handicapped, hindered or delayed at any time.

B. At all times during the progress of the work, the Contractor shall keep the premises clean and free of unnecessary materials and debris. The Contractor shall, on direction at any time from the Architect, clear any designated areas or area of materials and debris. On completion of any portion of the work, the Contractor shall remove from the premises all tools and machinery and all debris occasioned by the work, leaving the premises free of all obstructions and hindrances.

1.17 WARRANTY

A. Unless a longer warranty is hereinafter called for, all work, materials and equipment items shall be warrantied for a period of one year after acceptance by the Owner. All defects in labor and materials occurring during this period, as determined by the Architect/Engineer, shall be repaired and/or replaced to the complete satisfaction of the Architect/Engineer. Guarantee shall be in accordance with Division 01.

1.18 COMPLETION REQUIREMENTS

A. In accordance with the General Conditions and the General Requirements in Division 01, Project Closeout; before acceptance and final payment, the Contractor shall furnish:

1. Accurate project record drawings, shown in red ink on prints, showing all changes from the original plans made during installation of the work.
2. Contractors One Year Warranty.
3. All Manufacturers' Guarantees.
4. Test and Balance Reports.
5. Operation and Maintenance Manuals.

B. The accompanying plans do not indicate completely the existing plumbing and mechanical installations. The bidders for the work under these sections of the specifications shall inspect the existing installations and thoroughly acquaint themselves with conditions to be met and the work to be accomplished in removing and modifying the existing work, and in installing the new work in the present building and underground serving to and from that structure. Failure to comply with this shall not constitute grounds for any additional payments in connection with removing or modifying any part of the existing installations and/or installing any new work.

1.19 RELOCATION OF EXISTING INSTALLATIONS

A. There are portions of the existing plumbing, mechanical and electrical systems, which shall remain in use to serve the finished building in conjunction with the indicated new installations. By actual examination at the site, each bidder shall determine those portions of the remaining present installations, which must be relocated to avoid interference with the installations of new work of the Contractors particular trade and that of all other trades. All such existing installations, which interfere with new installations, shall be relocated by the Contractor.

1.20 SALVAGE MATERIALS

A. The Contractor shall remove existing equipment, duct, grilles and other items associated with the mechanical systems where no longer required for the project. Where such items are exposed to view or uncovered by any cutting or removal of general construction and has no continuing function (as determined by the Architect/Engineer), they shall be removed.

B. All items or materials removed from the project shall be made available for the Owner's inspection. The Owner retains the option to claim any item or material. Contractor shall deliver

any claimed item or material in good condition to the place designated by the Owner. All items not claimed become the property of the contractor and shall be removed from the site.

PART 2 PRODUCTS

2.01 MATERIALS

A. All equipment shall be regularly cataloged items of the manufacturer and shall be supplied as a complete unit in accordance with the manufacturer's standard specifications along with any optional items required for proper installation unless otherwise noted. Maintain manufacturer's identification, model number, etc. on all equipment at all times.

B. Where more than one of an item is to be provided, all of the items shall be identical manufacture, make, model, color, etc.

2.02 RESTRICTED MATERIALS

A. No materials containing asbestos in any form shall be allowed.

B. No solder or flux containing lead shall be used on this project.

C. Where materials or equipment provided by this Contractor are found to contain restricted materials, such items shall be removed and replaced with non-restricted materials items. Entire cost of restricted materials removal and disposal and cost of installing new items shall be the responsibility of the Contractor for those restricted materials containing items installed by the Contractor.

2.03 ELECTRICAL MOTORS

A. Motors: Furnish electric motors designed for the specific application and duty applied, and to deliver rated horsepower without exceeding temperature ratings when operated on power systems with a combined variation in voltage and frequency not more than + 10% of rated voltage. Motors for pumps and fans shall be selected to be non-overloading.

B. Verify from the drawings and specifications the available electrical supply characteristics and furnish equipment that will perform satisfactorily under the conditions shown and specified.

C. All motors for use with equipment with variable frequency drives shall be inverter ready motors. Verify compatibility and sizing of motor with variable frequency drive.

D. Size motors for 1.15 service factor and not to exceed 40º C temperature rise above ambient.

E. Fractional horsepower motors to have self-resetting thermal overload switch.

F. Provide Premium Efficiency, motors for all three phase motors one horsepower and larger. Standard efficiency motors will not be acceptable.

PART 3 EXECUTION

3.01 DRAWINGS

A. The drawings are partly diagrammatic, not necessarily showing all offsets or exact locations of piping and ducts, unless specifically dimensioned. The contractor shall provide all materials and labor necessary for a complete and operable system. Complete details of the building which affect the mechanical installation may not be shown. For additional details, see Architectural, [Structural], [Civil] and Electrical Drawings. Coordinate work under this section with that of all related trades.

3.02 INSTALLATION

A. All work shall comply with the latest adopted applicable codes and ordinances including, but not limited to, the IMC, UPC, IBC, NFPA, IECC, IFGC and IFC Standards; all local and state amendments to all codes and standards.

B. Obtain and pay for all inspection fees, connection charges and permits as a part of the Contract.

C. Compliance with codes and ordinances shall be at the Contractor's expense.

3.03 MEASUREMENTS

A. Verify all measurements on the job site.

B. Locate all equipment and fixtures on the centers of walls, openings, spaces, etc., unless specified otherwise.

C. Check all piping, ducts, etc. to clear openings.

D. Rough-in dimensions shall be per manufacturer's recommendations and in compliance with current ADA and ANSI 117.1 standards.

3.04 OPERATING INSTRUCTIONS

A. Before the facility is turned over to the Owner, instruct the Owner or Owner's personnel in the operation, care and maintenance of all systems and equipment under the jurisdiction of the Mechanical Division. These instructions shall also be included in a written summary in the Operating Maintenance Manuals.

B. The Operation and Maintenance Manuals shall be utilized for the basis of the instruction. Provide a minimum of eight hours of on site instruction to the owner designated personnel.

C. When required by individual specification sections provide additional training on HVAC systems and equipment as indicated in the respective specification section.

3.05 SYSTEM ADJUSTING

A. Each part of each system shall be adjusted and readjusted as necessary to ensure proper functioning of all controls, proper air distribution, elimination of drafts, noise and vibration.

B. Balance air and water systems for volume quantities shown and as required to ensure even temperature and the elimination of drafts. Balancing shall be done by a qualified firm acceptable to the Engineer. Provide balancing log to the Engineer before substantial completion.

3.06 CUTTING, FITTING, REPAIRING, PATCHING AND FINISHING

A. Arrange and pay for all cutting, fitting, repairing, patching and finishing of work by other trades where it is necessary to disturb such work to permit installation of mechanical work. Perform work only with craftsmen skilled in their respective trades.

B. Avoid cutting, insofar as possible, by setting sleeves, frames, etc. and by requesting openings in advance. Assist other trades in securing correct location and placement of rough-frames, sleeves, openings, etc. for ducts and piping.

C. Cut all holes neatly and as small as possible to admit work. Include cutting where sleeves or openings have been omitted. Perform cutting in a manner so as not to weaken walls, partitions or floors. Drill holes required to be cut in floors without breaking out around holes.

3.07 PAINTING

A. Perform all of the following painting in accordance with provisions of Division 09 with colors as selected by the Architect. Provide the following items as a part of mechanical work:

1. Factory applied prime and finish coats on mechanical equipment.
2. Factory applied prime and finish coat on all air registers, grilles and diffusers, unless otherwise specified.
3. Factory applied prime coat on access doors.
4. Pipe identification where specified.

B. If factory finish on any equipment furnished is damaged in shipment or during construction, refinish to equal original factory finish.

3.08 INSTALLATION OF EQUIPMENT

A. Unless otherwise indicated, mount all equipment and install in accordance with manufacturer's recommendations and approved submittals.

B. Maintain manufacture recommended minimum clearances for access and maintenance.

C. Where equipment is to be anchored to structure, furnish and locate necessary anchoring and vibration isolation devices.

D. Furnish all structural steel, such as angles, channels, beams, etc. required to support all piping, ductwork, equipment and accessories installed under this Division. Use structural supports suitable for equipment specified or as indicated. In all cases, support design will be based upon data contained in manufacturer's catalog. Provide Seismic Restraint in Accordance with Specification Section 23 0548.

E. Openings: Arrange for necessary openings in buildings to allow for admittance and reasonable maintenance or replacement of all equipment furnished under this Contract.

F. Access Doors: Provide as necessary for reasonable maintenance of all equipment valves, controls, etc. Coordinate with general contractor for location and finish. For additional details, see Architectural and Electrical Drawings. Coordinate work under this section with that of all related trades.

END OF SECTION

SECTION 23 0505

SELECTIVE DEMOLITION FOR HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

PART 1 GENERAL

1.01 DESCRIPTION

A. Work specified in this Section includes the demolition, removal, and disposition of certain mechanical work.

B. Drawings, the provisions of the Agreement, and Administrative Specification Sections apply to all work of this Section.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.01 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of conditions as satisfactory.

3.02 DEMOLITION, REMOVAL AND DISPOSITION

A. Saw-cut concrete as shown or required.

B. Piping, Ductwork, And Equipment To Be Removed: Remove all piping, ductwork, and equipment as indicated on the Drawings.

C. Piping Removed: Drawings do not show all existing piping which is to be removed. Unless indicated otherwise, where existing equipment has been removed, or its use replaced by new equipment, remove connecting piping back to the branch in the main so that there will be no dead ends or unused pipe lines in mechanical spaces at completion.

D. Piping, Ductwork, Equipment, Control Wiring and Tubing To Be Removed: Remove all piping, ductwork, equipment, control wiring and tubing as indicated. Drawings do not show all existing piping, ductwork, equipment, control wiring and tubing which is to be removed. Unless indicated otherwise, where existing equipment has been removed, or its use replaced by new equipment, remove connecting piping and ductwork back to the branch in the main so that there will be no dead ends or unused pipe lines in mechanical spaces at completion.

E. Materials To Owner: All items or materials removed from the project shall be made available for the Owner's inspection. The Owner retains the option to claim any item or material. The Contractor shall deliver any claimed item or material in good condition to the place designated by the Owner. All items not claimed become the property of the Contractor and shall be removed from the site by the Contractor.

F. Materials To Owner: As indicated on the Drawings.

G. Re-use Of Materials: Only were indicated on Drawings.

H. Materials To Contractor: Materials shown or specified to be removed, other than the materials indicated to be turned over to Owner.

I. Protect any active piping and/or wiring encountered; remove, plug or cap utilities to be abandoned. Notify the Architect of utilities encountered whose service is not known.

J. Debris Removal: Existing materials removed and not reinstalled or turned over to the Owner shall be immediately removed from the site and disposed of by the Contractor.

K. Repairs: Any portion of the facility damaged, cut back or made inoperable by this Contractor shall be repaired with similar materials as the existing structure and/or damaged item as instructed by the Architect.

END OF SECTION

SECTION 23 0519

METERS AND GAUGES FOR HVAC PIPING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Pressure Gauges.
2. Pressure Gauge Taps.
3. Thermometers.

B. PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THE SECTION

1. Section 23 2113 - Hydronic Piping: Installation of thermometer wells, pressure gauge tappings.
2. Section 23 3100 - HVAC Ducts and Casings: Installation of thermometers and static pressure gauges.

1.02 RELATED WORK

A. Section 23 0500 - Common Work Results for HVAC.

B. Section 23 0993 - Sequence of Operations for HVAC Controls.

C. Section 23 2116 - Hydronic Specialties.

D. Section 23 3300 - Air Duct Accessories.

1.03 REFERENCE STANDARDS

A. ASTM E1 - Specification for ASTM Thermometers.

B. ASTM E77 - Verification and Calibration of Liquid-in-Glass Thermometers.

C. ASTM E1 - Standard Specification for ASTM Thermometers.

1.04 SUBMITTALS

A. Product Data: Submit engineering data for each component, include list which indicates use, operating range, total range and location for manufactured components.

B. Submit manufacturer's installation instructions under provisions of Division 01.

1.05 CLOSEOUT SUBMITTALS

A. Project Record Documents: Accurately record actual location of all instrumentation and gauges.

B. Operation and Maintenance Data.

PART 2 PRODUCTS

2.01 INSTRUMENTATION FOR HVAC

A. Manufacturers:

1. Dwyer
2. Trerice.
3. Weiss.
4. Marshaltown.
5. Ashcroft.
6. Substitutions: In accordance with Division 01.

2.02 PRESSURE GAUGES

A. 4-1/2 inch diameter cast aluminum case, phosphor bronze bourbon tube, rotary bronze movement, brass socket, [with silicone fluid dampening] black figures on white background, one

percent mid-scale accuracy, scale calibrated in psi. Model 600CB as manufactured by Trerice or approved equal.

2.03 PRESSURE GAUGE TAPS

A. Gauge Isolation Valve: Lever handle ball valve, forged brass body, chrome plated brass ball, viton o-rings for maximum 150 psig. Model Mini T-82-M as manufactured by Jomar or equal.

B. Needle Valve: Brass for maximum 150 psig. Model 735 as manufactured by Trerice or equal.

C. Pulsation Damper: Pressure snubber, brass with 1/4 inch connections. Series 870 as manufactured by Trerice.

D. Coil Siphon: Brass, ¼", male pipe thread each end. 885 series.

2.04 STEM TYPE THERMOMETERS

A. Analog Thermometers: 9 inch scale, universal adjustable angle, organic spirits, lens front tube, cast aluminum case with blue/black metallic finish and clear Lexan window, extended brass stem, cast aluminum adjustable joint with positive locking device, 2 percent of scale accuracy to ASTM E77, scale calibrated in both degrees F and degrees C, range per schedule. BX9 series as manufactured by Trerice or approved equal.

B. Solar Digital Thermometers shall be adjustable angle type, 7" aluminum with epoxy finished. LCD display digits, switchable between F/C. Thermometer shall require no batteries or external power source and, and have a resolution of 1/10°. Thermometer accuracy shall be 1% of reading or 1º, whichever is greater. Temperature range shall per schedule. SX9 series as manufactured by Trerice or approved equal.

2.05 LIQUID LEVEL SWITCH GAUGE

A. Combination liquid level gauge and low-limit switch. Unit includes float switch and indicating dial and low-level contact. Cast aluminum poly-urethane coated case, brass float polycarbonate lens. Murphy L150 or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide two pressure gauges per pump, installing taps on suction and discharge of pump. Pipe to gauge with isolation valve to each tapping.

C. Install thermometers in piping systems in sockets in short couplings Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Select bulb length to reach centerline of pipe. Coat thermometer stem with conductive compound.

D. Install thermometer sockets and flanges adjacent to controls system thermostat, transmitter, or sensors. Refer to Section 23 0923.

E. Provide instruments with scale ranges selected according to service with largest appropriate scale.

F. Install gauges and thermometers in locations where they are easily read from normal operating level.

G. Install solar thermometers in locations where solar cells are activated by fixed interior lighting.

3.02 PRESSURE GAUGE SCHEDULE

LOCATION	SCALE RANGE
Pumps less than 40' TDH	0 - 30 PSIG
Pumps more than 40' TDH	0 - 60 PSIG
Glycol water system	0 - 30 PSIG
Others	As applicable

3.03 THERMOMETER SCHEDULE

LOCATION	SCALE RANGE
Glycol water system	0 - 200° F
Domestic hot water supply and recirc.	0 - 200° F
Others	As applicable

3.04 STATIC PRESSURE AND FILTER GAUGE SCHEDULE

LOCATION	SCALE RANGE
Filter banks	0 - 1 IN H_2O

END OF SECTION

SECTION 23 0529

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Pipe, Duct, and Equipment Hangers, Supports, and Associated Anchors.

B. Hanger Rods.

C. Inserts.

D. Equipment Curbs.

E. Equipment Bases and Supports.

F. Formed Steel Channel.

G. Sleeves and Seals.

1.02 PRODUCTS FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Furnish hanger and support sleeves for placement into formwork.

B. Placement of equipment roof support curbs.

1.03 RELATED WORK

A. Division 07 - Fire Stopping: Joint Seals for Piping and Duct Penetration of Fire Rated Assemblies.

B. Division 09 - Painting.

C. Section 23 0500 - Common Work Results for HVAC.

D. Section 23 0548 - Vibration and Seismic Controls for HVAC.

E. Section 23 0700 - HVAC Insulation.

F. Section 23 3116 - Hydronic Piping.

1.04 REFERENCES

A. ASME B31.1 - Power Piping.

B. ASME B31.2 - Fuel Gas Piping.

C. ASME B31.5 - Refrigeration Piping.

D. ASME B31.9 - Building Services Piping.

E. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.

F. ASTM E119 - Method for Fire Tests of Building Construction and Materials.

G. ASTM A 194 - Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure and/or High Temperature Service.

H. ASTM A 307 - Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.

I. ASTM A 575 - Steel Bars, Carbon, Merchant Quality, M-Grades.

J. ASTM A 653 - Steel Sheet, Zinc-Coated (Galvanized).

K. ASTM A 675 - Steel Bars, Carbon, Hot-Wrought, Special Quality.

L. ASTM E814 - Test Method of Fire Tests of Through Penetration Firestops.

M. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.

N. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.

O. ANSI/MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.

P. ANSI/MSS SP69 - Pipe Hangers and Supports - Selection and Application.

Q. AWS D1.1 - Structural Welding Code - Steel.

R. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.

S. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.

T. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

U. UL 1479 - Fire Tests of Penetration Firestops.

1.05 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: Provide manufacturers catalog data including load capacity.

C. Manufacturer's Installation Instructions: Indicate special procedures and assembly of components.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with AWS D1.1 for welding hanger and support attachments to building structure.

1.07 DELIVERY, STORAGE AND HANDLING

A. Delivery, storage and handle products under provisions of the Supplementary Conditions.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

C. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

PART 2 PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

A. Acceptable Manufacturers:

1. Anvil.
2. PHD Manufacturing, Inc.
3. Michigan Hanger Company.
4. B-Line Systems, Inc.

B. Hydronic Piping:

1. Conform to ANSI/MSS SP58.
2. Hangers for Pipe Sizes ½ to 1-½ Inch: Malleable iron, adjustable swivel, split ring for steel pipe, copper swivel for copper pipe.
3. Hangers for Hot Pipe Sizes 2 to 4 Inches and Cold Pipe Sizes 2 Inches and Larger: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.
5. Multiple or Trapeze Hangers: Steel channels or strut with hanger rods. Cast iron roll and stand for hot pipe sizes 6 inches and over.
6. Wall Support for Pipe Sizes to 3 Inches: Strut triangular bracket with pipe clamp and cushion insulator.
7. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp; adjustable steel yoke and cast iron roll for hot pipe sizes 6 inches and over.
8. Vertical Support: Steel riser clamp.
9. Floor Support for Pipe Sizes to 4 Inches and All Cold Pipe Sizes: Cast iron adjustable pipe saddle, locknut nipple, floor flange or steel support.
10. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

11. Copper Pipe Support: Carbon steel ring, adjustable, copper plated with felt isolation pad or all copper ring or swivel.

C. Refrigerant Piping:

1. Conform to ANSI/MSS SP58.
2. Hangers for Pipe Sizes ½ to 1-½ Inch: Malleable iron or carbon steel, adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
7. Vertical Support: Steel riser clamp.
8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated with neoprene isolation pad.

D. Shield for Insulated Piping 1-½ Inches and Smaller: 18 gauge galvanized steel shield over insulation in 180º segments, minimum 12 inches long at pipe support.

E. Shield for Insulated Piping 2 Inches and Larger: Hard block, calcium silicate insert, 180° segment, 12 inch minimum length, block thickness same as insulation thickness, flame resistant vapor barrier covering and 18 gauge galvanized shield.

F. Shields for Vertical Copper Pipe Risers: Galvanized steel pipe.

G. Design hangers to allow installation without disengagement of supported pipe.

H. Copper Plating: All hanger elements in metal-to-metal contact with copper pipe, except hanger rings with factory-applied 1/16 inch minimum thick plastic or tape cushion strip over all contact surfaces.

I. Strut Type Pipe Hanging System: Unistrut P-1000 series; framing members shall be No. 12 gage formed steel channels, 1-5/8 inch square, conforming to ASTM A653 GR33, one side of channel shall have a continuous slot with inturned lips; framing nut with grooves and spring 1/2 inch size, conforming to ASTM 675 GR60; screws conforming to ASTM A 307; fittings conforming to ASTM A 575; all parts enamel painted or electro-galvanized.

J. Fixed Strut Rooftop Pipe Supports: Foam bottom, UV stabilized thermoplastic base, with hot dip galvanized strut support. Size as required for pipe. Minimum 6" Height, utilize adjustable height as required. Erico Caddy Pyramid ST or approved equal.

2.02 HANGER RODS

A. Steel Hanger Rods: Mild steel, threaded both ends, threaded one end, or continuous threaded.

2.03 ANCHOR BOLTS

A. Anchor (Expansion) Bolts: Shall be carbon steel to ASTM A 307; nut shall conform to ASTM A194; shall be drilled-in type. Design values for shear and tension shall be not more than 80 percent of the allowable load.

2.04 INSERTS

A. Inserts: Malleable iron case of [galvanized] steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.05 FLASHING

A. Metal Flashing: 26 gauge minimum galvanized steel.

B. Metal Counter Flashing: 22 gauge minimum galvanized steel.

C. Lead Flashing: 5 lb./sq. ft. sheet lead for waterproofing; one lb./sq. ft. sheet lead for soundproofing.

D. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.

E. Caps: Steel, 22 gauge minimum; 16 gauge at fire resistant elements.

2.06 EQUIPMENT CURBS

A. Fabricate curbs of wood, unless specifically called out otherwise.

2.07 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors: Form with 18 gauge galvanized steel for 4 inch diameter and larger, 22 gauge up to 3" diameter.

B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Form with steel pipe or 18 gauge galvanized steel for 4 inch diameter and larger, 22 gauge up to 3" diameter.

C. Fire Stopping Insulation: Mineral fiber type, non- combustible.

D. Caulk: Fire stop sealant in compliance with ASTM E814, UL 1479 and Division 07.

2.08 FORMED STEEL CHANNEL

A. Manufacturers:

1. Allied Tube & Conduit Corp.
2. B-Line Systems.
3. Midland Ross Corporation, Electrical Products Division
4. Unistrut Corp.
5. Subsitutions under provisions of Division 01.

B. Product Description: Galvanized 12 gauge (2.8 mm) thick steel. With holes 1-1/2 inches (38 mm) on center.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install pipe hangers in accordance with ANSI/MSS-SP-69.

3.02 PIPE HANGERS AND SUPPORTS

A. Support piping as follows:

Pipe Size	Max. Hanger Spacing	Hanger Diameter
½ to 1-¼ inch	6'-0"	3/8"
1-½ to 2 inch	10'-0"	3/8"
2-½ to 3 inch	10'-0"	½"
4 to 6 inch	10'-0"	5/8"
8 to 12 inch	14'-0"	7/8"
14 inch and Over	20'-0"	1"
Polypropylene (PP) Piping 1" or smaller	32" [a]	3/8"
Polypropylene (PP) Piping 1-1/4" or 2"	4'-0" [a]	3/8"
Polypropylene (PP) Piping 2-½ to 3 inch	4'-0" [a]	1/2"
Polypropylene (PP) Piping 4 to 6 inch	4'-0" [a]	5/8"

Notes:

[a] See piping manufacturer installation instructions for additional requirements.

B. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.

C. Place a hanger within 12 inches of each horizontal elbow.

D. Use hangers with 1-½ inch minimum vertical adjustment.

E. Support vertical piping at every floor.

F. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

G. Support riser piping independently of connected horizontal piping.

H. Design hangers for pipe movement without disengagement of supported pipe.

I. Provide copper plated hangers and supports for copper piping.

J. Prime coat exposed steel hangers and supports. Hangers and supports located in crawlspace, pipe shafts, and suspended ceiling spaces are not considered exposed.

K. Support all piping on flat roofs using rooftop pipe supports. Install per manufacturer's instructions. Install piping minimum 6" above roof surface.

3.03 INSERTS

A. Provide inserts for placement in concrete formwork.

B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

D. Where concrete slabs form finished ceiling, provide inserts to be flush with slab surface.

E. Where inserts are omitted, drill through concrete slab from below and provide thru-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

3.04 EQUIPMENT BASES AND SUPPORTS

A. Provide equipment bases of where shown on plans and where required by equipment manufacturer installation instructions.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct support of steel members. Brace and fasten with flanges bolted to structure.

D. Provide housekeeping pads of concrete, minimum 4 [6] inches thick and extending 6 inches beyond supported equipment anchors. [Refer to Division 03].

E. Provide rigid anchors for pipes after vibration isolation components are installed.

F. Anchor (Expansion) Bolts: Install anchor bolts for all mechanical equipment, piping and ductwork as required. Tightly fit and clamp base-supported equipment anchor bolts at all equipment support points. Provide locknuts where equipment, piping, and ductwork is hung. Install anchor (expansion) bolts in holes drilled in concrete where necessary to hang piping or ductwork, or to anchor stationary equipment from existing concrete slabs.

3.05 FLASHING

A. Provide flexible flashing and metal counter-flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Provide curbs for mechanical roof installations 24 inches minimum high above roofing surface. Flexible sheet flash and counter-flash with sheet metal; seal watertight.

C. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.06 SLEEVES

A. Set sleeves in position in construction. Provide reinforcing around sleeves.

B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

C. Extend sleeves through floors one inch above finished floor level. Pack and caulk sleeves full depth and provide floor plate.

D. Where piping or ductwork penetrates floor, ceiling, or wall, install sleeve, close off space between pipe or duct and adjacent work with fire stopping insulation and caulk seal. Use fire rated caulking where area or occupancy separation walls are penetrated. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

E. Install chrome plated steel escutcheons at finished surfaces.

3.07 INSTALLATION OF EQUIPMENT

A. Unless otherwise indicated, mount all equipment and install in accordance with manufacturer's recommendations and approved submittals.

B. Maintain manufacture recommended minimum clearances for access and maintenance.

C. Where equipment is to be anchored to structure, furnish and locate necessary anchoring and vibration isolation devices.

D. Furnish all structural steel, such as angles, channels, beams, etc. required to support all piping, ductwork, equipment and accessories installed under this Division. Use structural supports suitable for equipment specified or as indicated. In all cases, support design will be based upon data contained in manufacturer's catalog.

E. Openings: Arrange for necessary openings in buildings to allow for admittance and reasonable maintenance or replacement of all equipment furnished under this Contract.

F. Access Doors: Provide as necessary for reasonable maintenance of all equipment valves, controls, etc.

END OF SECTION

SECTION 23 0548

VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section provides minimum acceptance requirements for vibration isolation and seismic/wind restraints for all HVAC piping, ductwork equipment and piping.

1.02 GENERAL

A. The requirements for seismic protection measures to be applied to plumbing equipment and systems specified herein are in addition to any other items called for in other sections of these specifications.

1.03 HVAC PIPING, DUCTWORK AND EQUIPMENT

A. This section provides minimum acceptance requirements for vibration isolation and seismic/wind restraints for all HVAC equipment, piping and ductwork. HVAC equipment shall include all items on mechanical plans or in other sections of the Division 23 specifications. Equipment shall include but not be limited to:

1. Air Separators.
2. Expansion tanks
3. Glycol Tanks.
4. Pumps.
5. Hydronic Piping.
6. Natural Gas Piping.
7. Ductwork.
8. Unit Heaters.
9. Cabinet Unit Heaters.
10. Roof top units.
11. Heat Exchangers.
12. Fans.
13. Heating Coils.
14. Control Panels.

1.04 RELATED WORK SPECIFIED ELSEWHERE

A. Vibration isolation and seismic/wind restraints for plumbing systems are specified elsewhere in Division 22.

B. Vibration isolation and seismic restraints for electrical systems are provided in Division 26.

1.05 QUALITY ASSURANCE

A. The following codes and standards will apply:

1. International Building Code.
2. American Society of Civil Engineers (ASCE) 7-16.

B. Manufacturer's Qualifications: Firms regularly engaged in manufacture of vibration control and wind restraint products of type, size, and capacity required, whose products have been in satisfactory use in similar service for not less than 5 years.

C. The following guides may be used for supplemental information on typical seismic installation practices:

1. Federal Emergency Management Agency (FEMA) manuals 412, Installing Seismic Restraints for Mechanical Equipment and 414, Installing Seismic Restraints for Ductwork and Pipe.
2. Sheet Metal and Air-conditioning Contractors' National Association's (SMACNA) Seismic Restraint Manual Guidelines for Mechanical Systems.
3. American Society for Heating, Refrigerating and Air-conditioning Engineers' (ASHRAE) A Practical Guide to Seismic Restraint.
4. Manufacturers Standardization Society of the Valve and Fittings Industry MSS SP-127-2014a, Bracing for Piping Systems, Seismic - Wind - Dynamic, Design, Selection, Application.

1.06 COMPONENT IMPORTANCE FACTOR

A. In order to identify systems requiring seismic restraint and to define those from which restraints may be excluded, utility components are assigned an ASCE 7 Importance Factor (Ip) on the basis of the following:

Ip = 1. Natural gas piping.

Ip = 1.0 All other components.

1.07 SUBMITTALS

A. Submit shop drawings and manufacturer's data in accordance with Division 01.

B. Provide calculations for selection of seismic/wind restraints in accordance with IBC and ASCE 7, certified by a qualified professional engineer, licensed in the state of the project.

C. Submit adequate number of City Plan Review department set of shop drawings and seismic calculations for their review. Submit to City plan review and owner concurrently. Submit plan review approved set to Engineer when available. The submittals must include a licensed engineer's stamp and signature and shall be provided as deferred submittal.

D. All outdoor mounted equipment shall be restrained for the highest wind speed as specified by the project's structural engineer, the governing building code(s) or the authority having jurisdiction.

E. Provide Shop drawings along with catalog cuts, templates and erection and installation details, as appropriate, for the items listed. Submittals shall be complete in detail; shall indicate thickness, type, grade, class of metal; and dimensions; and shall show construction details, reinforcement, anchorage, and installation with relation to the building construction.

1. Sway Braces.
2. Seismic Cable Restraint.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Vibration isolators and Seismic Restraint shall be manufactured by:

1. Amber/Booth.
2. Cooper Industries.
3. International Seismic Application Technology.
4. Kinetics Noise Control.
5. Mason Industries.
6. Vibro-Acoustics.
7. Substitutions: Items of same function and performance are acceptable in conformance with Division 01.

2.02 SEISMIC BRACING AND SUPPORT OF SYSTEMS AND COMPONENTS

A. General:

1. Seismic restraint designer shall coordinate all attachments with the structural engineer of record.
2. Design analysis shall include calculated dead loads, static seismic loads, and capacity of materials utilized for the connection of the equipment or system to the structure.
3. Analysis shall detail anchoring methods, bolt diameter, and embedment depth.
4. All seismic restraint devices shall be designed to accept without failure the forces calculated per the applicable building code and as summarized in installation requirements.
5. The total height of the structure (h) and the height of the system to be restrained within the structure (z) shall be determined in coordination with architectural plans and the General Contractor.

B. Friction from gravity loads shall not be considered resistance to seismic forces.

2.03 SEISMIC BRACING COMPONENTS

A. Steel strut shall be 1-5/8 wide in varying heights and mig-welded combinations as required to meet load capacities and designs indicated. A material heat code, part number, and manufacturer's name shall be stamped on all strut and fittings to maintain traceability to material test reports.
1. Material for epoxy painted strut: ASTM A1011, SS, Grade 33.
2. Material for pre-galvanized strut: ASTM A653, SS, Gr. 33.
3. Material for Hot-Dip Galvanized strut: ASTM A1011, SS, Grade 33 and hot-dip galvanized after fabrication in accordance with ASTM A123.
4. Material for fittings and accessories: ASTM A907 Gr. 33, Structural Quality or ASTM A1011, SS. Gr.33.
5. Fittings and accessories: Products shall be of the same manufacturer as strut and designed for use with that product.

PART 3 EXECUTION

3.01 GENERAL

A. Coordinate size, doweling, and reinforcing of concrete equipment housekeeping pads and piers with vibration isolation and seismic restraint device manufacturer to ensure adequate space and prevent edge breakout failures. Pads and piers must be adequately doweled in to structural slab.

B. Coordinate locations and sizes of structural supports with locations of vibration isolators and seismic/wind restraints (e.g., roof curbs, cooling towers, air-cooled chillers, etc.).

C. Isolated and restrained equipment and piping located on roofs must be attached to the structure. Intermediate supports between the restraint and structure that are not attached to the structure must be approved by the restraint manufacturer.

3.02 SEISMIC/WIND RESTRAINTS

A. General:
1. All equipment and piping shall be restrained to resist seismic/wind forces per the applicable building code(s) as a minimum. Restraint attachments shall be made by bolts, welds or a positive fastening method. Friction shall not be considered. All attachments shall be proven capable of accepting the required wind load by calculations. Additional requirements specified herein are included specifically for this project.
2. Install seismic and wind restraint devices per the manufacturer's submittals. Any deviation from the manufacturer's instructions shall be reviewed and approved by the manufacturer.

3. Attachment to structure for suspended equipment and pipe: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
4. Wall penetrations may be used as bracing locations provided the wall can provide adequate resistance without significant damage.
5. Coordinate sizes and locations of cast-in-place inserts for post-tensioned slabs with seismic restraint manufacturer.
6. Provide hanger rod stiffeners where indicated or as required to prevent buckling of rods due to seismic forces.
7. Where rigid restraints are used on equipment or piping, support rods for the equipment or piping at restraint locations must be supported by anchors rated for seismic use. Post-installed concrete anchors must be in accordance with ACI 355.2.
8. Ensure housekeeping pads have adequate space to mount equipment and seismic restraint devices and shall also be large enough to ensure adequate edge distance for restraint anchor bolts to avoid housekeeping pad breakout failure.

B. Concrete Anchor Bolts:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid pre- or post-tensioned tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Mechanical Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.

C. Equipment Restraints:

1. Seismically restrain equipment as indicated on the schedule. Install fasteners, straps and brackets as required to secure the equipment.
2. As indicated on the schedule, install seismic snubbers on HVAC equipment supported by floor-mounted, non-seismic vibration isolators. Locate snubbers as close as possible to vibration isolators and attach to equipment base and supporting structure as required.
3. Install neoprene grommet washers on equipment anchor bolts where clearance between anchor and equipment support hole exceeds 1/8" (3.2 mm).
4. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

D. Duct Systems:

1. Seismically restrain all ductwork listed below, using seismic cable restraints:
   a. All ducts with cross-sectional area equal to or greater than 6 ft2 (0.55 m2).
   b. Any ductwork which if it were to fail would result in damage to a piece of equipment or building function that has a component importance factor of 1.5.
   c. All ductwork weighing more than 17 lbs/ft (25 kg/m).

2. "12-inch rule", where duct can be exempted from seismic restraint based on the length of the support rods, is accepted if one of the following conditions are met:
    a. The hangers shall be detailed to avoid significant bending of the hangers and their attachments. The maximum stress due to combined loading including bending in the hangers must be less than 21.6 ksi.
    b. Isolation hangers are added to hanger rod to provide swivel joint and to prevent bending moment in hanger.
3. Space lateral supports a maximum of 30' o.c. (9 m), and longitudinal supports a maximum of 60' (18 m) o.c.
4. Duct risers shall be restrained at floor penetrations every 30' (9 m) maximum spacing.
5. Fire damper locations may be used as restraint locations for all directions except away from the damper.
6. Brace a change of direction longer than 12' (3.7 m).
7. Install restraint cables so they do not bend across edges of adjacent equipment or building structure.

E. Piping Systems:
1. For projects with a Seismic Design Category of C, provide seismic cable restraints on the following:
    a. All piping systems assigned a component importance factor, Ip, of 1.5 with a nominal pipe diameter greater than 2" (50 mm) or trapeze-supported piping with combined operating weight over 10 lbs/ft (15 kg/m).
2. For projects with a Seismic Design Category of D, E or F, provide seismic cable restraints on the following:
    a. All piping greater than 3" (75 mm) nominal diameter.
    b. All piping systems assigned a component importance factor, Ip, of 1.5 with a nominal pipe diameter greater than 1" (25 mm) or trapeze-supported piping with combined operating weight over 10 lbs/ft (15 kg/m).
3. "12-inch rule", where pipe can be exempted from seismic restraint based on the length of the support rods, is accepted if one of the following conditions are met:
    a. Hangers are detailed to avoid bending of the hangers and their attachment; and provisions are made for piping to accommodate expected deflections. The maximum stress due to combined loading including bending in the hangers must be less than 21.6 ksi.
    b. Isolation hangers are added to hanger rod to provide swivel joint and to prevent bending moment in hanger.
4. Restraint spacing:
    a. For ductile piping, space lateral supports a maximum of 40' (12 m) o.c., and longitudinal supports a maximum of 80' (24 m) o.c.
    b. For non-ductile piping (e.g., cast iron, PVC) space lateral supports a maximum of 20' (6 m) o.c., and longitudinal supports a maximum of 40' (12 m) o.c.
    c. For piping with hazardous material inside (e.g., natural gas, medical gas) space lateral supports a maximum of 20' (6 m) o.c., and longitudinal supports a maximum of 40' (12 m) o.c.
    d. For pipe risers, restrain the piping at floor penetrations using the same spacing requirements as above.
5. Brace a change of direction longer than 12' (3.7 m).

6. Longitudinal restraints for single pipe supports shall be attached directly to the pipe, not to the pipe hanger.
7. For supports with multiple pipes (trapezes), secure pipes to trapeze member with clamps approved for application.
8. Piping on roller supports shall include a second roller support located on top of the pipe at each restraint location to provide vertical restraint.
9. Install restraint cables so they do not bend across edges of adjacent equipment or building structure.
10. Install flexible metal hose loops in piping which crosses building seismic joints, sized for the anticipated amount of movement.
11. Install flexible piping connectors where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment.
12. Coordinate seismic restraints with thermal expansion compensators, guides and anchor points. Thermal expansion anchor points shall be designed to accommodate seismic forces.

END OF SECTION

SECTION 23 0553

IDENTIFICATION FOR HVAC PIPING, DUCTWORK AND EQUIPMENT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes identification of HVAC piping, ductwork and equipment installed under Division 23.

B. Related Sections:

1. Division 09 - Painting and Coating: Execution requirements for painting specified by this section.

1.03 REFERENCES

A. ANSI/ASME A13.1 - Scheme for the Identification of Piping Systems.

1.04 SUBMITTALS

A. Submit product data under provisions of Division 01.

B. Include product data on: Nameplates, tags, stencil and paint, and pipe markers.

1.05 QUALITY ASSURANCE

A. Conform to ASME A13.1 for color scheme for identification of piping systems and accessories.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Seton.

B. Marking Services Inc.

C. Craftmark Identification Systems.

D. Substitutions: Under provisions of Division 01.

2.02 MATERIALS

A. Color: Unless specified otherwise, conform with ANSI/ASME A13.1.

B. Plastic Nameplates: Laminated three-layer plastic with engraved black or white letters on contrasting background color. Plate size minimum ¾" X 2-½".

C. Plastic Tags: Laminated three-layer plastic with engraved black or white letters on contrasting background color. Tag size minimum 1-½ inch square.

D. Metal Tags: Brass with stamped letters; tag size minimum 1-½ inch diameter with smooth edges.

E. Stencils: With clean cut symbols and letters of following size:

Outside Diameter of Insulation or Pipe	Length of Color Field	Size of Letters
¾" - 1-¼"	8"	½"
1-½" - 2"	8"	¾"
2-½" - 6"	12"	1-¼"
8" - 10"	24"	2-½"
Over 10"	32"	3-½"

Outside Diameter of Insulation or Pipe	Length of Color Field	Size of Letters
Ductwork and Equipment	------	2-½"

F. Stencil Paint: Semi-gloss enamel, colors and lettering size conforming to ASME A13.1.

G. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and fluid being conveyed. Larger sizes may have maximum sheet size with spring fastener.

H. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Division 09 for stencil painting.

3.02 INSTALLATION

A. Apply stencil painting in accordance with Division 09.

B. Install identifying devices after completion of coverings and painting.

C. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.

D. Install labels with sufficient adhesive for permanent adhesion and seal with clear lacquer. For unfinished canvas covering, apply paint primer before applying labels.

E. Install tags using corrosion resistant chain. Number tags consecutively by location.

F. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

G. Equipment: Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with plastic or metal tags.

H. Identify control panels and major control components outside panels with plastic nameplates.

I. Identify valves in main and branch piping with tags showing service and valve number.

J. Identify piping, concealed or exposed, with plastic pipe markers. Tags may be used on small diameter piping. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

K. Ductwork: Identify ductwork with plastic nameplates or stencil. Identify as to air handling unit number, and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

L. Locations: Nameplates shall be located so as to be readily visible to maintenance personnel. Motor nameplates shall be readily visible on accessible, three phase motors, otherwise a duplicate motor nameplate shall be permanently affixed to the driven machinery in a visible locations.

END OF SECTION

SECTION 23 0593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 WORK INCLUDED

A. Air Systems:
   1. Constant Volume Air Systems.
   2. Variable Air Volume Systems.
   3. Exhaust Hood Systems.
   4. Space Pressurization.
   5. Existing HVAC Systems.

B. Hydronic Systems:
   1. Constant Flow Systems.
   2. Variable Flow Systems.
   3. Primary-secondary Systems.

1.02 SCOPE

A. Furnish the professional services of a qualified and approved balancing and testing firm to perform the work of this specification section.

B. The work of this section includes but is not necessarily limited to:
   1. Testing and balancing existing hydronic heating and ventilation systems as indicated on drawings.
   2. Testing and balancing fans and air handling systems.
   3. Testing and balancing new variable air volume terminal units.
   4. Testing and balancing new liquid heat transfer systems.
   5. Working directly with the control subcontractor to obtain proper system adjustments.
   6. Domestic water distribution system adjustment.

C. The work of this section does not include:
   1. Adjusting burners for proper combustion operation.
   2. Liquid waste transfer system adjustment.
   3. Fire protection systems.

1.03 APPLICABLE CODES AND STANDARDS

A. SMACNA Manual for the Balancing and Adjustment of Air Distribution Systems.

B. AMCA Publication 203, Field Performance Measurements.

C. American Air Balancing Council (AABC) Recommended Procedures

D. National Environmental Balancing Bureau (NEBB) Recommended Procedures

1.04 QUALIFICATION OF THE BALANCING FIRM OR COMPANY

A. Subcontractor minimum qualifications include:
   1. NEBB Certified in Testing, Adjusting and Balancing of Air and Hydronic Systems or Demonstration of satisfactory completion of five projects of similar scope in the State of Alaska during the past five years. Provide references if requested.

1.05 TIMING OF WORK

A. Do not begin balancing and testing until the systems, including controls, are completed and in full working order.

B. Schedule the testing and balancing work in cooperation with other trades.

C. Complete the testing and balancing at least one week before the date of substantial completion and before any occupancy occurs

1.06 CONTRACTOR RESPONSIBILITY TO BALANCING AGENCY

A. Award the test and balance contract to an approved firm or company upon receipt of contract to allow the Balance and Testing Agency to schedule this work in cooperation with other trades involved and comply with completion date.

B. Put all heating, ventilating and air conditioning systems, equipment and controls into full operation for the Balancing Agency and continue the operation of same during each working day of testing balancing.

C. Provide scaffolding, ladders and access to each system for proper testing balancing.

D. Ensure that the building enclosure is complete, including but not limited to, structural components, windows and doors installed, door hardware complete, ceilings complete, stair, elevator and mechanical shafts complete, roof systems complete, all plenums sealed, etc.

E. Make any changes in pulleys, belts and dampers, or add any dampers as required for correct balance as recommended by the Balance and Testing Agency at no additional cost to the Owner.

F. Complete installation, programming (including design parameters and graphics), calibration, and startup of all building control systems.

G. Require that the building control system firm provide access to hardware and software, or onsite technical support required to assist the TAB effort. The hardware and software or the onsite technical support shall be provided at no cost to the TAB firm.

1.07 REPORT

A. Certified Reports shall be included in project O & M manuals. Reports shall include: testing, adjusting, and balancing reports bearing the signature of the Test and Balance Agency Representative. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of the testing, adjusting and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the system. Follow the procedures and format specified below:

1. Draft Reports: Upon completion of testing, adjusting and balancing procedures, prepare draft reports on the approved forms. Draft reports may be hand written, but must be complete, factual, accurate, and legible. Organize and format draft reports in the same manner specified for the final reports.

2. Final Reports: Upon verification and approval of the draft report; prepare final reports, typewritten, organized and formatted as specified below.

3. Report Format: Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted and balanced. Report shall be provided in electronic PDF Format. The data in the electronic file shall be

arranged and indexed. Divide the contents into the below listed sections, with bookmarks for each section:

a. General Information and Summary.

b. Air Systems.

c. Hydronic Systems.

d. Temperature Control Systems.

e. Special Systems.

f. System Deficiency Reports and Corrective Actions.

4. Report Contents: Provide the following minimum information, forms and data:

a. General Information and Summary: Inside cover sheet to identify testing, adjusting, and balancing agency; contractor; owner, architect, engineer and project. Include addresses, contact names and telephone numbers. Also, include a certification sheet containing the name, address, telephone number and signature of the Certified Test and Balance Personnel. Include in this division a listing of the instrumentation used for the procedures along with the proof of calibration.

b. The remainder of the report shall contain the appropriate forms containing as a minimum, the information indicated on the standard report forms prepared by the AABC for each respective item and system. Prepare a schematic diagram for each item of equipment and system to accompany each respective report form.

c. Calibration Reports: Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards, within a period of six months prior to starting the project.

1.08 SUBMITTALS

A. Submit in accordance with Division 01.

B. Submit balancing agency qualifications and sample balancing forms.

C. Provide list of equipment to be used and date of last calibration.

D. Submit preliminary balance report a minimum of one week prior to substantial completion inspection.

PART 2 PRODUCTS

2.01 INSTRUMENTS

A. Maintain all instruments accurately calibrated and in good working order. Use instruments with the following minimum performance characteristics.

1. Air Velocity Instruments: Direct reading in feet per minute, 2% accuracy.

2. Static Pressure Instruments: Direct reading in inches' water gauge, 2% accuracy.

3. RPM Instruments: Direct reading in revolutions per minute, .5% accuracy; or revolution counter accurate within 2 counts per 1,000.

4. Pressure Readout: Direct reading in feet of water or PSI, .5% accuracy.

5. Temperature Instruments - Direct reading in degrees F, +.5% accuracy.

6. Water Flow Instruments: Differential pressure type; direct reading in feet of water or PSI, accuracy, suitable for readout balancing valve provided.

7. Sound Measuring Instrument: Octave Band Analyzer which essentially complies to AASA Standards SI.6 1960 with a range of 24DB to 150 DB sound pressure level ref. .0002 microbar. Calibrate sound test instrument before use to a closed coupler and a driving loudspeaker that produces a know-sound pressure level at the microphone of the analyzer.

PART 3 EXECUTION

3.01 GENERAL PROCEDURES FOR ALL SYSTEMS

A. Start with new, clean filters.

B. In cooperation with the control manufacturer's representative, coordinate adjustments of automatically operated dampers and valves to operate as specified, indicated and/or noted.

C. Use manufacturer's ratings on all equipment to make required calculations.

D. Make final adjustments for each space per heating or cooling comfort requirement. State reason for variance from design CFM, i.e., "too noisy", "drafty", etc.

E. Mark equipment and balancing device settings (including damper-control positions, valve position indicators, fan-speed-controls, and similar controls and devices) with paint or other suitable permanent identification material to show final settings.

3.02 REQUIREMENTS FOR ALL AIR HANDLING SYSTEMS

A. Identify each diffuser, grille and register as to location and area.

B. Identify and list size, type and manufacturer of diffusers, grilles, registers and all testing equipment.

C. In readings and tests of diffusers, grilles and registers, include required FPM velocity and required CFM and test CFM after adjustments. If test apparatus is designed to read CFM directly, velocity reading may be omitted. Identify test apparatus used. Identify wide open (W.O.) runs.

D. Check and record the following items:

1. Air temperatures; mixed air, after coils, outside air, return air and supply air.
2. Pressure drop at each coil, filter bank, etc.
3. Operating suction and discharge pressure.
4. Full nameplate data of all equipment.
5. Rated and actual running amperage and voltage of all motors.
6. Drive data including sheaves and belts and adjustments.
7. Electrical overloads/heaters sizes and ranges of motors.

3.03 BALANCING LOW VELOCITY CONSTANT VOLUME DUCTWORK

A. Analyze system and identify major branches. Tabulate design CFM for each branch.

B. Select the branch which appears to be the longest run from the fan or to have the highest static pressure requirements.

C. Adjust other branch dampers or the fan to establish 110% design air flow through the selected branch.

D. Adjust the air flow through each air inlet (exhaust systems) or outlet (supply systems) on the selected branch to within +5% of the requirements so that at least one branch damper serving

an inlet (or outlet) is wide open.

E. Proceed to another branch and set up 110% design airflow. Balance each inlet or outlet to within +5% of requirements, again leaving at least one wide open run. Repeat this process until all branches are balanced 110% airflow.

F. Once each branch has been balanced at 110% flow with one wide open run on each branch, balance with branches together, leaving at least one branch damper wide open. At this point, adjust the fan delivery so that each branch is at about 110% design airflow. Adjust the branch dampers so that each inlet (or outlet) in the system is within 10% of the required airflow.

G. Adjust the fan for design airflow.

H. Read and record the airflow at each inlet and outlet.

I. Secure each branch damper and mark the balanced position of the damper quadrant.

J. Test and record entering and leaving air temperatures of coils.

K. Test and record entering and leaving water temperatures of coils.

L. Test and record static pressure drop across each filter and coil bank.

3.04 BALANCING VAV AIR SYSTEMS

A. The high velocity ductwork of the Variable Air Volume (VAV) systems are computer designed and in general should not require special balancing. The balancer must, however, check the CFM's and adjust as necessary and work with the Control Contractor to set up the fans and controls for proper operation through the range of system operation. The balancing essentially consists of the following:

1. Set up and adjust each fan.
2. Set up duct static pressure control.
3. Balance ductwork and mixing boxes, air outlets, terminal units, etc.
4. Set up building static pressure control.

B. Step 1: Adjust all thermostats set points to call for full airflow. Adjust supply air temperature so that terminal units will stay in full airflow position. If system diversity exceeds 80%, some boxes may have to be temporarily closed.

C. Step 2: Adjust variable speed drive controller to provide 100% fan CFM volume. Check current draw on motor. Do not exceed nameplate full load current rating. Adjust fan RPM accordingly.

D. Step 3: Proceed with the adjustment of diffusers downstream of each terminal box. Proceed as though each box were a branch on a constant volume system. Adjust thermostats of nearby boxes or adjust fan delivery to bring the total terminal box airflow to within + 10% of design box airflow. Record data. Establish a wide-open run and balance the diffusers to within +5% of percentage of total box airflow to design box airflow.

E. Step 4: At each terminal box, adjust the high-volume limiter to the CFM scheduled on the computer run to the total air flow scheduled through the box. Coordinate with the control subcontractor and adjust the low volume limit. Record correction factor for each box.

F. Step 5: Upon completion of all the diffuser adjustments at each terminal box in all zones, place enough thermostats to the no flow position to compensate for diversity. These should be randomly selected based on judgment as to how diversity applies to the particular air distribution system, considering building use. The object is to create 100% airflow at the fan.

G. Step 6: Adjust the static pressure sensor controlling the variable speed drive to the specified

setting for its location in the duct system and adjust fan for 100% CFM at wide open RPM. Record fan suction and discharge static pressure, fan CFM, RPM, motor amperage and voltage, filter and coil pressure drops and static pressure at control sensor location. Refer to procedure for constant volume fan adjustment.

H. Step 7: Work with control subcontractor to set up all fan system controls and building static pressure control. Readjust space thermostats set points.

3.05 FLUID SYSTEM TESTING AND BALANCING

A. Preparation of system - Phase I:

1. Complete air balance before beginning fluid balance.
2. Clean all strainers.
3. Examine fluid in system to determine if treated and clean.
4. Check pump rotation.
5. Verify expansion tanks are not air bound and system full of fluid.
6. Verify all air vents at high points of fluid systems are installed properly and are operating freely. Make certain all air is removed from circuiting system.
7. Open all valves to full flow position including coil and heater stop valves, close bypass valves and open return line balancing cocks. Set temperature controls so that automatic valves are open to full flow through apparatus.
8. Check and set operating temperature of boilers and heat exchangers to design requirements when balancing by temperature drop.
9. Adjust all flows to 110% of design flows as shown.

B. Test and Balance Procedure - Phase II:

1. Set pumps to proper GPM delivery and set proper GPM delivery in main piping runs from boiler room. Note flow variations for additive alternates.
2. Adjust flow of fluid through primary equipment.
3. Check leaving fluid temperatures and return fluid temperatures and pressure drop through major equipment. Reset to correct design temperatures.
4. Check fluid temperature at inlet side of coils and other heat transfer equipment. Note rise or drop of temperatures from source.
5. Balance each coil and all other heat transfer apparatus in system.
6. Upon completion of flow readings and adjustments, mark all settings and record all data.

C. Test and Balance Procedure - Phase III:

1. After making adjustments to coils and apparatus, recheck settings at pumps and major equipment. Readjust if required.
2. Attach pressure gauges on each coil, then read pressure drop through coil at set flow rate on call for full flow through coil. Set pressure drop across bypass valve to match coil full flow pressure drop. This prevents unbalanced flow conditions when coils are on full bypass.
3. Check and record the following items with flows set at 100% of design.
    a. Inlet and leaving fluid and air temperatures at coils and major equipment.

b. GPM flow of each coil and major equipment.

c. Pressure drop of each coil and major equipment.

d. Pressure drop across bypass valve.

e. Pump operating suction and discharge pressures and final total developed head.

f. Pump GPM.

g. Rated and actual running amperage and voltage of pump motor.

h. Full nameplate data of all pumps and equipment.

i. Electrical overloads/heaters sizes and ranges of motors.

4. Permanently mark adjusted position of all balancing valves. Stamp indicator plate of circuit setters and other balancing valves without memory stop.

END OF SECTION

SECTION 23 0700
HVAC INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping Insulation.

B. Equipment Insulation.

C. Ductwork Insulation.

D. Jackets and Accessories.

1.02 RELATED WORK

A. Division 09 - Painting.

B. Section 23 0500 - Common Work Results for HVAC Systems.

C. Section 23 0519 - Meters and Gages for HVAC Piping.

D. Section 23 2113 - Hydronic Piping.

E. Section 23 2116 - Hydronic Specialties.

F. Section 23 3100 - HVAC Ducts and Casings.

G. Section 23 3300 - Air Duct Accessories.

H. Section 23 5700 - Heat Exchangers for HVAC.

I. Section 23 8200 - Convection Heating and Cooling Units.

J. Section 23 8216 - Air Coils.

K. Section 23 8300 - Radiant Heating Units.

1.03 REFERENCES

A. ASTM B209 - Aluminum and Aluminum-alloy Sheet and Plate.

B. ASTM C195 - Mineral Fiber Thermal Insulating Cement.

C. ASTM C450 - Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.

D. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

E. ANSI/ASTM C533 - Calcium Silicate Block and Pipe Thermal Insulation.

F. ANSI/ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

G. ANSI/ASTM C547 - Mineral Fiber Pipe Insulation (Preformed).

H. ANSI/ASTM C552 - Cellular Glass Thermal Insulation.

I. ANSI/ASTM C553 - Mineral Fiber Blanket Insulation.

J. ANSI/ASTM C578 - Preformed, Block Type Cellular Polystyrene Thermal Insulation.

K. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).

L. ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.

M. ASTM C449 - Mineral Fiber Hydraulic-setting Thermal Insulating and Finishing Cement.

N. ASTM C610 - Expanded Perlite Block and Pipe Thermal Insulation.

O. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).

P. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

Q. ASTM C1427 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

R. ASTM D774 - Standard Test Method for Bursting Strength of Paper.

S. ASTM D1000 - Standard Test Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications.

T. ASTM E84 - Surface Burning Characteristics of Building Materials.

U. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

V. UL 723 - Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS

A. Submit product data under provisions of Division 01.

B. Include product description, thickness for each service, and locations.

C. Submit manufacturer's installation instructions.

1.05 QUALITY ASSURANCE

A. Applicator: Company specializing in piping insulation application with three years minimum experience.

B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.

C. Materials: Flame spread/smoke developed rating of 25/50 in accordance with UL 723, ASTM E84, or NFPA 255.

D. Factory fabricated fitting covers manufactured in accordance with ASTM C450.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Division 01 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

C. Shipment of materials from manufacturer to installation location shall be in weather tight transportation.

D. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesive, mastics, and insulation cements.

1.08 FIELD MEASURMENTS

A. Verify field measurements prior to fabrication.

1.09 WARRANTY

A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Armacell.

B. Certain-Teed.

C. IMCOA.

D. Johns Manville.

E. Knauf.

F. Owens-Corning.

G. Manson.

H. Nomaco.

I. Pittsburgh - Corning.

J. K-Flex USA.

K. Armstrong.

L. Substitutions: Under provisions of Division 01.

2.02 INSULATION - PIPING

A. Type A: Glass fiber, rigid, molded, non-combustible insulation; ANSI/ASTM C547; 'k' value of 0.23 at 75º F, rated from 0º F to 850º F, vapor retarder jacket of Kraft paper bonded to aluminum foil, self-sealing lap and butt strips; Johns Manville "Micro-Lok" or approved equal.

B. Type E: Elastomeric foam; EPDM-based closed-cell flexible foam, ASTM C534; flexible cellular elastomeric in sheet or pre-formed tube, 'k' value of 0.26 at 75º F, max. service temp - 300º F, ASTM C534; max. flame spread = 50, max. smoke developed = 50, ASTM E84; UV-resistant coating/jacketing if exposed to sunlight; K-FLEX USA "Insul-Tube", "Insul-Sheet", or approved equal.

2.03 FIELD APPLIED PIPING JACKET

A. Vapor Barrier Jackets: Kraft reinforced foil vapor barrier with self-sealing adhesive joints.

B. PVC Jackets and solvent welding adhesive: One piece, pre-molded type, Johns Manville "Zeston 2000", fitting covers and jacketing material. Johns Manville "Perma-Weld" solvent welding adhesive.

C. Aluminum Jackets: ASTM B209; 0.016 inch thick; corrugated or textured finish, longitudinal slip joints.

D. Stainless Steel Jackets: Type 304 stainless steel; 0.010 inch thick; corrugated finish.

E. Re-Wettable Canvas Jacketing: Fiberglass cloth made from texturized yarns, impregnated throughout with an inorganic fire retardant asbestos free adhesive; 20x14 thread count, 14.5 oz./sq.yd, 0.04 inch thickness, 1,000º F upper temperature limit; GLT Products "Style 1989" or approved equal.

2.04 INSULATION - EQUIPMENT

A. Type G: Rigid fiberglass board with FSK outer facing. Johns Manville 814 FSK, 3.0 lbs./cu. ft. density, ASTM C612, K= .23 @ 75º F, 450º F maximum service temperature, Johns Manville 1000 series "Spin-Glas" or approved equal.

B. Type H: Reusable Thermal Insulation Covers, HVAC Equipment: 2" thermal insulating wool, 2.4 lb./cu.ft. density, maximum temperature rating of 1000 Deg. F; Interior/Exterior Fabric: 17 oz./sq. yd. silicone coated fiberglass cloth, maximum temperature range of -80 to 500 Deg F; Securement: Lacing Anchors, fourteen gauge stainless steel with 1.5" diameter stainless steel speed washers; Sewing Thread: Kevlar/Stainless Steel S-110 Natural with stainless steel core, all blanket seems to be single sewn lock stitch interior seams, six to nine stitches per inch; Drawcord: 0.125" diameter #4 ultra-strength polyester. Thermal Energy Products "Energy-Wrap EW.2T.NM.SH.SC" or approved equal.

2.05 INSULATION - DUCTWORK

A. Type K: Exterior FSK Duct Wrap: Flexible glass fiber; ASTM C553; commercial grade; 'k' value of 0.27 at 75º F, 0.6 lb./cu. ft. density. 0.00035 inch vinyl scrim facing with 2" stapling tab. Johns Manville "Microlite Standard Duct Wrap" or equal.

B. Type L: Exterior FSK Rigid Fiber Board Duct Insulation; ASTM C612, 'k' value of 0.23 at 75° F, 3.0 lb./cu. ft. density. 0.00035 inch foil scrim facing. Johns Manville "814 Spin-Glas" or equal.

C. Type M: Duct Liner: Rigid Fiber Board; ASTM C1071; 'k' value of 0.23 at 75º F; coated air side for maximum 6,000 ft./min. air velocity, UL listed adhesive galvanized steel pins. Johns Manville “Permacote Linacoustic R-300" or approved equal.

D. Type N: Duct Liner: Close cell, CFC- and HCFC-free flexible elastomeric acoustical insulation with scrim-reinforced acrylic adhesive on one side; ASTM C534 type 2 (sheet) grade 1, ASTM E84 25/50 at 2" and below; 'k' value of 0.25 at 75° F; R-4.2 and noise reduction coefficient (NRC) of 0.5 at 1" thick; recommended for -40 to 200° F temperature applications; install metal nosing for air velocities greater than 4,000 ft./min., UL listed adhesive galvanized steel pins. K-flex USA "K-flex duct liner gray" or approved equal..

2.06 FIELD APPLIED EQUIPMENT AND DUCTWORK JACKETS

A. Aluminum Jackets: ASTM B209; 0.016 inch thick; corrugated or textured finish, longitudinal slip joints.

B. Stainless Steel Jackets: Type 304 stainless steel; 0.010 inch thick; corrugated finish.

C. Re-Wettable Canvas Jacketing: , Fiberglass cloth made from texturized yarns, impregnated throughout with an inorganic fire retardant asbestos free adhesive; 20x14 thread count, 14.5 oz./sq.yd, 0.04 inch thickness, 1,000º F upper temperature limit; GLT Products “Style 1989” or approved equal.

2.07 INSULATION ACCESSORIES

A. Adhesives: Waterproof and fire-retardant type.

B. Lagging Adhesive: Fire resistive to NFPA 255.

C. Impale Anchors: Galvanized steel, 12 gauge, self-adhesive pad.

D. Joint Tape: Glass fiber cloth, open mesh.

E. FSK Joint Tape; ASTM C1136 Foil-Scrim-Kraft (FSK) lamination coated with solvent acrylic pressure sensitive adhesive; capable of adhering to fibrous and sheet metal surfaces; tri-directionally reinforced 2x3 squares per inch fiberglass scrim; 9.5 mils thick, -40 to 240º F service temperatures; Venture Tape “1525CW” or approved equal.

F. Tie Wire: Annealed steel, 16 gauge.

G. Insulated pipe supports: Calcium silicate with galvanized steel jacket (min. 24 gauge); ANSI/ASTM C533; rigid white; 'k' value of 0.37 at 100º F, rated to 1,200º F; Thermal Pipe Shields “T-1000 Calsil” or equal.

PART 3 EXECUTION

3.01 PREPARATION

A. Install materials after piping, equipment and ductwork has been tested and approved.

B. Clean surfaces for adhesives.

C. Prepare surfaces in accordance with manufacturer's recommendations.

3.02 INSTALLATION – PIPING INSULATION

A. Install materials in accordance with manufacturer's recommendations, building codes and industry standards.

B. Continue insulation vapor barrier through penetrations except where prohibited by code.

C. Locate insulation and cover seams in least visible locations.

D. Neatly finish insulation at supports, protrusions, and interruptions.

E. Provide insulated cold pipes conveying fluids below ambient temperature with vapor retardant jackets with self-sealing laps. Insulate complete system, including under fitting jackets.

F. For insulated pipes conveying fluids above ambient temperature, secure jackets with self-sealing lap or outward clinched, expanded staples. Bevel and seal ends of insulation at equipment, flanges, and unions. Insulate complete system, including under fitting jackets.

G. Provide insert fabricated of Johns Manville Thermo-12 Gold or other heavy density insulating material suitable for temperature between support shield and piping on piping 1-½" inch diameter or larger shall not be less than the following lengths:

1-½" to 2-½" pipe size	10" long	
3" to 6" pipe size	12" long	
8" to 10" pipe size	16" long	***inserts only***
12" and over	22" long	***inserts only***

H. For exterior applications, provide weather protection jacket or coating. Insulated pipe, fittings, joints, and valves shall be covered with PVC or metal jacket. Jacket seams shall be located on bottom side of horizontal piping.

I. Fully insulate all piping including all spaces under jacketing.

J. Jackets:

1. Indoor, Concealed Applications: Insulated pipes shall have vapor barrier jackets, factory-applied. Vapor barrier PVC fittings may also be used provided joints are sealed with solvent welding adhesive approved by the jacket manufacturer.
2. For pipe exposed in mechanical equipment rooms or in finished spaces below 10 feet above finished floor, finish with PVC jacket and fitting covers or metal jacket.

3.03 SCHEDULE – PIPING

PIPING	TYPE	PIPE SIZE	MINIMUM INSULATION THICKNESS
Heating Glycol/Water Supply and Return	A	1-1/4” and Smaller	1-1/2”
Heating Glycol/Water Supply and Return	A	1-1/2" and Larger	2”
Refrigerant Suction	E	All Sizes	1"
Refrigerant Hot Gas	E	All Sizes	1"

3.04 INSTALLATION - EQUIPMENT

A. Install materials in accordance with manufacturer's instructions.

B. Do not insulate factory insulated equipment.

C. Apply insulation as close as possible to equipment by grooving, scoring, and beveling insulation, if necessary. Secure insulation to equipment with studs, pins, clips, adhesive, wires, or bands. Minimum 2" overlap on blanket material.

D. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.

E. Cover insulation with metal mesh and finish with heavy coat of insulating cement.

F. Do not insulate over nameplate or ASME stamps. Bevel and seal insulation around such.

G. When equipment with insulation requires periodical opening for maintenance, repair, or cleaning, install insulation in such a manner that it can be easily removed and replaced without damage.

H. Where canvas jacketing is indicated, apply mastic in sufficient thickness to completely cover the texture of the canvas material.

3.05 SCHEDULE - EQUIPMENT

EQUIPMENT	INSULATION TYPE	THICKNESS
Air Separator	G, H	2"
Heat Exchangers/Converters	G, H	2"

3.06 INSTALLATION – DUCTWORK INSULATION

A. Install materials in accordance with manufacturer's instructions.

B. Provide insulation with vapor barrier when air conveyed may be below ambient temperature. Continue insulation with vapor barrier through penetration.

C. Exterior Insulation (Type J) Application:

1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
2. Secure insulation without vapor barrier with staples, tape, or wires.
3. Install without sag on underside of ductwork. Use mechanical fasteners to prevent sagging. Secure insulation with mechanical fasteners on 15 inch centers maximum, on bottom and side of ductwork with dimension exceeding 20 inches. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
4. Maximum 25% compression.

D. Fiberglass Duct Liner (Type M) Application:

1. Adhere insulation with approved adhesive for 100 percent coverage. Secure insulation with mechanical fasteners on 15 inch centers maximum on top and side of ductwork with dimension exceeding 20 inches. Butt joints together tightly then seal and smooth. Thoroughly coat ends of liner with adhesive. Do not use nail-type fasteners. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
2. Ductwork dimensions indicated are net inside dimensions required for air flow. Increase ductwork to allow for insulation thickness.
3. Install liner as indicated on plans.

E. Fiber-Free Duct Liner (Type N) Application:

1. Adhere insulation with approved adhesive for 100 percent coverage. Secure insulation with mechanical fasteners on 15 inch centers maximum on top and side of ductwork with dimension exceeding 20 inches. Butt joints together tightly then seal and smooth. Thoroughly coat ends of liner with adhesive. Do not use nail-type fasteners. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
2. Ductwork dimensions indicated are net inside dimensions required for air flow. Increase ductwork to allow for insulation thickness.
3. Install liner as indicated on plans.

F. Where ductwork is scheduled for exterior insulation and is shown on the plans to be internally lined, the exterior insulation thickness may be reduced by the thickness of the lining. Where exterior insulation can be eliminated or reduced due to thickness of lining, overlap exterior insulation a minimum 24 inches over lined ductwork.

G. Where canvas jacketing is indicated, apply mastic in sufficient thickness to completely cover the texture of the canvas material.

3.07 SCHEDULE - DUCTWORK

DUCTWORK	TYPE	INSULATION THICKNESS	FINISH
Exhaust & Relief Ducts Within 10 ft. of Exterior Openings	K,L	1"	FSK
Supply Ducts	K	1"	FSK
Internal Acoustic Lining	M,N	1"	
Internal Lining in Supply Ducts	N	1"	

END OF SECTION

SECTION 23 08 00

COMMISSIONING OF HVAC

PART 1 GENERAL

1.01 COMMISSIONING DESCRIPTION

A. HVAC commissioning process includes the following tasks:
   1. Testing and startup of HVAC equipment and systems.
   2. Equipment and system pre-functional verification checks.
   3. Assistance in functional performance testing to verify testing and balancing, and equipment and system performance.
   4. Provide qualified personnel to assist in commissioning tests.
   5. Ensure all equipment and systems are fully operational and ready for functional performance testing.
   6. Provide equipment, materials, and labor necessary to correct deficiencies found during commissioning process to fulfill contract and warranty requirements.
   7. Provide operation and maintenance information to Commissioning Authority for review.

B. Equipment and Systems to Be Commissioned:
   1. Roof Top Units.
   2. Heating Coils.
   3. Cabinet Unit Heaters.
   4. Fin tube.
   5. Pumps.
   6. Heat Exchangers.
   7. Air Conditioning Unit.
   8. Exhaust Fans.
   9. Transfer Fans.
   10. Snowmelt System.
   11. Variable Air Volume Terminal Boxes.
   12. Building Automation System

1.02 COMMISSIONING SUBMITTALS

A. Section 01 81 00 - Commissioning: Requirements for commissioning submittals.

B. Draft Forms: Submit draft of start-up plan, pre-functional verification checklists within 6 months of contract award.

C. Test Reports: Indicate data on pre-functional verification checklists for each piece of equipment and system as specified.

D. Field Reports: Indicate deficiencies preventing completion of equipment or pre-functional verification checklists or system to achieve specified performance.

1.03 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with ASHRAE Guideline 1.

1.05 COMMISSIONING RESPONSIBILITIES

A. Contractor or System Installer Commissioning Responsibilities:
   1. Attend commissioning meetings.
   2. Assist the Commissioning Authority in developing a commissioning schedule for completion of the commissioning work.
   3. Review draft commissioning plan prepared by the Commissioning Authority.
   4. Review the Functional Performance Test procedures that describe the step-by-step process to functionally test the system.

5. Develop startup and initial checkout plan.
6. Develop pre-functional verification checklists.
7. Prior to startup, inspect, check, and verify correct and complete installation of equipment and system components for pre-functional verification checks.
8. Perform and document completed startup and pre-functional verification checklists.
9. Provide manufacturer's representatives to execute starting of equipment where specified.
10. Provide personnel to assist commissioning authority during functional performance testing.
11. Assist commissioning authority in performing functional performance tests on equipment and systems.
12. Provide the Commissioning Authority with completed equipment start-up forms, pre-functional verification checklists, point-to-point checklists, balancing logs, pre-test acquisition forms and other information appropriate to the commissioning process.

B. Temperature Controls Installer Commissioning Responsibilities:
1. Attend commissioning meetings.
2. Review design for ability of systems to be controlled.
3. Inspect, check, and confirm proper operation and performance of control hardware and software.
4. Submittal of pre-functional verification checklists for performing automatic temperature control system point-to-point checks.
5. Inspect check and confirm correct installation and operation of automatic temperature control system input and output device operation through point-to-point check.
6. Demonstrate system performance and operation to commissioning authority during functional performance tests including each mode of operation.
7. Provide control system technician to assist during commissioning authority functional performance testing.
8. Provide control system technician to assist testing, adjusting, and balancing agency.

C. Testing, Adjusting, and Balancing Agency Commissioning Responsibilities:
1. Attend commissioning meetings.
2. Participate in verification of testing, adjusting, and balancing report for verification or diagnostic purposes.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install additional balancing dampers, balancing valves, access doors, test ports, and pressure and temperature taps required by Commissioning Authority.

B. Place mechanical systems and equipment into full operation and continue operation during each working day of commissioning.

C. Install replacement sheaves and belts to obtain system performance, as requested by Commissioning Authority.

D. Install test holes in ductwork and plenums as required for balancing and as requested by Commissioning Authority for taking air measurements.

F. Prior to start of functional performance test, install replacement filters in equipment.

G. Return all equipment controls to normal operating positions and setpoints.

END OF SECTION

SECTION 23 0923

DIRECT DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

1.01 SUMMARY

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

B. Furnish a native BACnet-based Building Automation System (BAS), including an operator's workstation using Microsoft as the operating system and shall be based on a distributed control system in accordance with this specification. The operator's workstation, all building controllers, application controllers, and all input/output devices shall communicate using the protocols and network standards as defined by ANSI/ASHRAE Standard 135, BACnet.

C. Provide all necessary BACnet-compliant hardware and software to meet the system's functional specifications. Provide Protocol Implementation Conformance Statement (PICS) for Windows-based control software and every controller in system, including unitary controllers.

D. Prepare individual hardware layouts, interconnection drawings, and software configuration from project design data.

E. Implement the detailed design for all analog and binary objects, system databases, graphic displays, logs, and management reports based on control descriptions, logic drawings, configuration data, and bid documents.

F. Design, provide, and install all equipment cabinets, panels, data communication network cables needed, and all associated hardware.

G. Provide and install all interconnecting cables between supplied cabinets, application controllers, and input/output devices.

H. Provide and install all interconnecting cables between all operator's terminals and peripheral devices (such as printers, etc.) supplied under this section.

I. Provide complete manufacturer's specifications for all items that are supplied. Include vendor name of every item supplied.

J. Provide supervisory specialists and technicians at the job site to assist in system startup, and commissioning.

K. Provide a comprehensive operator and technician training program as described herein.

L. Provide as-built documentation, operator's terminal software, diagrams, and all other associated project operational documentation (such as technical manuals) on approved media, the sum total of which accurately represents the final system.

M. Provide new sensors, dampers, valves, and install only new electronic actuators. No used components shall be used as any part or piece of installed system.

1.02 SYSTEM DESCRIPTION

A. Distributed logic control systems complete with all software and hardware functions shall be provided and installed. System shall be completely based on ANSI/ASHRAE Standard 135, BACnet. This system is to control all mechanical equipment, including all unitary equipment such as pumps, air handlers, heat exchangers, etc. and any other listed equipment using native BACnet-compliant components.

B. Operator's workstation software shall be Microsoft as the computer operating system. The Building Management System (BAS) application program shall be written to communicate specifically utilizing BACnet protocols. Software shall include password protection, scheduling (including optimum start), alarming, logging of historical data, full graphics including animation, after-hours billing program, demand limiting, full suite of field engineering tools including graphical programming and applications.

C. Building controllers shall include complete energy management software, including scheduling building control strategies with optimum start and logging routines. All energy management software and firmware shall be resident in field hardware and shall not be dependent on the operator's terminal. Operator's terminal software is to be used for access to field-based energy management functions only. Provide zone-by-zone direct digital logic control of space temperature, scheduling, runtime accumulation, equipment alarm reporting, and override timers for after-hours usage. All application controllers all equipment and any other piece of controlled equipment shall be fully programmable. Application controllers shall be mounted next to controlled equipment and communicate with building controller via BACnet LAN.

D. Room sensors shall allow room setpoint adjustment within preset limits. Initial settings 68-72 Degrees F.

E. Provide all alarms, manual control, and status indication functions as indicated under the sequence of operation, Specification Section 23 09 93.

F. The system shall be Web Enabled and shall be accessible through any computer connected to the internet using a standard web browser and appropriate password protection. Contractor shall include costs for all network wiring and coordination with the owner for IP Address connection.

G. The system shall include remote notification services to allow messaging of critical alarms to owners' designated personnel and to the central alarm facility.

H. The DDC system shall be hosted on the existing Central Server. Coordinate with Owner for integration and hosting requirements on existing central server.

1.03 RELATED SECTIONS

A. Section 23 0500 - Common Work Results For HVAC.

B. Section 23 0593 - Testing, Adjusting and Balancing for HVAC.

C. Section 23 2113 - Hydronic Piping.

D. Section 23 2116 - Hydronic Specialties.

E. Section 23 3300 - Air Duct Accessories.

F. Section 23 3600 - Air Terminal Units.

G. Division 26 - Electrical Specifications

1.04 REFERENCES

A. ANSI/ASHRAE 135, BACNET - A Data Communication Protocol for Building Automation and Control Neworks (BACnet).

1.05 QUALITY ASSURANCE

A. The direct digital control system provided shall be designed, furnished, installed, tested, certified and placed into service by a Control Contractor who is regularly engaged in the installation of direct digital control systems in Alaska. The Control Contractor shall maintain an office in Alaska with parts and maintenance personnel to ensure prompt response (24 hour maximum) to an emergency call during the one year correction period.

B. The Control Contractor shall be able to demonstrate that he has had experience designing and installing direct digital control systems of comparable type and size to that called for in these Specifications.

C. The Control Contractor, if other than the manufacturer, shall hold a manufacturer's franchise or license to design and install control systems for that manufacturer.

D. Within two weeks after award of contract submit to the Project Manager the following items for Contractor qualification:

1. Name of manufacturer and proof that the Control Contractor holds a manufacturer's franchise or license to design and install the proposed control system.

2. Proof of Alaskan Office, with full time service representative.

3. List of Alaskan buildings with names, addresses, and phone numbers of Owners which are representative of direct digital control systems that have been installed by the Control Contractor. Include a brief description and approximate control system construction cost of each system submitted.
4. Provide verification that each and every controller, sensor, and all other BAS components shall be individually tested and listed by the BACnet Testing Laboratories (BTL).

1.06 EQUIPMENT AND SHOP DRAWING REVIEW SUBMITTALS

A. Provide electronic submittals in accordance with Section 23 0500 and Division 01.

B. Prior to programming, ordering of equipment, or installation of any portion of the system submit the following in a single tabbed and indexed PDF package for review by the Project Manager. The shop drawings shall include an electronic bookmark for every major system initial sheet. Shop drawings without bookmarks will be rejected without review for correction.

1. System architecture diagram showing power supply to each component; interconnection of direct digital controllers, building management station, and peripherals; and indication of proposed location of direct digital controllers.
2. Sequence of operations. Print sequence of operations on the schematic control diagrams so that the relevant sequence is on the same diagram with the control schematic it describes. The Sequence of Operations provided in the Contract Documents is written in directive language. Rewrite the sequence of operations to be submitted to the Owner in language that explains the sequences of operation. Remove all directives to the Contractor.
3. Schematic control diagrams 11 inches by 17 inches minimum paper size with upper case lettering, minimum 1/16 inch high plotted from digitized files in AutoCAD format. Clearly indicate wire and terminal labels, set points, reset schedules, switch over points, signal ranges, and other points required to completely describe the system. Show interface with any existing control systems. Depict circuitry on schematic control diagrams to allow circuits to be traced from connection to connection using one of the following methods:
    a. Diagram each wire or tube depicting full length of circuit from connection to connection.
    b. Reference each wire to a uniquely labeled terminal. Depict terminals on a sequentially labeled terminal strip showing attached wires and the device labels of the components attached at the other end. If the wiring label used is different than the terminal label indicate the wire label. In addition provide ladder diagrams indicating current or air flow through circuitry components.
    c. Construct digitized schematic control diagrams using a symbol library so that symbols for similar equipment are common. Use separate layers or line type designations for the following items:
        1) Device Symbols.
        2) Equipment Symbols.
        3) Ductwork.
        4) Piping.
        5) Wiring.
4. Valve schedules.
5. Control Wiring Floor Plans. Provide architectural floor plans overlaid with control components. Plans shall include locations of sensors, valves, dampers, transformers, control cabinets, mechanical and electrical equipment interlocked or controlled by BAS, and communication and power wiring.
6. Subpanel and panel face layouts.
7. Control components data sheets, installation, operation, and adjustment instructions. Further index and tab this section of the submittal by item number.

a. Each control component shall be identified with a separate item number. Separate each item with a divider sheet with plastic index tabs.

b. Provide two alphabetical listings of all items included in the binder in an index at the front of the binder. One index shall list items by functional name. The other index shall list items by symbol used in the control diagrams.

c. Each sheet or page shall indicate the specific item(s) proposed for this project. Delete or cross out all other items.

d. For all system elements operator's workstation(s), building controller(s), application controllers, routers, and repeaters, provide BACnet Protocol Implementation Conformance Statements (PICS) as per ANSI/ASHRAE Standard 135.

e. Provide complete description and documentation of any proprietary (non-BACnet) services and/or objects used in the system.

8. Orientation and training instruction schedule and course outlines.

9. Control Transformer Schedule. Provide control transformer schedule indicating tag id, location, equipment serviced, and VA consumed. Transformers shall be UL listed, class 2 power limited, provide built in circuit breaker and have a minimum of 15% spare capacity.

1.07 OPERATION AND MAINTENANCE MANUALS

A. Provide electronic operations and maintenance manuals in accordance with Section 23 05 00 and Division 01 Standard General Provisions.

B. Operation and Maintenance Manuals must be submitted for review, reviewed by the Project Manager, corrected in accordance with review comments, and accepted by the Project Manager before a request for final or substantial completion inspection will be considered by the Project Manager.

C. The Operation and Maintenance Manual shall include the information required for the equipment review submittal, updated as required to reflect current as-built conditions, plus the following:

1. A brief customized guide to system operation prepared for the proprietary programming and interfacing software. Include copies of the guide in the Operation and Maintenance Manual, laminated between two plastic sheets for use away from the workstations. The guide shall include:

a. Log on procedure.

b. Procedure for accessing interactive video display screens, changing set points, acknowledging alarms, creating history logs, and reviewing history logs.

c. Instructions for backing up the building management system and start up the system after a computer failure.

d. Instructions for backing up individual direct digital controllers and start them up after a controller failure.

2. Maintenance information and parts lists for control components.

3. Complete system as-built wiring diagrams indicating the following:

a. Wiring for all control and power circuits indicating the voltage and breaker location for each circuit.

b. Wiring for direct digital controllers and interface panels.

c. Terminal number or code name for terminals in direct digital controllers and interface panels with unused terminals marked "spare".

d. Assigned name, address, and engineering units for direct digital controller input and output terminals.

4. Control Wiring Floor Plans. Provide architectural floor plans overlaid with control components. Plans shall include locations of sensors, valves, dampers, transformers,

control cabinets, mechanical and electrical equipment interlocked or controlled by BAS, and communication and power wiring.

5. Control Transformer Schedule. Provide control transformer schedule indicating tag id, location, equipment serviced, and VA consumed.
6. Valve Schedule.
7. List of software with current revision numbers, vendor name and support telephone numbers.
8. Include copies of programming and variable printouts for the direct digital control logic created to fulfill the sequence of operation requirements. Include the following information:
   a. Print the sequence of operation corresponding to the program listing on that page.
   b. Block Programming diagrams if block programming is used.
9. Provide backup copy of programming and graphics for the direct digital control system with instructions on how to install the backup software if the system needs to be re-installed. Provide on USB drive.
10. Provide digitized copies of O & Ms, as built schematic control diagrams, wiring diagrams, and graphic screens recorded on USB drive in PDF drawing format.
11. Provide a print out of the configuration files for each controller. Place controller specific print out in specific controller cabinet.
12. Provide other information required for the Owner to properly troubleshoot and maintain the control system.

D. Published and bound building management system software or hardware manuals are not required to be included in the three ring “Operation and Maintenance Manual”. Provide one digital copy of each published building management system software or hardware manual required for the maintenance and operation of building management system to the Project Manager one week prior to request for substantial completion. Provide a separate index sheet describing each separate manual as part of the “Operation and Maintenance Manual”.

E. Provide editing facilities used in the developing of the building management system so that any custom programming required to apply the building management system to this project is accessible to a trained operator for viewing, editing, or creating similar software structures. List software that cannot be changed by the operator with model and version number. Any custom software is considered the property of the owner with full right to copy. This software is required to work across the BACNET/IP network.

F. After the final inspection and subsequent punch list inspections update each copy of the Operation and Maintenance Manual to reflect final as-built conditions.

1.08 SYSTEMS DEMONSTRATION

A. The Contractor will completely check out, calibrate and test all connected hardware and software to insure that the system performs in accordance with the approved specifications and sequences of operation.

B. Provide complete demonstration of system operation to the owners representative at the project substantial completion inspection. The Contactor will demonstrate to the Owner's satisfaction that all equipment and systems operate in accordance with the sequence of operation as outlined under Section 23 0993. Demonstration will include all equipment controlled by the Direct Digital Control System.

C. Building management station demonstration will consist of:

1. Running sample point log and system configuration reports as requested.
2. Display and demonstrate each data entry to show site specific customizing capability. Demonstrate parameter changes.

3. Step through penetration tree, display all graphics, demonstrate dynamic update and direct access to graphics.
4. Execute system commands in graphic mode including operation of control system set points, schedules, valves, dampers and control relays. Commands shall be executed as necessary to demonstrate the system is controlling in accordance with the sequence of operations.
5. Demonstrate update, and alarm responsiveness.
6. Demonstrate digital system configuration graphics with interactive upload and download, and demonstrate specified diagnostics.

1.09 WARRANTY

A. Under provisions of Division 01 Standard General Provisions.

B. All components, system software, parts and assemblies will be guaranteed against defects in materials and workmanship for one year from acceptance date.

C. Labor to troubleshoot, repair, reprogram, or replace system components will be furnished by the Contractor at no charge to the owner during the warranty period.

D. All corrective software modifications made during warranty service periods will be updated on user documentation and on user and manufacturer archived software.

1.10 SUBSTANTIAL INSPECTION SUPPLEMENTAL DATA

A. Substantial inspection supplemental data must be submitted for review, reviewed by the Project Manager, corrected in accordance with review comments, and accepted by the Project Manager before a request for substantial completion inspection will be considered by the Project Manager.

PART 2 PRODUCTS

2.01 APPROVED BUILDING AUTOMATION SYSTEMS

A. Johnson Controls.

B. Substitutions: None controls to match existing.

2.02 OPERATOR'S WORKSTATION

A. General structure of workstation interaction shall be a standard client/server relationship. Server shall be used to archive data and store system database. Clients shall access server for all archived data. Each client shall include flexibility to access graphics from server or local drive.

B. BACnet Conformance:

1. Operator's workstation shall support Ethernet BACnet LAN types. It shall communicate directly via these BACnet LANs as a native BACnet device. Operator's terminal shall comply with the requirements of a BACnet conformance class 3 device and support all BACnet services necessary to provide the following BACnet functional groups.
    a. Clock Functional Group.
    b. Event Response Functional Group.
    c. Time Master Functional Group.
    d. Device Communications.
2. Please refer BACnet Functional Groups, in the BACnet standard for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.
3. Standard BACnet object types accessed by the workstation shall include as a minimum: Analog Value, Analog Input, Analog Output, Binary Value, Binary Input, Binary Output, Calendar, Device, Event Enrollment, File, Notification Class, Program and Schedule object types. All proprietary object types, if used in the system, shall be thoroughly documented

and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

4. The Operator Workstation shall comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internetwork, while using the same Ethernet LAN for non-IP communications to other BACnet devices on the LAN. Must support interoperability on wide area networks (WANs) and campus area networks (CANs). Workstation shall support Foreign Device Registration to allow temporary workstation connection to IP network.
5. Displays:
    a. Operator's workstation shall display all data associated with project as called out on drawings and/or object type list supplied. Graphic files shall be created using digital, full color photographs of system installation, AutoCAD™ or Visio™ drawing files of field installation drawings and wiring diagrams from as-built drawings. Operator's workstation shall display all data using three-dimensional graphic representations of all mechanical equipment. System shall be capable of displaying graphic file, text, and dynamic object data together on each display and shall include animation. Information shall be labeled with descriptors and shall be shown with the appropriate engineering units. All information on any display shall be dynamically updated without any action by the user. Workstation shall allow user to change all field-resident EMCS functions associated with the project, such as setpoints, weekly schedules, exception schedules, etc. from any screen no matter if that screen shows all text or a complete graphic display. This shall be done without any reference to object addresses or other numeric/mnemonic indications.
    b. All displays and programming shall be generated and customized by the local EMCS supplier and installer.
    c. Binary objects shall be displayed as ACTIVE/INACTIVE/NULL or with customized text. Text shall be justified left, right or center as selected by the user. Also, allow binary objects to be displayed as individual change-of-state graphic objects on the display screen such that they overlay the system graphic. Each binary object displayed in this manner shall be assigned up to three graphic files for display when the point is ON, OFF or in alarm. For binary outputs, toggle the object's commanded status when the graphic item is selected with the system mouse. Similarly, allow the workstation operator to toggle the binary object's status by selecting with the mouse a graphic of a switch or light, for example, which then displays a different graphic (such as an "ON" switch or lighted lamp). Additionally, allow binary objects to be displayed as an animated graphic. Animated graphic objects shall be displayed as a sequence of multiple graphics to simulate motion. For example: when a pump is in the OFF condition, display a stationary graphic of the pump. When the operator selects the pump graphic with the mouse, the represented object's status is toggled and the graphic of the pump's impeller rotates in a time-based animation. The operator shall be able to click on an animated graphical object or switch it from the OFF position to ON, or ON to OFF. Allow operator to change graphic file assignment and also create new and original graphics online. System shall be supplied with a library of standard graphics, which may be used unaltered or modified by the operator. Systems that do not allow customization or creation of new graphic objects by the operator (or with third-party software) shall not be allowed.
    d. Analog objects shall be displayed with operator modifiable units. Analog input objects may also be displayed as individual graphic items on the display screen as an overlay to the system graphic. Each analog input object may be assigned a minimum of five graphic files, each with high/low limits for automatic selection and display of these graphics. As an example, a graphic representation of a thermometer would rise and fall in response to either the room temperature or its deviation from the controlling setpoint. Analog output objects, when selected with the mouse, shall be displayed as

a prompted dialog (text only) box. Selection for display type shall be individual for each object. Analog object values may be changed by selecting either the "increase" or "decrease" arrow in the analog object spinner box without using the keypad. Pressing the button on the right side of the analog object spinner box allows direct entry of an analog value and accesses various menus where the analog value may be used, such as trendlogs.

e. Analog objects may also be assigned to an area of a system graphic, where the color of the defined area changes based on the analog object's value. For example, an area of a floor-plan graphic served by a single control zone would change color with respect to the temperature of the zone or its deviation from setpoint. All editing and area assignment shall be created or modified online using simple icon tools.

f. A customized menu label (push-button) shall be used for display selection. Menu items on a display shall allow penetration to lower level displays or additional menus. Dynamic point information and menu label push buttons may be mixed on the same display to allow sub-displays to exist for each item. Each display may be protected from viewing unless operator has appropriate security level. A security level may be assigned to each display and system object. The menu label shall not appear on the graphic if the operator does not have the appropriate security level.

g. A mouse shall be used to move the pointer arrow to the desired item for selection of new display or to allow the operator to make changes to object data.

6. Password Protection:

a. Provide security system that prevents unauthorized use unless operator is logged on. Access shall be limited to operator's assigned functions when user is logged on. This includes displays as outlined above.

b. Each operator's terminal shall provide security for 200 users minimum. Each user shall have an individual User ID, User Name and Password. Entries are alphanumeric characters only and are case sensitive (except for User ID). User ID shall be 0-8 characters, User Name shall be 0-29 characters, and Password shall be 4-8 characters long. Each system user shall be allowed individual assignment of only those control functions and menu items to which that user requires access. All passwords, user names, and access assignments shall be adjustable online at the operator's terminal. Each user shall also have a set security level, which defines access to displays and individual objects the user may control. System shall include 10 separate and distinct security levels for assignment to users.

c. System shall include an Auto Logout Feature that shall automatically logout user when there has been no keyboard or mouse activity for a set period of time. Time period shall be adjustable by system administrator. Auto Logout may be enabled and disabled by system administrator. Operator terminal shall display message on screen that user is logged out after Auto Logout occurs.

7. Operator Activity Log:

a. Operator Activity Log shall be included with system that tracks all operator changes and activities. System shall track what is changed in the system, who performed this change, date and time of system activity and value of the change before and after operator activity. Operator shall be able to display all activity, sort the changes by user and also by operation.

b. Log shall be gathered and archived to hard drive on operator workstation as needed. Operator shall be able to export data for display and sorting in a spreadsheet.

c. Any displayed data, that is changeable by the operator, may be selected using the right mouse button and the operator activity log shall then be selectable on the screen. Selection of the operator activity log using this method shall show all operator changes of just that displayed data.

8. Scheduling:
    a. Operator's workstation shall show all information in easy-to-read daily format including calendar of this month and next. All schedules shall show actual ON/OFF times for day based on scheduling priority. Priority for scheduling shall be events, holidays and daily with events being the highest.
    b. Operator shall be able to change all information for a given weekly or exception schedule if logged on with the appropriate security access.
    c. System shall include a Schedule Wizard for set up of schedules. Wizard shall walk user through all steps necessary for schedule generation. Wizard shall have its own pull-down selection for startup or may be started by right clicking on value displayed on graphic and then selecting Schedule.
    d. Scheduling shall include optimum start based on outside air temperature, current heating/cooling setpoints, indoor temperature and history of previous starts. Each and every individual zone shall have optimum start time independently calculated based on all parameters listed. User shall input schedules to set time that occupied setpoint is to be attained. Optimum start feature shall calculate the startup time needed to match zone temperature to setpoint. User shall be able to set a limit for the maximum startup time allowed.
9. Alarm Indication and Handling:
    a. Operator's workstation shall provide audible, visual, and printed means of alarm indication. The alarm dialog box shall always become the top dialog box regardless of the application(s), currently running. Printout of alarms shall be sent to the assigned terminal and port.
    b. System shall provide log of alarm messages. Alarm log shall be archived to the hard disk of the system operator's terminal. Each entry shall include a description of the event-initiating object generating the alarm. Description shall be an alarm message of at least 256 characters in length. Entry shall include time and date of alarm occurrence, time and date of object state return to normal, time and date of alarm acknowledgment and identification of operator acknowledging alarm.
    c. Alarm messages shall be in user-definable text (English or other specified language) and shall be entered either at the operator's terminal or via remote communication.
    d. System shall include an Alarm Wizard for set up of alarms. Wizard shall walk user through all steps necessary for alarm generation. Wizard shall have its own pull-down selection for startup or may be started by right clicking on value displayed on graphic and then selecting alarm setup.
10. Trendlog Information:
    a. System server shall periodically gather historically recorded data stored in the building controllers and archive the information Archived files shall be appended with new sample data, allowing samples to be accumulated. Systems that write over archived data shall not be allowed, unless limited file size is specified. Samples may be viewed at the operator's workstation. Operator shall be able to scroll through all trended data. All trendlog information shall be displayed in standard engineering units.
    b. Software shall be included that is capable of graphing the trend logged object data. Software shall be capable of creating two-axis (x,y) graphs that display up to ten object types at the same time in different colors. Graphs shall show object values relative to time.
    c. Operator shall be able to change trend log setup information. This includes the information to be logged as well as the interval at which it is to be logged. All input, output, and value object types in the system may be logged. All operations shall be

password protected. Setup and viewing may be accessed directly from any and all graphics on which object is displayed.

d. System shall include a trend Wizard for setup of logs. Wizard shall walk user through all necessary steps. Wizard shall have its own pull-down selection for startup, or may be started by right clicking on value displayed on graphic, and then selecting Trendlogs from the displayed menu.

11. Energy Log Information:

a. System server shall be capable of periodically gathering energy log data stored in the field equipment and archive the information. Archive files shall be appended with new data, allowing data to be accumulated. Systems that write over archived data shall not be allowed unless limited file size is specified. Display all energy log information in standard engineering units.

b. All data shall be stored in data base file format for direct use by third-party programs. Operation of system shall stay completely online during all graphing operations.

c. Operator shall be able to change the energy log setup information as well. This includes the meters to be logged, meter pulse value, and the type of energy units to be logged. All meters monitored by the system may be logged. System shall support using flow and temperature sensors for BTU monitoring.

d. System shall display archived data in tabular format form for both consumption and peak values. Data shall be shown in hourly, daily, weekly, monthly and yearly formats. In each format the user shall be able to select a specific period of data to view.

12. Demand Limiting:

a. System shall include demand limiting program that includes two types of load shedding. One type of load shedding shall shed/restore equipment in binary fashion based on energy usage when compared to shed and restore settings. The other type of shedding shall adjust operator selected control setpoints in an analog fashion based on energy usage when compared to shed and restore settings. Shedding may be implemented independently on each and every zone or piece of equipment connected to system.

b. Binary shedding shall include minimum of 5 priority levels of equipment shedding. All loads in a given priority level shall be shed before any loads in a higher priority level are shed. Load shedding within a given priority level shall include two methods. In one the loads shall be shed/restored in a "first off-first on" mode and in the other the loads are just shed/restored in a linear fashion.

c. Analog shed program shall generate a ramp that is independently used by each individual zone or individual control algorithm to raise the appropriate cooling setting and lower appropriate heating setting to reduce energy usage.

d. Status of each and every load shed program shall be capable of being displayed on every operator terminal connected to system. Status of each load assigned to an individual shed program shall be displayed along with English description of each load.

13. Configuration/Setup:

a. Provide means for operator to display and change system configuration. This shall include, but not be limited to, system time, day of the week, date of daylight savings set forward/set back, printer termination, port addresses, modem port and speed, etc. Items shall be modified using understandable terminology with simple mouse/cursor key movements.

14. Field Engineering Tools:

a. Operator's workstation software shall include field-engineering tools for programming all controllers supplied.

b. Programming tools shall include a real time operation mode. Function blocks shall display real time data and be animated to show status of data inputs and outputs when in real time operation. Animation shall show change of status on logic devices and countdown of timer devices in graphical format.

c. Field engineering tools shall also include a database manager of applications that include logic files for controllers and associated graphics. Operator shall be able to select unit type, input/output configuration and other items that define unit to be controlled.

d. Field engineering tool shall include Device Manager for automatic detection of devices connected anywhere on the BACnet network by scanning of the entire network. This function shall display device instance, network identification, model number and description of connected devices. It shall record and display software file loaded into each controller. A copy of each file shall be stored on the computer's hard drive.

e. System shall include backup/restore function that will back up entire system to selected medium and then restore system from that media.

15. Workstation Hardware:

a. Provide operator's workstation(s) at location(s) noted on the plans. [Provide new control graphics on existing operator workstation for all new systems installed in this project.]

16. Workstation/Server Computer Minimum Requirements:

a. Intel 4.7 Ghz or better.

b. 16 GB RAM or better.

c. 256 0GB hard disk or better.

d. High-performance graphics adapter.

e. Ethernet 10/100 network interface card.

f. 802.11ac Wireless + Bluetooth 4.2, Dual Band 2.4&5 GHz

g. Keyboard and Mouse.

h. 21.5-inch FHD (1920 x 1080) IPS Anti-Glare LED-Backlit Narrow Border Touch Display.

i. Windows 10 Pro.

C. At the conclusion of project, contractor shall leave with owner a USB drive that includes the complete software operation system and project graphics, setpoints, system parameters, etc. This backup shall allow the owner to completely restore the system in the case of a computer malfunction.

2.03 BUILDING CONTROLLER

A. General:

1. All communication with operator workstation and all application controllers shall be via BACnet. Building controller shall incorporate as a minimum, the functions of a 3-way BACnet router. Controller shall route BACnet messages between the high-speed LAN (Ethernet 10/100MHz) master slave token passing (MS/TP) LANs, a point-to-point (PTP - RS-232) connection and modem.

a. Each MS/TP LAN must be software configurable from 9.6 to 76.8Kbps.

b. The RJ-45 Ethernet connection must accept either 10Base-T or 100Base-TX BACnet over twisted pair cable (UTP).

c. The direct access port must be a female DB-9 connector supporting BACnet temporary PTP connection of a portable BACnet operator terminal at 9.6 to 115.2 Kbps over RS-232 null modem cable.

2. Building controller shall be capable of providing global control strategies for the system based on information from any objects in the system regardless if the object is directly monitored by the controller or by another controller. The program that implements these strategies shall be completely flexible and user definable. Any systems utilizing factory pre-programmed global strategies that cannot be modified by field personnel on-site or downloaded via remote communications are not acceptable. Changing global strategies via firmware changes is also unacceptable.
3. Programming shall be object-oriented using control function blocks, supporting DDC functions, 1000 Analog Values and 1000 Binary Values. All flowcharts shall be generated and automatically downloaded to controller. Programming tool shall be resident on workstation and the same tool used for all controllers.
4. Provide means to graphically view inputs and outputs to each program block in real-time as program is executing. This function may be performed via the operator's workstation or field computer.
5. Building controller shall provide battery-backed real-time (hardware) clock functions.
6. Controller shall have a memory needed to ensure high performance and data reliability. Battery shall retain static RAM memory and real-time clock functions for a minimum of 1.5 years (cumulative).
7. Global control algorithms and automated control functions should execute via 32-bit processor.
8. Controller installation shall include memory-free gel-cell battery providing ongoing power conditioning and noise filtering for operation data integrity. It shall provide up to 5 minutes of powerless operation for orderly shutdown and data backup.

B. BACnet Conformance:

1. Building Controller shall as a minimum support Point-to-Point (PTP), MS/TP and Ethernet BACnet LAN types. It shall communicate directly via these BACnet LANs as a native BACnet device and shall support simultaneous routing functions between all supported LAN types. Global controller shall be a BACnet conformance class 3 device and support all BACnet services necessary to provide the following BACnet functional groups:
   a. Clock Functional Group.
   b. Files Functional Group.
   c. Reinitialize Functional Group.
   d. Device Communications Functional Group.
   e. Event Initiation Functional Group.
2. Please refer to section 22.2, BACnet Functional Groups, in the BACnet standard for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.
3. Standard BACnet object types supported shall include as a minimum: Analog Value, Binary Value, Calendar, Device, File, Group, Notification Class, Program and Schedule object types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.
4. The Building Controller shall comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internetwork, while using the same Ethernet LAN for non-IP communications to other BACnet devices on the LAN. Must support interoperability on wide area networks (WANs) and campus area networks (CANs) and function as a BACnet Broadcast Management Device (BBMD).

C. Schedules:

1. Each building controller shall support a minimum of 250 BACnet Schedule Objects and 250 BACnet Calendar Objects.

D. Logging Capabilities:

1. Each building controller shall log a minimum of 1000 trend logs. Any object in the system (real or calculated) may be logged. Sample time interval shall be adjustable at the operator's workstation.
2. Logs may be viewed both on-site or off-site via remote communication.
3. Building controller shall periodically upload trended data to networked operator's workstation for long term archiving if desired.
4. Archived data stored in database format shall be available for use in third-party spreadsheet or database programs.

E. Alarm Generation:

1. Alarms may be generated within the system for any object change of value or state either real or calculated. This includes things such as analog object value changes, binary object state changes, and various controller communication failures.
2. Each alarm may be dialed out as noted in paragraph 2 above.
3. Alarm log shall be provided for alarm viewing. Log may be viewed on-site at the operator's terminal or off-site via remote communications.
4. Controller must be able to handle up to 1500 alarm setups stored as BACnet event enrollment objects - system destination and actions individually configurable.

2.04 APPLICATION CONTROLLERS

A. Provide one or more native BACnet application controllers for each mechanical system and provide native BACnet application controllers as needed for control that adequately cover all objects listed in object list. All controllers shall interface to building controller via MS/TP LAN using BACnet protocol. No gateways shall be used. Controllers shall include input, output and self-contained logic program as needed for complete control of units. Controllers shall be fully programmable. Programming tool shall be resident on operator workstation and be the same tool as used for the building controller. No auxiliary or non-BACnet controllers shall be used.

B. BACnet Conformance:

1. Application controllers shall as a minimum support MS/TP BACnet LAN types. They shall communicate directly via this BACnet LAN at 9.6, 19.2, 38.4 and 76.8 Kbps, as native BACnet devices. Application controllers shall be of BACnet conformance class 3 and support all BACnet services necessary to provide the following BACnet functional groups:
   a. Files Functional Group.
   b. Reinitialize Functional Group.
   c. Device Communications Functional Group.
2. Please refer to BACnet Functional Groups, in the BACnet standard, for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.
3. Standard BACnet object types supported shall include as a minimum-Analog Input, Analog Output, Analog Value, Binary Input, Binary Output, Binary Value, Device, File, and Program object types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

4. Application controllers shall include universal inputs with 10-bit resolution that accept thermistors or RTDs, 0-10VDC, 0-5 VDC, 4-20 mA and dry contact signals. Any input on a controller may be either analog or digital. Controller shall also include support and modifiable programming for interface to intelligent room sensor with digital display. Controller may include binary and analog outputs on board. Analog outputs shall be switch selectable as either 0-10VDC or 0-20mA. Software shall include scaling features for analog outputs. Application controller shall include 24VDC voltage supply for use as power supply to external sensors.
5. All program sequences shall be stored on board application controller in EEPROM nonvolatile flash memory. No batteries shall be needed to retain logic program. All program sequences shall be executed by controller 10 times per second and capable of multiple PID loops for control of multiple devices. All calculations shall be completed using floating-point math and system shall support display of all information in floating-point nomenclature at operator's terminal. Programming of application controller shall be completely modifiable in the field over installed BACnet LANs or remotely via modem interface. Operator shall program logic sequences by graphically moving function blocks on screen and tying blocks together on screen. Application controller shall be programmed using programming tools as described in operator's terminal section.
6. Application controller shall include support for intelligent room sensor. Display on intelligent room sensor shall be programmable at application controller and include an operating mode and a field service mode. All button functions and display data shall be programmable to show specific controller data in each mode based on which button is pressed on the sensor. See sequence of operation for specific display requirements at intelligent room sensor.

2.05 EXPANDABLE APPLICATION CONTROLLERS

A. General:

1. Expandable application controller shall be capable of providing control strategies for the system based on information from any or all connected inputs. The program that implements these strategies shall be completely flexible and user definable. Any systems utilizing factory pre-programmed global strategies that cannot be modified by field personnel on-site via simple download are not acceptable. Changing global strategies via firmware changes is also unacceptable. Program execution of controller shall be a minimum of once per second.
2. Controller shall support additional Analog and Binary Values. Each and every analog and binary value shall support standard BACnet priority arrays. Programming tool shall be provided with system and shall be the same tool that is used to program the Building Controller. All flowcharts shall be generated and automatically downloaded to controller. No re-entry of database information shall be necessary.
3. Provide means to graphically view inputs and outputs to each program block in real-time as program is executing. This function may be performed via the operator's terminal or field computer.
4. Controller shall have adequate data storage to ensure high performance and data reliability. Battery shall retain static RAM memory and real-time clock functions for a minimum of 1.5 years (cumulative). Battery shall be a field-replaceable (non-rechargeable) lithium type. Unused battery life shall be 10 years.
5. The onboard, battery-backed real time clock must support schedule operations and trend logs.
6. Global control algorithms and automated control functions should execute via 32-bit processor.
7. Controller shall include both on-board 10BASE-T/100BASE-TX Ethernet BACnet communication over twisted pair cable (UTP) and shall include BACnet IP communication. In addition, controller shall include BACnet PTP connection port.

8. The base unit of the controller shall host up to 8 expansion modules with various I/O combinations. These inputs and outputs shall include universal 12-bit inputs, binary triac outputs, and 8-bit switch selectable analog outputs (0-10V or 0-20 mA). Inputs shall support thermistors or RTDs, 0-5VDC, 0-10VDC, 4-20mA, dry contacts and pulse inputs directly.
9. All outputs must have onboard Hand-Off-Auto switches and a status indicator light. HOA switch position shall be monitored. Each analog output shall include a potentiometer for manually adjusting the output when the HOA switch is in the Hand position.
10. The position of each and every HOA switch shall be available system wide as a BACnet object. Expandable Controller shall provide up to 176 discreet inputs/outputs per base unit.

B. BACnet Conformance:

1. Controller shall as a minimum support Point-to-Point (PTP), MS/TP and Ethernet BACnet LAN types. It shall communicate directly via these BACnet LANs as a native BACnet device and shall support simultaneous routing functions between all supported LAN types. Building controller shall be a BACnet conformance class 3 device and support all BACnet services necessary to provide the following BACnet functional groups:
   a. Clock Functional Group.
   b. Files Functional Group.
   c. Reinitialize Functional Group.
   d. Device Communications Functional Group.
   e. Event Initiation Functional Group.
2. Please refer to section 22.2, BACnet Functional Groups, in the BACnet standard for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All necessary tools shall be supplied for working with proprietary information.
3. Standard BACnet object types supported shall include as a minimum: Analog Input, Binary Input, Analog Output, Binary Output, Analog Value, Binary Value, Device, File, Group, Event Enrollment, Notification Class, Program and Schedule object types. All necessary tools shall be supplied for working with proprietary information.
4. The Controller shall comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internet work, while using the same Ethernet LAN for non-IP communications to other BACnet devices on the LAN. Must support interoperability on wide area networks (WANs) and campus area networks (CANs) and function as a BACnet Broadcast Management Device (BBMD).

C. Schedules:

1. Each controller shall support a minimum of 50 BACnet Schedule Objects.

D. Logging Capabilities:

1. Each controller shall support a minimum of 200 trend logs. Any object in the system (real or calculated) may be logged. Sample time interval shall be adjustable at the operator's workstation.
2. Controller shall periodically upload trended data to system server for long term archiving if desired.
3. Archived data stored in database format shall be available for use in third-party spreadsheet or database programs.

E. Alarm Generation:

1. Alarms may be generated within the system for any object change of value or state either real or calculated. This includes things such as analog object value changes, binary object state changes, and various controller communication failures.

2. Alarm log shall be provided for alarm viewing. Log may be viewed on-site at the operator's terminal or off-site via remote communications.
3. Controller must be able to handle up to 200 alarm setups stored as BACnet event enrollment objects - system destination and actions individually configurable.

2.06 TERMINAL UNIT APPLICATION CONTROLLERS

A. Provide one native BACnet application controller for each piece of unitary mechanical equipment that adequately covers all objects listed in object list for unit. All controllers shall interface to building controller via MS/TP LAN using BACnet protocol. No gateways shall be used. Controllers shall include input, output and self-contained logic program as needed for complete control of unit.

B. BACnet Conformance:

1. Application controllers shall as a minimum support MS/TP BACnet LAN types. They shall communicate directly via this BACnet LAN at 9.6, 19.2, 38.4 and 76.8 Kbps, as a native BACnet device. Application controllers shall be of BACnet conformance class 3 and support all BACnet services necessary to provide the following BACnet functional groups:
   a. Files Functional Group.
   b. Reinitialize Functional Group.
   c. Device Communications Functional Group.
   d. Please refer to section 22.2, BACnet Functional Groups in the BACnet standard for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.
   e. Standard BACnet object types supported shall include as a minimum-Analog Input, Analog Output, Analog Value, Binary Input, Binary Output, Binary Value, Device, File and Program Object Types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

C. Application controllers shall include universal inputs with 10-bit resolution that can accept 3K thermistors or RTDs, 0-10 VDC, 4-20 mA, dry contact signals. Any input on controller may be either analog or digital. Controller shall also include support and modifiable programming for interface to intelligent room sensor. Controller shall include binary outputs on board with analog outputs as needed.

D. All program sequences shall be stored on board controller in EEPROM nonvolatile flash memory. No batteries shall be needed to retain logic program. All program sequences shall be executed by controller 10 times per second and shall be capable of multiple PID loops for control of multiple devices. Programming of application controller shall be completely modifiable in the field over installed BACnet LANs or remotely via modem interface. Operator shall program logic sequences by graphically moving function blocks on screen and tying blocks together on screen. Application controller shall be programmed using same programming tools as building controller and as described in operator workstation section. All programming tools shall be provided and installed as part of system.

E. Application controller shall include support for intelligent room sensor (see Section 2.9.B.) Display on room sensor shall be programmable at controller and include an operating mode and a field service mode. All button functions and display data shall be programmable to show specific controller data in each mode based on which button is pressed on the sensor. See sequence of operation for specific display requirements at intelligent room sensor.

2.07 SENSORS

A. General:

1. Provide sensors with specified output type for remote sensing of temperature, humidity pressure, and flow rate. Factory calibrate for the specific application.
2. Provide two or three wire sensors and transmitters. Whenever transmitters are indicated or are required as part of sensor provide transmitters with 0-10VDC or 4-20ma signal output.

B. Space Temperature:
1. Thermistor or RTD with minimum 32-150 deg F range, accuracy of plus or minus 0.4 deg F over full range, and maximum drift of 0.1 deg F/year. Removable covers with tamper proof fasteners.

C. Space Temperature - Tamper Resistant
1. Where tamper resistant sensors are indicated provide temperature sensor bonded to a stainless steel handy box cover plate.
2. Provide sensor with logo decal and insulated back.

D. Duct Air Temperature, Probe Type:
1. Thermistor or RTD with minimum 32 deg F to 150 deg F range, accuracy of plus or minus 0.4 deg F over full range, and maximum drift of 0.1 deg F/year.
2. Handy box enclosure, with probe length suitable for duct size.

E. Duct Air Temperature, Averaging Type:
1. Thermistor or RTD continuous sensing element inside copper tube with minimum 32 deg F150 deg F range, accuracy of plus or minus 0.75 deg F over full range, and maximum drift of 0.1F/year. Provide Sensor element length suitable for complete duct coverage.

F. Fluid Temperature:
1. Thermistor or RTD with minimum 30 deg F to 230 deg F range, accuracy of plus or minus 1.0 deg F over full range, and maximum drift of 0.5 deg F per year.
2. Provide threaded well to allow removal of element without draining system.

G. Outside Air Temperature:
1. Thermistor or RTD with minimum minus 58 deg F to 110 deg F range, Accuracy of plus or minus 1.0 deg F over full range, and maximum drift of 1 deg F per yearProvide with ventilated sun shield and weather proof box.

H. Fluid Pressure:
1. Gauge pressure transducer with range 150 percent of operating pressure and over pressure tolerance of 200 percent of range pressure, plus or minus 2 percent accuracy over full range, and maximum drift of 1 percent full range per year.
2. Watertight enclosure.
3. Provide with brass or stainless steel snubber and pigtail on steam applications.
4. Provide with ball valve isolation.

I. Duct Static or Air Differential Pressure:
1. Differential pressure transducer with range 150 percent of operating pressure and over pressure tolerance of 200 percent of range pressure, plus or minus 2 percent accuracy over full range, and maximum drift of 1 percent full range per year. Veris Px series or equal.
2. Provide static pressure tips for reference tubing at duct penetrations.

J. Current Sensor:
1. Current transformer and conditioning circuitry to convert AC line current to binary output, Veris Hawkeye or equal.

K. Indoor Air Quality Sensors:

1. Provide carbon dioxide sensors or VOC Volatile Organic Compound) sensor for sensing indoor air quality in rooms or air ducts.
2. Power Supply: 24VAC, 50-60Hz, max 6VA.
3. Range of Use: 0-2000ppm.
4. Tolerance: +/- 100ppm.
5. Voltage Output: 0-10Vdc.
6. Operating Temperature: 14-113 deg F.
7. Humidity: 0-95% RH.

L. Airflow Sensor Measurement Devices

1. Acceptable Manufacturers:
   a. EBTRON, Inc.
   b. Air Monitor.
   c. No Substitutions.
2. Provide airflow sensor measurement devices as indicated in the sequence of operations. Fan inlet measurement devices shall not be substituted for duct or plenum measurement devices indicated on the plans.
3. Each measurement device shall consist of one or more sensor probe assemblies and a single microprocessor-based transmitter. Each sensor probe assembly will contain one or more independent sensor housings. Multiple sensor housings shall be equally weighted and averaged by the transmitter prior to output Vortex shedding flow meters are not acceptable.
4. All Sensor Probe Assemblies:
   a. Each electronic sensor housing shall utilize two hermetically sealed thermistor probes to determine airflow rate and ambient temperature. Devices that do not have 2 thermistors in each sensor housing are not acceptable.
   b. Each sensor housing shall be calibrated at a minimum of 16 airflow rates and have an accuracy of +/-2% of reading over the entire operating airflow range. Each sensor assembly shall be calibrated to standards that are traceable to the National Institute of Standards and Technology (NIST).
   c. Devices whose accuracy is the combined accuracy of the transmitter and sensor probes must demonstrate that the total accuracy meets the performance requirements of this specification throughout the measurement range.
   d. Each sensor probe assembly shall have an integral, U.L. listed, plenum rated cable and terminal plug for connection to a remotely mounted transmitter. All terminal plug interconnecting pins shall be gold plated.
   e. Each sensor assembly shall not require matching to the transmitter in the field.
   f. A single manufacturer shall provide both the airflow measuring probe(s) and transmitter at a given measurement location.
5. Duct and Plenum Sensor Probe Assemblies:
   a. Sensor housings shall be mounted in an extruded, 6063 aluminum tube probe assembly.
   b. The number of sensor housings provided for each location shall be as follows:

1) Area (sq. ft.)	Sensors
<=1	2
>1 to <4	4
4 to <8	6

8 to <12	8
12 to <16	12
>=12	16

c. Probe assembly mounting brackets shall be constructed of 304 stainless steel. Probe assemblies shall be mounted using one of the following options:
   1) Insertion mounted through the side or top of the duct.
   2) Internally mounted inside the duct or plenum.
   3) Standoff mounted inside the plenum.

d. The operating airflow range shall be 0 to 5,000 CFM unless otherwise indicated on the plans.

6. Fan Inlet Sensor Probe Assemblies (Allowed only at roof mounted relief fans upon written permission from the engineer).
   a. Sensor housings shall be mounted on 304 stainless steel blocks.
   b. Mounting rods shall be field adjustable to fit the fan inlet and constructed of nickel plated steel.
   c. Mounting feet shall be constructed of 304 stainless steel.
   d. The operating airflow range shall be 0 to 10,000 CFM unless otherwise indicated on the plans.
7. Transmitters:
   a. The transmitter shall have an LCD display capable of displaying airflow and temperature. Airflow shall be field configurable to be displayed as a velocity or a volumetric rate.
   b. The transmitter shall be capable of displaying the individual airflow and temperature readings of each sensor on the LCD display.
   c. The transmitter shall operate on 24 VAC. The transmitter shall be protected from weather and water.
   d. The transmitter shall be capable of communicating with the host controls using one of the following interface options:
      1) Linear analog output signal: Field selectable, fuse protected and isolated, 0-10VDC and 4-20mA (4-wire).
      2) BACnet-MS/TP.
      3) 10 Base-T Ethernet: Field selectable BACnet Ethernet, BACnet-IP, The measuring device shall be UL listed as an entire assembly.
8. The manufacturer's authorized representative shall review and approve placement and operating airflow rates for each measurement location indicated on the plans. A written report shall be submitted to the mechanical engineer if any measurement locations do not meet the manufacturer's placement requirements.
9. Install in accordance with manufacturer's instructions at the locations indicated on the contract drawings. Duct and plenum devices shall not be adjusted without approval from the mechanical engineer.

2.08 SWITCHES

A. Bypass timer/timer switch:
   1. Instant close, timed open, spring wound timer switch, Mark-Time or equal.
   2. Digital push button timer, settings available from 5 minutes to 12 hours, time scrolling for custom duration run time, Watt Stopper Inteliswitch TS-400-24-W or equal.

B. Low Voltage Thermostats – Space Temperature:

1. Adjustable setpoint, adjustable calibration of setpoint, room temperature indication, setpoint index, adjustable heat anticipator.
2. Heating thermostats: 55 deg F to 75 deg F minimum setpoint adjustment range.
3. Combination heating and cooling thermostats: 55 deg F to 85 deg F minimum setpoint adjustment range. Dual setpoint. Adjustable deadband, 0 deg F to 10 deg F.
4. Covers: Removable and without temperature or setpoint indication unless specifically indicated otherwise. Setpoint adjustment shall require cover removal.

C. Line Voltage Thermostat - Space Temperature:

1. Provide where non-DDC space temperature control is indicated.
2. Adjustable setpoint, room temperature, and setpoint indication.
3. Switching through SPDT contacts rated 16 amp inductive current at 120V.
4. Setpoint range: 50 deg F to 80 deg F minimum setpoint adjustment range.
5. Removable setpoint adjustment knob.
6. Covers: Removable and without temperature or setpoint indication unless specifically indicated otherwise.
7. Mount covers to bases with tamper proof fasteners.

D. Current Operated Switches:

1. Provide current sensing relays for status of fans or pumps as called out in sequence of operation. Provide with field adjustable current setpoint range suitable for application. Adjust sensor for equipment current draw. Veris or equal.
2. Internal circuits powered by induced line current.

2.09 TRANSMITTERS

A. Temperature Transmitter:

1. Two or three wire transmitter, with adjustable setpoint, and selectable range. Select range with mid range at setpoint.
2. Accuracy, 0.1F or 0.2 percent of span.
3. Optional LED display.

2.10 CONTROL RELAYS

A. General: Provide relays rated for current and voltage requirements of controlled equipment.

B. Panel Mounted Relays:

1. Plug in type, with DIN rail mountable plug in sockets. IDEC RH series or equal.
2. UL listed.

C. Field Mounted Relays:

1. Solid state packaged relay including relay, LED indicator, provisions for mounting, transient protection and housing. Functional Devices RIB T series or equal.
2. Provide with a Hand-Off-Auto switch.
3. Provide internal separation between class 1 and class 2 wiring including separate wire ways or nipples.
4. UL listed.

2.11 CONTROL VALVES

A. Control valves shall be two-way or three-way type for two-position or modulating service as shown.

B. Close-off (differential) Pressure Rating: Valve actuator and trim shall be furnished to provide the following minimum close-off pressure ratings:

1. Water/Glycol Valves:
    a. Two-way: 150% of total system (pump) head.
    b. Three-way: 300% of pressure differential between ports A and B at design flow or 100% of total system (pump) head.
2. Steam Valves: 150% of operating (inlet) pressure.

C. Water/Glycol Valves.

1. Body and trim style and materials shall be in accordance with manufacturer's recommendations for design conditions and service shown, with equal percentage ports for modulating service.
2. Sizing Criteria:
    a. Two-position service: Line size.
    b. Two-way and three-way modulating service: Pressure drop shall be sized for 3 psi maximum. [5 psi for critical control applications].
    c. Valves ½ in. through 2 in. shall be bronze body or cast brass ANSI Class 250, spring-loaded, PTFE packing, quick opening for two-position service. Two-way valves to have replaceable composition disc or stainless steel ball.
    d. Valves 2½ in. and larger shall be cast iron ANSI Class 125 with guided plug and PTFE packing.
3. Water/Glycol valves shall fail normally open or closed, as scheduled on plans, or as follows:
    a. Zone valves shall be normally open for heating applications.
    b. Control valves shall be normally closed for hot water generators.
    c. Heating coils in air handlers shall be normally open.
    d. Chilled water control valves shall be normally closed.
    e. Other applications-as scheduled or as required by sequences of operation.

2.12 DAMPER AND VALVE ACTUATORS

A. General:

1. Where exposed to outdoor air or air temperatures lower than 32 deg F provide completely weatherproof actuators with internal heaters to allow normal operation at minus 50 deg F.
2. Provide spring return to normal position type actuators except at and variable air volume terminal units where fail to last position actuators are acceptable.
3. Provide actuators of the following signal types:
    a. Modulating Electronic Actuators. Actuator to convert electronic 1-10VDC or 4-20mA analog signal to a linear, positive positioning stroke. Provide modulating electronic actuators for modulating control except as indicated. Belimo or equal.
    b. Tri-State Reversing or Floating Point Electric Actuators. Actuator to reverse or hold position depending on contact closure state. Tri-state reversing or Floating Point electric actuators may be used for terminal unit control. Belimo or equal.
    c. Two Position Electric Actuator. Direct mounting actuator to open or close depending on contact closure state. Belimo or equal.

2.13 WIRING AND RACEWAYS

A. Provide wiring and raceway complying with the National Electrical Code, Division 26 05 33, and State and Local Codes and Ordinances, with the following exception:
   1. The minimum size of conduit shall be 1/2". This shall apply to conduit and cabling operating at voltages less than 48V.

B. Provide wiring and raceway complying with the National Electrical Code, Division 26, and State and Local Codes and Ordinances.

C. Provide wiring and raceway complying with the National Electrical Code, and State and Local Codes and Ordinances.

D. Raceways:
   1. EMT, metal duct, IMC, surface metal raceways, or totally enclosed metal trough with flexible metal tubing unless otherwise noted.
   2. Provide rigid steel conduit raceways when raceway is buried or embedded in concrete.
   3. Provide 18 inches minimum to 36 inches maximum flexible metal conduit of galvanized steel construction for final connection to control devices. For connections to pipe mounted devices, and to devices in damp, wet, or exterior locations, or in mechanical rooms containing boilers or steam converters, provide oil-resistant liquid-tight flexible metal conduit.
   4. Provide EMT connectors with rain tight compression fittings and insulated throats.
   5. Wire mould is generally not allowed except as approved on a case-by-case basis with the owner's representative.

E. Wiring:
   1. Provide wire with copper stranded conductors. Provide color or number coded jackets.
   2. Low voltage wiring from control components to input/output modules: 20 gauge minimum foil-shielded cable rated 100 VDC at 80 deg C.
   3. Provide plenum rated cable whenever wire is run without conduit.
   4. Provide communications network wiring meeting the gauge, impedance, capacitance, resistance and shielding requirements specified by the manufacturer of the connected devices.
   5. Identify wires and cables with permanent self-laminating machine print labeling system. Provide labels capable of receiving 8 characters of type written text, with minimum print on area of 1 inch by 1/2 inch, and protected by a clear sheath. Thomas & Betts E-Z Code or equal.
   6. Support or bundle wire with self locking, UL listed cable ties. Provide 40 lb rated cable ties incorporating a stainless steel locking insert. Provide UL 94V-0 flammability rated, halar cable ties when installed without panel enclosure. Thomas & Betts Ty-Rap or equal.
   7. Provide cable tie anchors designed for mechanical anchoring, allowing removal of cable tie without removal of anchor, capable of accepting at a minimum a number 8 screw. Adhesive cable tie anchors are allowed only on the interior surface of panel doors. Panduit TM series or equal.

2.14 PANELS

A. General: Investigate potential reuse of existing panel enclosures, Otherwise locate new panels in same locations these panel were located.

1. UL listed, not over 24 inches wide by 42 inches high, constructed of 14 U.S.S gauge steel except that enclosures less than 20 inches in both dimensions may be 16 gauge. Provide multi-section or multiple individual panels as required. Hoffman or equal.
2. Equipped with subpanels.
3. Punched or stamped when needed to receive front mounted switches, gauges, indicating lights and alarms.
4. Secure to the front of every control panel that has more than one source of power the following warning label: The word "WARNING" shall be in 1 inch high letters. Other letters shall be 1/4 inch high.
    a. WARNING Complete de-energization of this control panel requires that circuit breakers supplying all equipment controlled by this panel be opened.
5. Provide track mounted terminals with integral permanent labeling system. Integral screws for securing connected wires. Voltage and amperage ratings to match terminated wire ratings. Marathon or equal.
6. Provide nylon insulated crimp connectors with voltage and amperage rating matching connected wire ratings unless terminal strip is designed to connect to connected wire type without using a crimp connector. Thomas & Betts STA-KON connectors or equal.
7. Indicating lamps on panel shall be long life type, rated for a minimum life of 10,000 hours.

B. Interior Enclosures:

1. Piano hinged front with latch and lock.
2. Baked enamel finish.
3. Concealed enclosures may be standard electrical boxes.

2.15 FIRESTOPPING

A. Capable of maintaining an effective barrier against flame, heat, and smoke. Metalines, Dow, 3M, or equal.

B. Provide installations classified in Underwriter's Laboratories (UL) Building Materials Directory or listed in the Warnock Hersey International Directory.

C. Paintable where exposed to view.

D. Waterproof in plumbing chases.

E. Provide the product of more than one manufacturer if required to provide listed installations throughout.

PART 3 EXECUTION

3.01 GENERAL

A. Modify existing control system devices as indicated. Extend and modify the existing wiring and control system power source to accommodate indicated direct digital control system devices.

B. Before beginning installation of new system components, test the existing system devices that are being reused in modified control systems for proper operation and report any devices in need of replacement or repair to the Project Manager. At the option of the Project Manager, he will issue a contract amendment to replace or repair the defective devices or he will have Owner maintenance personnel replace or repair the defective devices. The Contractor shall be responsible for providing new devices to replace existing devices that are not brought to the Project Manager’s attention before beginning installation of new system components.

C. Work must comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards. Perform work by persons qualified to produce

workmanship of specified quality. If required by the State of Alaska workers shall be licensed. If requested provide copy of license.

D. Do not install control devices in locations where they are subject to damage or malfunction due to normally encountered ambient temperatures.

E. Mount damper operators and other control devices secured to insulated ductwork on brackets such that the device is external of the insulation.

F. Schematics and diagrams, when indicated on the Drawings, show approximate functional relationships and sequences only. All required devices are not shown. Contractor is responsible for providing all components required for a complete functioning system selected to meet the specific functional requirements of each application.

G. Hard wire control devices. Do not use power line carriers.

H. Ensure that the direct digital controller network, and power wiring will support both a 15 percent increase in network length, and a 10 percent increase in controllers similar to those installed without having to add additional network repeaters, increase power wire size or circuit breaker capacity.

I. Unless indicated otherwise, connect the primary sensing input and the associated output for each control loop to the same controller. A secondary or resetting input may be attached to any controller and communicated over the network.

J. After the final inspection and subsequent punch list inspections provide wiring schematic and Control Drawings with written sequence of operations, 11 inches by 17 inches in size, produced from the as-built Control Drawings. Provide one copy in each Operation and Maintenance Manual, and one copy, at its applicable control panel. Provide one set of system backup on USB drive to restart and reload all programmable devices used in the control system.

K. Tune control loops to respond quickly to control fluctuations without hunting.

L. Label control devices mounted in the field and within control cabinets with 1/4 inch high white embossed letters and black tape background. Dymo or equal. Tags to match tags used on Control Drawings.

3.02 DEMOLITION

A. Remove existing valves, dampers, operators, sensors, and controllers that are replaced by new devices or that are not reused. Present all removed equipment to owner for first right of refusal before disposing of equipment. Review copy of existing system “As-Built” control schematics for existing device location and extent of required demolition.

B. Patch holes in existing ductwork at removed sensors that are not reused with sheet metal patches of equal gauge or heavier material sheet metal that are seal airtight with adhesive and then screwed or pop riveted to the ductwork.

C. Existing conduit and wiring may be reused when available and when wiring is rated for application. Remove existing unused conductors.

D. Demolish unused pneumatic tubing back to main air connection. Plug tubing with brass fittings.

E. Repairs: Any portion of the facility damaged, cut back or made inoperable shall be repaired with similar materials as the existing structure and/or damaged item as instructed by the Project Manager.

3.03 SHUT DOWN OF EXISTING SYSTEMS

A. Refrigeration, Heating and Ventilation are critical to the function of the facility. Schedule any required shutdowns with Project Manager. Provide a minimum of 5 days written notification to the Project Manager.

B. This building depends on operation of the ventilation systems for space heating and cooling. During system shutdowns the contractor is responsible for maintaining all spaces within the building at a minimum temperature of 68 deg F. and maximum of 77 deg F.

3.04 WIRING AND RACEWAYS

A. Permanently label electrical or electronic wiring at each end indicating location and the device at opposite end. At the direct digital controller end use either the I/O address, if it describes the connected device, or the unique control device tag used on the control schematics. At the device end indicate both the terminal number and the controller connected at the other end. For color coded multi-conductor cable, label cable sheath not individual conductors.

B. At field devices where conductors are not wired to terminal strips wire using a unique color for each conductor connected to that device.

C. Install wiring in a neat and orderly manner generally running along building lines.

D. Support low voltage wiring run without conduit at a maximum of 4 feet between anchors.

E. Seal conduit penetrations at floor and wall penetrations with firestopping installed as indicated. Note that this applies to all floor and wall penetrations, not just fire barrier penetrations. At all mechanical rooms or other rooms containing floor drains, except those with slab on grade floors, make penetration watertight and extend sleeve 3 inches above the floor.

F. Wire all electrical controls and switches furnished under this Section of the Specifications.

G. Make wire connections using factory fabricated jack assemblies, terminal strips, or solder connections. Use crimp connectors on stranded wire unless connecting to terminal strips approved for direct stranded wire connection. Insulate solder connections with heat shrink tubing. Field connections in control power wiring circuits may be made using wire nuts.

H. Avoid splices in signal wire, where unavoidable connect with solder connections and label on each side of splice. Use identical wire type and color on each side of splice.

I. Conceal wiring in finished areas. Unless otherwise noted, install wiring inside conduit or fully enclosed metallic raceway.

J. Low voltage wiring installed in concealed accessible locations may be run without conduit. Sleeve wiring at wall penetrations.

K. Metal raceways crossing expansion joints make provision for 3 way movement. For conduits 1 & 1/2 inch and larger use O-Z type DX fittings, or equal.

L. At raceway penetrations of the vapor barrier provide a double splice patch (one on each side of vapor barrier) by cutting a square piece of vapor barrier 12 inches larger on all sides than the pipe. Cut a round hole in the center of the square splice patch, smaller than the pipe, to form a stretched fit. Force the pipe through the splice patch and tape all sides to the vapor barrier and seal the vapor barrier to the pipe at the penetration with an adhesive compatible with the vapor barrier material.

M. Securely seal at both ends, raceways running from a warm area to a cold area. Ductseal or equal.

N. Install all wiring in accordance with National Electrical Code, and State and Local Codes and Ordinances.

3.05 PANELS

A. Provide UL listed panel assemblies when required by local authorities.

3.06 SENSORS AND SWITCHES

A. Mount room sensors and fan control switches in offices 48 inches above finished floor, with any operable portion no higher than 48 inches, unless otherwise indicated. Where adjacent to light switches mount at same height as switches to provide a clean horizontally aligned installation unless doing so requires the operable portion to be above 48 inches. For sensors with tamper proof guards, sensors may be mounted between 48 inches and 60 inches above finished floors.

B. Provide tamper proof protective guards for all components installed in public spaces. Concealed sensors can be used in lieu of protective guards if approved by Engineer.

C. Liquid or air flow across pumps, and fans, etc. shall be sensed using current sensor unless indicated otherwise.

D. Differential pressure transducers shall be used to sense differential pressure unless indicated otherwise.

E. Connect low temperature limit switches directly to the controlled equipment's motor starter control coil or, for equipment with no motor starter, to contacts of a relay in the equipment's power circuit.

F. Fill immersion fluid temperature sensor wells with heat conducting compound. At 1-1/2 inches and smaller piping install wells in pipe tees one size larger than line size.

G. Provide sensors and thermostats installed on exterior surfaces with insulated bases such that actual room temperature not wall surface temperature is sensed.

H. Provide ventilated, nonbreakable shields and mounting brackets for sensors which are indicated to have protective covers.

I. Provide averaging sensors in air handling unit casings or in areas where stratification is likely to occur. Provide averaging element of sufficient length to accurately indicate the average duct temperature.

J. Protect averaging or capillary tubes where they penetrate duct with rubber grommet and seal with clear silicon. Support averaging or capillary tubes with copper capillary clips which maintain a minimum tubing bend radius of 1 inch.

3.07 CONTROL POWER SUPPLY

A. Provide uniterruptible power supply (UPS) on power supply to all control panels and control transformers.

B. Provide electric power to control devices from control system power circuit or from device or equipment being controlled.

C. Carry a dedicated ground wire to controllers from the associated breaker panel. Do not use the conduit system for grounding purposes.

3.08 TESTING AND ADJUSTING

A. Upon completion of the installation, the contractor shall initiate operation of the control system and perform all necessary testing and diagnostics to ensure proper operation. A formal commissioning procedure shall be utilized to insure complete system integrity and conformance to these specifications. This procedure shall consist of two separate steps incorporating point verification and program verification. Commissioning forms shall address all field devices, field controllers, software statements, and software points. Submit for approval a written testing procedure indicating how each of these steps will be accomplished at least two weeks prior to the start of the commissioning process. See Section 23 08 00 for additional requirements.

B. Verify correct installation and wiring of all points.

C. Prior to commissioning the system, submit for approval Point Verification Commissioning Forms listing all points for the system.

D. Confirm that all devices are installed correctly. Verify that terminations are tight and of correct polarity. Document and signoff the results on Point Verification form.

E. Coordinate the final adjustments and "fine tuning" of control functions and devices so that the building, the mechanical systems, and the control systems operate and respond as an integrated, comfortable and energy efficient component of this facility.

F. Upon completion of start up test existing smoke detectors to ensure fan shutdown. Note that test of circuitry is sufficient.

G. Verify that all points are wired to the correct termination block at the control panel by verifying continuity between the device and the panel termination. Document and signoff results on Point Verification form. Verify that each sequence performs as specified in contract documents. Tune each loop as required for proper operation.

H. Document and signoff the results on Program Verification form.

I. Command all digital output points on and off and confirm proper operation of the associated output device. Command all analog output points to various levels within their range and confirm proper operation of the associated output device. Activate all digital input sensors and confirm proper point status at the panel. Measure conditions at all analog input sensors with an independent reference device, calibrate as required, and confirm proper point status at the panel. Document and signoff the results on Point Verification form.

J. Deficiencies revealed by failed test(s) shall be repaired and corrected and the test(s) repeated until successful.

K. Provide Substantial inspection data to consist of the following as a minimum:

1. Provide signed off Point Verification commissioning forms to mechanical engineer and owner prior to owner acceptance walkthrough.
2. Provide signed off Point Verification forms indicated the correct execution of all sequence of operations for each piece of equipment. List test procedure and results.
3. Point logs indicated point values with time and date stamp.

3.09 SPECIAL TOOLS AND SPARE PARTS

A. Provide three sets of special tools required to adjust control devices. This includes allen wrenches and other special tools. This does not include common tools such as pliers, adjustable wrenches, flat blade or Phillips screwdrivers. This set shall be provided during Owner instruction period and proper use shall be demonstrated to Owner personnel during said period.

3.10 DATABASE ARCHIVAL AND UPGRADE

A. Provide a complete database backup USB drive for the building management system and each direct digital controller to the Owner at final inspection. If software modifications are required during the warranty period update USB drive.

3.11 ORIENTATION AND TRAINING

A. Provide 40 hours of on-site orientation and training to Owner personnel designated by the Project Manager. Orientation and training sessions shall be conducted by a factory trained manufacturers representative familiar with the systems software, hardware, and accessories. Limit training time per day to 6 hours. Complete training and orientation according to the following schedule:

1. 24 hours (3 days) of instruction after acceptable performance of the system hardware and software has been established and prior to final inspection.
2. 16 hours (2 days) of instruction six months after final inspection.

B. Submit proposed training dates and instruction session course outlines for acceptance by Project Manager.

C. Provide instructions on all the operations listed in the initial course outline during the first training session. On subsequent sessions communicate in advance with facility supervisor to determine which operations require additional instruction.

D. Initial course outline:

1. Determine the control strategies that have been defined for a specific piece of equipment.
2. Utilize X-Y graphing and histories as an aid for control loop tuning.
3. Enable or disable control strategies.
4. Assign sensors and/or actuators to a control strategy.
5. Simulate control strategies with substituted inputs or outputs.
6. Define appropriate control loop algorithms and choose optimum loop parameters for loop control.
7. Add/delete control loops to the system.

8. Add/delete points to the system.
9. Label parameters and variables with names or acronyms of a minimum of eight letters.
10. Select points to be alarmable and define the alarm state(s).
11. Download programming to the system after all direct digital controllers and building management station program memory has been lost.
12. Process stored historical data and display and printout data in tabular and graphical formats.
13. Diagnose system malfunctions.
14. Change system operating sequences.

3.12 SUBSTANTIAL INSPECTION REQUIREMENTS

A. Substantial inspection data must be submitted for review, reviewed by the Project Manager, corrected in accordance with review comments, and accepted by the Project Manager before a request for final or substantial completion inspection will be considered by the Project Manager.

B. Prior to the substantial inspection, review and test entire installation for conformance with contract documents. Test shall include thorough field check of sequence of operations for each system and piece of equipment including simulation of all possible modes of operation. With the call for inspection, verify in writing that this system review and test has been performed and anything not conforming to contract documents shall be so noted.

C. During the Substantial inspection Contractor personnel shall provide on-site assistance to inspection personnel required for a complete and thorough inspection.

D. During the Substantial inspection Contractor personnel shall demonstrate that the control system performs in accordance with the contract documents. Provide material and personnel required to perform the demonstration.

END OF SECTION

SECTION 23 0993

SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof Top Unit.

B. Ventilation Fans.

C. Exhaust Fans.

D. Baseboard Convectors.

E. Cabinet Heaters.

F. Unit Heaters.

G. Snowmelt system.

H. Existing Equipment.

1.02 RELATED SECTIONS

A. Section 23 0500 - Common Work Results for HVAC.

B. Section 23 0923 - Direct Digital Control System for HVAC.

C. Section 23 2123 - Hydronic Pumps.

D. Section 23 7400 – Package Outdoor HVAC Equipment.

1.03 SYSTEM DESCRIPTION

A. This Section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other Sections.

1.04 SUBMITTALS

A. Submit under provisions of Division 01.

B. Submit diagrams indicating mechanical system controlled and control system components. Label with settings, adjustable range of control and limits. Include written description of control sequence.

C. Include flow diagrams for each control system, graphically depicting control logic.

D. Include draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.

1.05 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Division 01.

B. Accurately record actual setpoints and settings of controls, including changes to sequences made after submission of shop drawings.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.01 ROOF TOP UNIT

A. Alarms:

1. No flow.
2. Filter maintenance alarm.
3. Smoke detection.
4. Low temperature supply air temperature.
5. High temperature supply air temperature.

B. Manual Control and Indication:
   1. H-O-A Control.
   2. On-Off Indication.
   3. Outside air temperature indication.
   4. Supply air temperature set point.
   5. Supply air temperature indication.
   6. Return air temperature indication.
   7. Return air damper position indication.
   8. Relief air damper position indication.
   9. Outside air damper position indication.
   10. Economizer mode.
   11. Cooling stage (on, off, stage 1 through 6)
   12. Supply fan status
   13. Supply fan speed (Hz)
   14. Duct static pressure indication.
   15. Duct static pressure set point.
   16. Relief Fan status
   17. Relief Fan speed (Hz)
   18. Building static pressure indication.
   19. Building static pressure set point.
   20. Alarm set points.

C. Automated Control:
   1. Operation mode: Day and night mode of operation will be controlled by an occupied/unoccupied schedule.
   2. Night mode operation: During night mode of operation the AHU will run based upon zone night set back temperature. If any zone drops below night set back the unit shall start and run with the outside air dampers full closed and the return air dampers open.
   3. Override mode: Room DDC sensor over ride buttons shall override the time schedule and set the system into day mode for 2 hours.

D. Day mode operation:
   1. The outside air dampers shall open past minimum to maintain supply air temperature set point.
   2. The return air damper modulates with the outside air damper such that when the outside air damper is open the return air damper is closed.
   3. The supply air temperature shall be linearly reset between the two points as follows: When the outside air temperature is above 60 F the supply air temperature shall be maintained at 55 F; at 30 F outside the supply air temperature shall be maintained at 65 F.
   4. VFD Supply Fan: Duct static pressure sensor, two-thirds of the way down the supply duct system, will modulate the variable speed drive to maintain set point.
   5. Relief Fan: Building static pressure sensor, will modulate the variable speed drive to maintain set point.

E. On low supply air temperature alarm (initially 40º F, adjustable), delay two minutes, then O/A dampers will fully close, R/A dampers will fully open, and an alarm shall signal. Provide automatic reset of alarm after five minutes.

F. On smoke detection, the fan shall stop, O/A dampers will fully close, R/A dampers will fully open. Interconnect with fire alarm system such that upon smoke indication fire alarm system shall be signaled and conversely upon activation of the fire alarm system shall stop the fan as indicated above. Coordinate with fire alarm system.

3.02 VAV TERMINAL UNITS

A. Alarms:
   1. High space temperature.
   2. Low space temperature.
   3. Low air flow.
   4. High air flow.

B. Digital Control and Indication:
   1. Occupied space temperature setpoint.
   2. Unoccupied space temperature setpoint.
   3. Space temperature indication.
   4. Supply temperature indication (downstream of reheat coil).
   5. Operation mode schedule adjustment.
   6. Operation mode indication.
   7. Actual cfm indication.
   8. Occupied airflow setpoint.
   9. Unoccupied air flow setpoint.
   10. Alarm setpoints.

C. Automated Control:
   1. Operation Mode: Occupied and unoccupied mode of operation will be controlled by the DDC system.
   2. Occupied Mode: Air valve volume is maintained at the minimum flow per the supply air terminal schedule. Occupied space temperature is maintained by modulating the air valve in sequence with the two way control valve on the tempering coil.
   3. Unoccupied Mode: Air valve volume is maintained at the minimum air flow per the supply air terminal schedule. Unoccupied space temperature is maintained by modulating the two way control valve on the tempering coil.

3.03 EXHAUST FANS (EF-3 and 6)

A. Alarms:
   1. Fan failure (each fan).

B. Manual Control and Indication:
   1. H-O-A Control (each fan).
   2. On-Off Indication (each fan).

C. Automated Control:
   1. Exhaust fans run and the exhaust air damper opens whenever RTU-1 is operating in the day mode.

3.04 EXHAUST FANS (EF-11)

A. Alarms:
   1. Fan failure (each fan).

B. Manual Control and Indication:

1. H-O-A Control (each fan).
2. On-Off Indication (each fan).

C. Automated Control:

1. Exhaust fans run and the exhaust air damper opens whenever RTU-4 is operating in the day mode.

3.05 TRANSFER FAN (TF-1)

A. Alarms:

1. Fan failure (each fan).

B. Manual Control and Indication:

1. H-O-A Control (each fan).
2. On-Off Indication (each fan).

C. Automated Control:

1. Exhaust fan cycles on and off to maintain the temperature in the electrical room.

3.06 FIN-TUBE

A. Alarms:

1. High space temperature.
2. Low space temperature.

B. Digital Control and Indication:

1. Occupied space temperature setpoint.
2. Unoccupied space temperature setpoint.
3. Space temperature indication.
4. Operation mode schedule adjustment.
5. Operation mode indication.
6. Alarm setpoints.

C. Automated Control:

1. Operation Mode: Occupied and unoccupied mode of operation will be controlled by the DDC system.
2. Occupied Mode: Occupied space temperature is maintained by cycling the two way control valve on the fin-tube.
3. Unoccupied Mode: Occupied space temperature is maintained by cycling the two way control valve on the fin-tube.

3.07 CABINET UNIT HEATERS

A. Alarms:

1. High space temperature.
2. Low space temperature.

B. Digital Control and Indication:

1. Space temperature setpoint.
2. Space temperature indication.

C. Automated Control:

1. Fan shall cycle on/off and valve shall open/close to maintained setpoint.

3.08 UNIT HEATERS

A. Alarms:
   1. High space temperature.
   2. Low space temperature.

B. Digital Control and Indication:
   1. Space temperature setpoint.
   2. Space temperature indication.

C. Automated Control:
   1. Fan shall cycle on/off and valve shall open/close to maintained setpoint.

3.09 SNOWMELT SYSTEM

A. Alarms:
   1. Low Snowmelt System Temperature.
   2. Pump Failure, CP-1
   3. Pump Failure, CP-2
   4. High Slab Temperature.
   5. Maximum Slab Temperature Differential.
   6. Snowmelt Glycol Tank Low Alarm.

B. Digital Control and Indication:
   1. Glycol Supply Temperature Indication.
   2. Glycol Return Temperature Indication.
   3. Snowmelt Supply Temperature Indication.
   4. Snowmelt Return Temperature Indication.
   5. Snowelt Supply Temperature Setpoint.
   6. Slab Temperature Indication.
   7. Outdoor Temperature Indication.
   8. Snow/Ice Sensor.
   9. System Enable Setpoint.
   10. Pump Status.

C. Automated Control:
   1. Enable Snowmelt System when outside air temperature is below 38 Degrees F. When the snowmelt system is active, the pump shall operate continuously.
   2. Idle Mode: When snow is not detected the snow melt system shall be in idle mode. The 3-way control valve on the heat exchanger shall modulate to maintain the idling surface temperature setpoint.
   3. Melting Mode: When the slab embedded snow/ice sensor detects water, ice, or snow the 3-way control valve on the heat exchanger shall modulate to maintain the snow melt glycol discharge temperature.
   4. To protect the slab from cracking due to thermal stresses, the control system shall limit the rate of heat applied to the slab through a "ΔT Max" setting. The ΔT represents the difference between the slab supply and return fluid temperatures which are measured by the control system. If this temperature difference approaches the "ΔT Max" setting, the control system shall modulate the 3-way valve to maintain the ΔT at the "ΔT Max" setting.
   5. To protect the heat exchanger from freezing the 3-way modulating valve shall maintain a 10% minimum flow rate when OSA temperatures are below 35 Deg F.

6. Glycol Tank isolation valve shall normally be closed. Utilize supervised fill procedure only. Open isolation valve, Glycol Tank Package controls shall cycle pump on as required to obtain system operating pressure.

3.10 AIR CONDITIONING UNIT (AC-1)

A. Alarms:
   1. High Temperature Alarm.

B. Manual Control and Indication:
   1. None.

C. Automated Control:
   1. AC unit is controlled via manufactured supplied room sensor and controls.

END OF SECTION

SECTION 23 1123
FACILITY NATURAL-GAS PIPING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Pipe and pipe fittings.

B. Valves.

1.02 RELATED WORK

A. Section 23 0500 - Common Work Results for HVAC

B. Section 23 0519 - Meters and Gages for HVAC Piping.

C. Section 23 0529 - Hangers and Supports for HVAC Piping and Equipment.

D. Section 23 0548 - Vibration and Seismic controls for HVAC Piping, Ductwork and Equipment.

E. Section 23 0553 - Identification for HVAC Piping, Ductwork and Equipment.

1.03 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body.

1.04 SUBMITTALS

A. Submit product data under provisions of Division 01.

B. Include data on pipe materials, pipe fittings, valves and accessories.

1.05 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 and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.01 NATURAL GAS PIPING, ABOVE GRADE

A. Piping: Steel Pipe ASTM A53, Schedule 40 black. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, forged steel welding type.

B. Joints:

1. Low pressure, 2” and under: Screwed or Viega MegaPressG Cold Press Mechanical Joint. Press fittings are acceptable to last tee for connection to the appliance. Utilize threaded piping at the last tee.
2. Medium pressure or larger than 2”: ANSI/AWS D1.1, welded.

2.02 FLANGES, UNIONS, AND COUPLINGS

A. Pipe Size 2 Inches and Under: 150 psig malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.

B. Pipe Size Over 2 Inches: 150 psig forged steel slip-on flanges for ferrous piping; bronze flanges for copper piping: 1/16 inch thick preformed neoprene bonded to fiber.

C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.03 ACCEPTABLE MANUFACTURERS – GAS COCKS AND BALL VALVES

A. Apollo.

B. Hammond.

C. Milwaukee.

D. Nibco.

E. Substitutions: Under provisions of Division 01

2.04 GAS COCKS

A. Up to 2 Inches: Bronze body, bronze tapered plug. non-lubricated, Teflon packing, threaded ends.

B. Over 2 Inches: Cast iron body and plug, non- lubricated, Teflon packing, flanged ends.

2.05 BALL VALVES

A. Up to 2 Inches: Bronze two piece body, full port, forged brass, chrome plated ball, Teflon seats and stuffing box ring, lever handle, solder, threaded or press-fit ends.

B. Over 2 Inches: Cast steel, two piece body, full port chrome plated steel ball, Teflon seat and stuffing box seals, lever handle, flanged, solder, threaded or press-fit ends.

2.06 ACCEPTABLE MANUFACTURERS – SEISMIC VALVES

A. Pacific Seismic Products, PSP.

B. Substitutions: Under provisions of Division 01.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

D. Verify that excavations are to required grade, dry, and not over excavated.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom to conserve building space and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance for installation of insulation and access to valves and fittings.

H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.

I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

J. Install valves with stems upright or horizontal, not inverted.

K. Terminate plastic piping above ground with anodeless riser.

3.03 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

3.04 TESTING

A. Test all piping in accordance with IFGC and UPC requirements. The test pressure used shall be no less than 10 times the proposed maximum working pressure, but not less than 10 psig for low pressure gas systems (7 inch WC) or 60 psig for medium pressures gas systems (2 psig or 5 psig). All welded pipe shall be tested with not less than 60 psig test pressures.

END OF SECTION

SECTION 23 2113
HYDRONIC PIPING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Pipe and Pipe Fittings.

B. Valves.

C. Heating Water Piping System.

D. Glycol Water Piping System.

1.02 RELATED WORK

A. Section 23 0500 - Common Work Results for HVAC.

B. Section 23 0519 - Meters and Gages for HVAC Piping.

C. Section 23 0529 - Hangers and Supports for HVAC Piping and Equipment.

D. Section 23 0548 - Vibration and Seismic controls for HVAC.

E. Section 23 0553 - Identification for HVAC Piping, Ductwork and Equipment.

F. Section 23 0700 - HVAC Insulation.

G. Section 23 0923 - Direct Digital Control System for HVAC.

H. Section 23 2116 - Hydronic Piping Specialties.

I. Section 23 2123 - Hydronic Pumps.

J. Section 23 5700 - Heat Exchangers for HVAC.

K. Section 23 7400 – Packaged Outdoor HVAC Equipment.

L. Section 23 8200 - Convection Heating and Cooling Units.

1.03 REGULATORY REQUIREMENTS

A. Conform to ANSI/ASME B31.9.

1.04 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body.

B. Welding Materials and Procedures: Conform to ANSI/ASME SEC 9, and applicable state labor regulations.

C. Welders Certification: In accordance with ANSI/ASME SEC 9.

1.05 SUBMITTALS

A. Submit product data under provisions of Division 01.

B. Include data on pipe materials, pipe fittings, valves, and accessories.

1.06 WARRANTY

A. Polypropylene pipe and fittings shall be covered by a factory warranty for 30 years to be free of defects in materials or manufacturing.

1.07 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 and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.01 HEATING WATER AND GLYCOL PIPING, ABOVE GROUND

A. Steel Pipe: ASTM A53, Schedule 40, for sizes 4 inch and over, black.
   1. Fittings: ANSI/ASTM B16.3, malleable iron or ASTM A234, steel welding type fittings.
   2. Joints: Screwed, or ANSI/AWS D1.1, welded.

B. Copper Tubing: ASTM B88, Type L, hard drawn.
   1. Fittings: ANSI/ASME B16.18 Cast Copper Alloy Solder Joint Pressure Fittings or ANSI/ASME B16.22 Wrought Copper and Copper Alloy Solder Joint Pressure Fittings [or ANSI/ASME B16.50 Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings].
   2. Joints: ASTM B32, solder, Grade 95TA or ANSI/AWS A5.8, BCuP silver braze; Flux: ASTM B813.
   3. Press Fittings: Viega ProPress Fittings are allowed. Sealing elements for press fittings shall be EPDM.Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer. Press end shall have Smart Connect feature design leakage path. Smart Connect™ (SC Feature) In ProPress ½" to 4" dimensions the Smart Connect Feature assures leakage of liquids and/or gases from inside the system past the sealing element of an un-pressed connection. The function of this feature is to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.

C. Grooved piping systems are not allowed.

2.02 EQUIPMENT DRAINS AND OVERFLOWS

A. Steel Pipe: ASTM A53, Schedule 40 galvanized.
   1. Fittings: Galvanized cast iron, or ANSI/ASTM B16.3 malleable iron.
   2. Joints: Screwed, or grooved mechanical couplings.

B. Copper Tubing: ASTM B88, Type L, hard drawn.
   1. Fittings: ANSI/ASME B16.18 cast bronze, or ANSI/ASME B16.29 solder wrought copper.
   2. Joints: ASTM B32, solder, Grade 95TA or ANSI/AWS A5.8, BCuP silver braze; Flux: ASTM B813.

C. PVC Pipe: ASTM D1785, Schedule 40, and Schedule 80 for sizes 8 inch and larger, or ASTM D2241, SDR 21 or 26.
   1. Fittings: ASTM D2466 or D2467, PVC.
   2. Joints: ASTM D2855, solvent weld.

D. ABS Pipe: ASTM D2680 or D2751.
   1. Fittings: ASTM D2751.
   2. Joints: ASTM D2235, solvent weld.

2.03 FLANGES, UNIONS, AND COUPLINGS

A. Pipe Size 2 Inches and Under: 150 psig malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.

B. Pipe Size Over 2 Inches: 150 psig forged steel slip-on flanges for ferrous piping; bronze flanges for copper piping.

2.04 GATE VALVES

A. Gate valves will not be permitted. Use ball or butterfly valves for isolation.

2.05 GLOBE VALVES

A. Globe valves will not be permitted. Use ball or butterfly valves for throttling.

2.06 ACCEPTABLE MANUFACTURERS - ALL VALVE TYPES

A. Apollo.
B. Crane.
C. FNW.
D. Hammond.
E. Milwaukee.
F. NIBCO.
G. Red-White Valve Corp.
H. Substitutions: Under provisions of Division 01.

2.07 BALL VALVES

A. Up to 2 Inches: 600 PSI CWP Bronze two piece body, full port, forged brass, chrome plated ball, Teflon seats and stuffing box ring, lever handle, solder or threaded ends. Seat material to be compatible with fluid handled.]
B. Over 2 Inches: Cast steel, two piece body, full port chrome plated steel ball, Teflon seat and stuffing box seals, lever handle flanged. Seat material to be compatible with liquid handled.

2.08 PLUG COCKS

A. Up to 2 Inches: Bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends, with one wrench operator for every ten plug cocks.
B. Over 2 Inches: 285 CWP Cast iron body and plug, pressure lubricated, Teflon packing, flanged ends, with wrench operator with set screw.

2.09 BUTTERFLY VALVES

A. Over 2 Inches: 200 PSI CWP Ductile iron body, aluminum bronze disc, EPDM seat for service to 250º F, lug ends, extended neck, 10 position lever handle.

2.10 SWING CHECK VALVES

A. Up to 2 Inches: Bronze 45º swing disc, solder ends.
B. Over 2 Inches: Iron body, bronze trim, 45º swing disc, renewable disc and seat, flanged ends.

2.11 SPRING LOADED CHECK VALVES

A. Iron body, bronze trim, stainless steel spring, renewable composition disc, screwed, wafer or flanged ends.

2.12 RELIEF VALVES

A. Bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labeled.

2.13 HYDRONIC SYSTEM CLEANER

A. Acceptable Products:
    1. CH2O Boil Out Liquid
    2. Oatey Hercules Boiler and Heating System Cleaner.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
B. Remove scale and dirt on inside and outside before assembly.
C. Prepare piping connections to equipment with flanges or unions.
D. After completion, fill, clean, and treat systems.

3.02 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure, and maintain gradient.

B. Install piping to conserve building space, and not interfere with use of space and other work.

C. Group piping whenever practical at common elevations.

D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 23 0516.

E. Provide clearance for installation of insulation, and access to valves and fittings.

F. Provide access where valves and fittings are not exposed.

G. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

H. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

I. Prepare pipe, fittings, supports, and accessories for finish painting. Refer to Division 09.

J. Install valves with stems upright or horizontal, not inverted.

K. Support all piping in accordance with International Mechanical Code and Manufacturer installation instructions. Where there is a conflict between requirements of the Mechanical Code and Manufacturer installation instructions, the more restrictive requirement shall apply.

3.03 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.

C. Install ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

D. Install ball or butterfly valves for throttling, bypass, or manual flow control services.

E. Provide spring loaded check valves on discharge of condenser water pumps.

F. Provide ¾ inch ball drain valves at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.

3.04 CLEANING OF THE HYDRONIC SYSTEM

A. Prior to starting work, verify system is complete. Thoroughly flush and drain the system. Clean all strainer baskets and start-up screens on pump suction diffusers. Re-install strainer baskets and start-up screens and refill system.

B. Fill the hydronic piping systems with the system cleaner in accordance with cleaning compound directions for use.

C. Boil out system for a minimum period of four (4) hours [or as recommended by system cleaner, boiler, chiller start-up instructions] at a system design operating temperature.

D. Upon completion of boil out, completely flush system and drain all low points. Remove and clean and re-install all strainer baskets. Remove start-up screens on pump suction diffusers.

E. Fill system with water or glycol as indicated on the plans. Feed water to system through make-up line with pressure regulator, venting system high points. Set to fill at 12 psig. Pressure system cold at 5 psig, adjust when hot to 12 psig. See Specification Section 23 2116 for glycol fill procedures.

F. Submit a written and signed statement to the Owner that the above referenced cleaning procedures have been completed.

3.05 TESTING

A. Test all heating water and glycol piping hydrostatically at 100 psig or 150 percent of working pressure, whichever is greater, for a period of 4 hours. Observe piping during this period and repair all leaks.

END OF SECTION

SECTION 23 2116
HYDRONIC SPECIALTIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Expansion Tanks.

B. Air Vents.

C. Air Separators.

D. Strainers.

E. Flow Indicators, Controls, Meters.

F. Balance Valves.

G. Flow Control Valves.

H. Relief Valves.

I. Glycol Specialties.

1.02 RELATED WORK

A. Section 23 0500 - Common Work Results for HVAC.

B. Section 23 0529 - Hangers and Supports for HVAC Piping and Equipment.

C. Section 23 0548 - Vibration and Seismic controls for HVAC.

D. Section 23 0923 - Direct Digital Control System for HVAC.

E. Section 23 2123 - Hydronic Pumps.

F. Section 23 5700 - Heat Exchangers for HVAC.

1.03 REFERENCES

A. ANSI/ASME - Boilers and Pressure Vessels Code.

1.04 REGULATORY REQUIREMENTS

A. Conform to ANSI/ASME Boilers and Pressure Vessels Code Section 8D for manufacture of tanks.

1.05 QUALITY ASSURANCE

A. Manufacturer: For each product specified, provide components by same manufacturer throughout.

1.06 SUBMITTALS

A. Submit product data under provisions of Division 01 and Section 23 0500.

B. Submit glycol solution test results with glycol percentage and PH after system fill procedures are completed.

1.07 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 01.

B. Include installation instruction, assembly views, lubrication instructions, and replacement parts list.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 01.

B. Store and protect products under provisions of Division 01.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - DIAPHRAGM-TYPE COMPRESSION TANKS

A. Amtrol.

B. Taco.

C. Bell & Gossett.

D. Substitutions: Under provisions of Division 01.

2.02 DIAPHRAGM-TYPE COMPRESSION TANKS

A. Construction: Welded steel, tested and stamped in accordance with Section 8D of ANSI/ASME Code; supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.

B. Accessories: Pressure gauge and air-charging fitting, tank drain; precharge to 12 psig.

2.03 ACCEPTABLE MANUFACTURERS - AIR VENTS

A. Taco.

B. Amtrol.

C. Bell & Gossett.

D. Substitutions: Under provisions of Division 01.

2.04 AIR VENTS

A. Manual Type: Disk type vent with built-in check valve for manual or automatic operation, discs replaceable without draining system, 1/8 inch shank, rated at 50 psi; Hoffman No. 508 or equal.

B. Float Type: Maintenance free solid brass construction, continuous air venting, 150 psig standard working pressure, 240° F maximum temperature, 1⁄2 inch male tread at vent point for pressure testing or remote venting, 1/2 or ¾ inch female threaded connections. Provide with mini ball valve for isolation. Taco 409 , Spirotherm Spirotop VTP or approved equal.

C. High Capacity Automatic Air Vent: Cast iron body, stainless steel and brass trim, EPDM diaphragm, rated for 250°F, 2 PSIG through 150 PSIG, ¾ inch system connection, 3/8 inch NPT connection to atmosphere with drain piping. Provide with isolation valve and strainer upstream of vent. Armstrong AAE-750 or equal.

2.05 ACCEPTABLE MANUFACTURERS - AIR SEPARATORS

A. Spirotherm.

B. Armstrong

C. Bell & Gossett.

D. Taco.

E. Substitutions: Under provisions of Division 01.

2.06 AIR SEPARATORS

A. Coalescing type combination air eliminator and dirt separator fabricated of steel, rated for 150 psig working pressure, stamped and registered in accordance with ASME Section VIII, Division 01 for unfired pressure vessels, and include two equal chambers above and below the inlet / outlet nozzles. Unit shall include internal elements filling the entire vessel to suppress turbulence and provide air elimination efficiency of 100% free air, 100% entrained air, and 99.6% dissolved air at the installed location. Dirt separation efficiency shall be a minimum of 80% of all particles 30 micron and larger within 100 passes. The elements must consist of a copper core tube with continuous wound copper wire medium permanently attached and followed by a separate continuous wound copper wire permanently affixed. Each unit shall have a separate venting chamber to prevent system contaminants from harming the float and venting valve operation. At the top of the venting chamber shall be an integral full port float actuated

brass venting mechanism. Units shall include a valved side tap to flush floating dirt or liquids and for quick bleeding of large amounts of air during system fill or refill.

B. Air Elimination Valve: Bronze, float operated, for 125 psig operating pressure.

2.07 ACCEPTABLE MANUFACTURERS - STRAINERS

A. Bell & Gossett.

B. Taco.

C. Armstrong.

D. Substitutions: Under provisions of Division 01.

2.08 STRAINERS

A. Size 2 inch and Under: Screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

B. Size 2-½ inch to 4 inch: Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.

C. Size 5 inch and Larger: Flanged iron body for 175 psig working pressure, basket pattern with 1/8 inch stainless steel perforated screen.

2.09 ACCEPTABLE MANUFACTURERS - PUMP SUCTION AND DISCHARGE FITTINGS

A. Taco.

B. Bell & Gossett.

C. Armstrong.

D. Metraflex.

E. Substitutions: Under provisions of Division 01.

2.10 ACCEPTABLE MANUFACTURERS - FLOW CONTROL VALVES

A. Griswold.

B. FlowCon.

C. Hydronic Components, Inc., HCI

D. RWV Hydronic Controls.

E. Substitutions: Under provisions of Division 01.

2.11 FLOW CONTROL VALVES

A. Construction, Valves 2” and Smaller: ASTM B584 Brass body, rated at 300 psig @ 250 ºF with union on inlet temperature and pressure test plug on inlet and outlet.

B. Construction, Valves larger than 2”: Class 150 Flange End Valves shall consist of steel pipe with flange ends, and stainless steel flow control cartridge assembly; 230 psig @ 250 ºF; flange ends compatible with ANSI B 16.5-2017 150 lb. Steel flanges shall be permanently marked to show direction of flow.

C. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 14 times minimum pressure required for control. Four operating pressure ranges shall be available with the minimum range requiring less than 3 psi differential pressure to actuate the mechanism.

D. Control Mechanism: Stainless steel one-piece cartridge with segmented port design and full travel linear coil spring.

E. Accessories:

1. In-line strainer on inlet and ball valve on outlet.
2. Pressure/temperature test valves.

3. Provide Identification tags indelibly marked with flow rate, model number, zone identification. Tags shall be 3" x 3" aluminum.

2.12 ACCEPTABLE MANUFACTURERS - BALANCE VALVES

A. Armstrong.

B. Taco.

C. Bell & Gossett.

D. Substitutions: Under provisions of Division 01.

2.13 BALANCE VALVES

A. Angle or straight pattern, inside screw globe valve for 125 psig working pressure, with bronze body and integral union for screwed connections, renewable composition disc, plastic wheel handle for shut-off service, and lockshield key cap [and set screw memory bonnet] for balancing service.

2.14 ACCEPTABLE MANUFACTURERS - RELIEF VALVES

A. Watts.

B. Taco.

C. Bell & Gossett.

D. Substitutions: Under provisions of Division 01.

2.15 RELIEF VALVES

A. Bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labeled.

2.16 GLYCOL SYSTEM – HEATING SYSTEM

A. Provide new glycol for the entire PCC II boiler and heating system including the remodel areas and the non-remodeled areas.

B. Glycol Solution: Dow Frost HD, Inhibited propylene glycol and water solution mixed 50-50 suitable for operating temperatures of -29º F. The glycol shall be delivered to site in sealed containers, provide with color dye red.

2.17 GLYCOL SYSTEM – SNOWMELT SYSTEM

A. HDPE storage/mixing tank with cover; pump suction hose with inlet strainer; pressure pump with thermal cut-out; integral pressure switch; integral check valve; cord and plug; pre-charged accumulator tank with EPDM diaphragm; manual diverter valve for purging air and agitating contents of storage tank; 10 to 25 psi pressure adjustable regulating valve complete with pressure gauge; integral replaceable strainer; built-in check valve; union connection; low level pump cut-out. Pressure pump shall be capable of running dry without damage. Unit shall be completely pre-assembled and certified by a recognized testing agency to CSA standard C22.2 No 68.

B. Glycol Solution: Dow Frost HD, Inhibited propylene glycol and water solution mixed 50-50 suitable for operating temperatures of -29º F. The glycol shall be delivered to site in sealed containers, provide with color dye red.

PART 3 EXECUTION

3.01 INSTALLATION AND APPLICATION

A. Install specialties in accordance with manufacturer's instructions to permit intended performance.

B. Support tanks inside building from building structure.

C. Provide manual air vents at system high points and as indicated.

D. Provide air separator on suction side of system circulation pump and connect to expansion tank.

E. Provide valved drain and hose connection on strainer blow down connection.

F. Provide shutoff valves on water inlet to terminal heating units such as radiation, unit heaters, and fan coil unit.

G. Provide flow controls valves on water outlet from terminal heating units.

H. Provide relief valves on heat exchangers.

I. Pipe relief valve outlet to floor.

3.02 GLYCOL APPLICATION

A. Clean and flush piping system before adding glycol solution. All of the existing glycol in the system shall be thoroughly flushed from the hydronic system and disposed of. Provide new glycol for the entire PCC II heating system including remodel and non-remodeled areas.

B. Perform tests determining strength of glycol and water solution and submit written test results.

3.03 AIR VENT APPLICATION SCHEDULE

Location	Type
Terminal heating units, mains below	Manual
Terminal heating units, mains above	None
Heating mains, at high points in system	Automatic
Combination air separator/strainers	High capacity

Note: For terminal heating units, mains above unit, install branch piping connections at bottom of mains or 45° from bottom to allow air migration to mains.

END OF SECTION

SECTION 23 2123
HYDRONIC PUMPS

PART 1 GENERAL

1.01 WORK INCLUDED

A. In-line Circulators.

1.02 RELATED WORK

A. Section 23 0500 - Common Work Results for HVAC.

B. Section 23 0519 - Meters and Gages for HVAC Piping.

C. Section 23 0553 - Identification for HVAC Piping, Ductwork and Equipment.

D. Section 23 0923 - Direct Digital Control System for HVAC.

E. Section 23 2113 - Hydronic Piping.

F. Section 23 2116 - Hydronic Piping Specialties.

1.03 REFERENCES

A. ANSI/UL 778 - Motor Operated Water Pumps.

1.04 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacture, assembly, and field performance of pumps with minimum three years' experience.

1.05 SUBMITTALS

A. Submit product data under provisions of Division 01.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 01.

B. Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 01.

B. Store and protect products under provisions of Division 01.

1.08 EXTRA PARTS

A. Provide one extra set of mechanical seals for pumps.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Grundfos.

B. Bell & Gossett.

C. Taco.

D. Armstrong.

E. Substitutions: Under provisions of Division 01.

2.02 GENERAL CONSTRUCTION REQUIREMENTS

A. Balance: Rotating parts, statically and dynamically.

B. Construction: To permit servicing without breaking piping or motor connections.

C. Pump Motors: Operate at 1750 rpm unless specified otherwise.

D. Pump Connections: Flanged.

2.03 IN-LINE CIRCULATORS

A. Type: Maintenance free, self-lubricated, 3 speed industrial/commercial single stage, direct drive circulator.

B. Casing: Cast iron.

C. Impeller: Type 304 stainless steel.

D. Bearings: Upper and lower radial bearings to be aluminum oxide ceramic, tungsten carbide shaft bearing surfaces.

E. Shaft: Stainless steel with type 430F.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install pumps in accordance with manufacturer's instructions.

B. Provide access space around pumps for service. Provide no less than minimum as recommended by manufacturer.

C. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

D. Decrease from line size with long radius reducing elbows or reducers.

E. Support piping adjacent to pump such that no weight is carried on pump casings. In-line pumps are supported by adjacent piping.

F. Provide line sized shut-off valve and strainer on pump suction, and line sized combination pump discharge valve on pump discharge.

END OF SECTION

SECTION 23 3100
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Duct Materials.
2. Insulated Flexible Ducts.
3. Casings.
4. Ductwork Fabrication.

1.02 RELATED SECTIONS

A. Section 23 0700 - HVAC Insulation: Product requirements for duct liners for placement by this section.

B. Section 23 3300 - Air Duct Accessories: Product requirements for duct accessories for placement by this section.

1.03 REFERENCES

A. ASTM International:

1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
3. ASTM A568/A568M - Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
4. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
5. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
6. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. National Fire Protection Association:

1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
2. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems.
3. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

C. Sheet Metal and Air Conditioning Contractors:

1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

D. Underwriters Laboratories Inc.:

1. UL 181 - Factory-Made Air Ducts and Connectors.

1.04 DEFINITIONS

A. Duct Sizes: Inside clear dimensions. For lined ducts, maintain sizes inside lining.

B. Low Pressure: Three pressure classifications: ½ inch WG positive or negative static pressure and velocities less than 2,000 fpm; 1 inch WG positive or negative static pressure and velocities less than 2,500 fpm and 2 inch WG positive or negative static pressure and velocities less than 2,500 fpm.

C. Medium Pressure: Three pressure classifications: 3 inch WG positive or negative static pressure and velocities less than 4,000 fpm, 4 inch WG positive static pressure and velocities greater than 2,000 fpm, 6 inch WG positive static pressure and velocities greater than 2,000 fpm.

D. High Pressure: 10 inch WG positive static pressure and velocities greater than 2,000 fpm.

1.05 PERFORMANCE REQUIREMENTS

A. Variation of duct configuration or sizes other than those of equivalent or lower loss coefficient is not permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.06 SUBMITTALS

A. See General Conditions and the General Requirements in Division 01 regarding submittals.

B. Shop Drawings: Submit duct fabrication drawings, drawn to scale not smaller than 1/8” inch equals 1 foot, on drawing sheets same size as Contract Documents, indicating:

1. Fabrication, assembly, and installation details, including plans, elevations, sections, details of components, and attachments to other work.
2. Duct layout, indicating pressure classifications and sizes in plan view. For exhaust duct systems, indicate classification of materials handled as defined in this section.
3. Fittings.
4. Reinforcing details and spacing.
5. Penetrations through fire rated and other walls.
6. Terminal unit and coils

C. Product Data: Submit data for duct materials, duct liner.

1.07 CLOSEOUT SUBMITTALS

A. Division 01 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.08 QUALITY ASSURANCE

A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and flexible.

B. Maintain one copy of each document on site.

1.09 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Division 01 - Product Requirements.

B. Do not install duct sealant when temperatures are less than those recommended by sealant manufacturers.

C. Maintain temperatures during and after installation of duct sealant.

1.11 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.12 WARRANTY

A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

PART 2 PRODUCTS

2.01 DUCT MATERIALS

A. Galvanized Steel Ducts: ASTM A653/A653M galvanized steel sheet, lock-forming quality, having G90 zinc coating of in conformance with ASTM A90/A90M.

B. Fasteners: Rivets, bolts, or sheet metal screws.

C. Hanger Rod: ASTM A36/A36M; steel [, galvanized]; threaded both ends, threaded one end, or continuously threaded.

2.02 LOW PRESSURE DUCTWORK FABRICATION

A. Fabricate and support rectangular ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible and ASHRAE handbooks, except as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

B. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.

C. Construct T's, bends, and elbows with minimum radius 1-1/2 times centerline duct width. Where not possible and where rectangular elbows are used, provide airfoil turning vanes. Where acoustical lining is indicated, furnish turning vanes of perforated metal with glass fiber insulation.

D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30° divergence upstream of equipment and 45°convergence downstream.

E. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.

F. Provide standard 45-degree lateral wye takeoffs. When space does not allow 45-degree lateral wye takeoff, use 90-degree conical tee connections.

G. Provide easements where low pressure ductwork conflicts with piping and structure. Where easements exceed 10 percent duct area, split into two ducts maintaining original duct area.

H. Connect flexible ducts to metal ducts with draw bands.

I. Use crimp joints with or without bead for joining round duct sizes 12” and smaller with crimp in direction of airflow.

J. Use double nuts and lock washers on threaded rod supports.

2.03 MEDIUM PRESSURE DUCTWORK FABRICATION

A. Fabricate and support rectangular ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible and ASHRAE handbooks, except as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

B. Construct T's, bends, and elbows with minimum radius 1-1/2 times centerline duct width. Where not possible and where rectangular elbows are used, provide airfoil turning vanes. Where acoustical lining is indicated, furnish turning vanes of perforated metal with glass fiber insulation.

C. Transform duct sizes gradually, not exceeding 15° divergence and 30° convergence.

D. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.

E. Provide standard 45-degree lateral wye takeoffs. When space does not allow 45-degree lateral wye takeoff, use 90-degree conical tee connections.

F. Plenum connections: Ensure round duct connections are welded joint bellmouth type.

2.04 INSULATED FLEXIBLE DUCTS

A. Manufacturers:
   1. Thermaflex Model M-KC.
   2. Hart & Cooley Model F294, FB294.
   3. Substitutions: Division 01 - Product Requirements.

B. Product Description: UL 181, Class 1, coated fiberglass woven fabric supported by coated helical wound spring steel wire; fiberglass insulation; aluminized polyester vapor barrier film. Thermal Resistance: R-4.2 for 1.5" thickness.

PART 3 EXECUTION

3.01 EXAMINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Verify sizes of equipment connections before fabricating transitions.

3.02 INSTALLATION

A. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. During construction, install temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

C. Use crimp joints with or without bead or beaded sleeve couplings for joining round duct sizes 12" and smaller.

D. Install duct hangers and supports in accordance with Section 23 0529.

E. Use double nuts and lock washers on threaded rod supports.

F. Connect flexible ducts to metal ducts with draw bands.

G.

3.03 INTERFACE WITH OTHER PRODUCTS

A. Install openings in ductwork where required to accommodate thermometers and controllers. Install pitot tube openings for testing of systems. Install pitot tube complete with metal can with spring device or screw to prevent air leakage. Where openings are provided in insulated ductwork, install insulation material inside metal ring.

B. Connect diffusers to low pressure ducts with a minimum of 5 feet and a maximum length 10 feet of flexible duct.

3.04 SCHEDULES

A. Ductwork Material Schedule:

Air System	Material
Low Pressure Supply	Steel
Medium Pressure Supply	Steel
Return and Relief	Steel
General Exhaust	Steel

END OF SECTION

SECTION 23 3300
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Duct Access Doors.
   2. Volume Control Dampers.
   3. Flexible Duct Connections.
   4. Duct Test Holes.
   5. Turning Vanes.

1.02 RELATED SECTIONS

A. Section 23 3100 - HVAC Ducts and Casings.

1.03 REFERENCES

A. Air Movement and Control Association International, Inc.:
   1. AMCA 500 - Test Methods for Louvers, Dampers, and Shutters.

B. ASTM International:
   1. ASTM E1 - Standard Specification for ASTM Thermometers.

C. National Fire Protection Association:
   1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
   2. NFPA 92A - Recommended Practice for Smoke-Control Systems.

D. Sheet Metal and Air Conditioning Contractors:
   1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

1.04 SUBMITTALS

A. Division 01 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers and duct access doors.

C. Product Data: Submit for the following. Include where applicable electrical characteristics and connection requirements.
   1. Backdraft dampers.
   2. Flexible duct connections.
   3. Volume control dampers.
   4. Duct access doors.
   5. Duct test holes.

1.05 CLOSEOUT SUBMITTALS

A. Division 01 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of access doors and test holes

1.06 QUALITY ASSURANCE

A. Dampers tested, rated and labeled in accordance with the latest UL requirements.

B. Damper pressure drop ratings based on tests and procedures performed in accordance with AMCA 500.

C. Maintain one copy of each document on site.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years [documented] experience.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Division 01 - Product Requirements: Product storage and handling requirements.

B. Protect dampers from damage to operating linkages and blades.

C. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.

D. Storage: Store materials in a dry area indoor, protected from damage.

E. Handling: Handle and lift dampers in accordance with manufacturer's instructions. Protect materials and finishes during handling and installation to prevent damage.

1.09 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 COORDINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Coordinate Work where appropriate with building control Work.

PART 2 PRODUCTS

2.01 DUCT ACCESS DOORS

A. Manufacturers:

1. Duro-Dyne.
2. Ruskin.
3. Nailor.
4. Substitutions: General Conditions of the Contract - Product Requirements.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.

C. Review locations prior to fabrication.

D. Fabricate rigid and close-fitting doors of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum one inch thick insulation with sheet metal cover.

E. Access doors smaller than 12 inches square may be secured with sash locks.

F. Provide two hinges and two sash locks for sizes up to 18 inches square, three hinges and two compression latches with outside and inside handles for sizes up to 24 x 48 inches. Provide an additional hinge for larger sizes.

G. Access doors with sheet metal screw fasteners are not acceptable.

2.02 VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

B. Fabricate single blade dampers for duct sizes to 9-1/2 x 30 inch.

C. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 12 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

D. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

E. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where rod lengths exceed 30 inches provide regulator at both ends. Where volume dampers are located

above gypsum or other non-accessible ceilings, extend damper rods to ceiling and install recessed concealed regulator with adjustable cover for flush installation, with cover. Exposed portions shall be chrome plated. Regulator shall include spring washer, lock nut, coupling, ninety degree screw or gear drive and rod as required, Young Regulator or equal.

F. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

2.03 FLEXIBLE DUCT CONNECTIONS

A. Manufacturers:

1. Duro-Dyne.
2. Substitutions: Division 01 - Product Requirements. [Not Permitted].

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards, and as indicated.

C. UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 20 oz. per sq. yd., approximately 3 inches wide, crimped into metal edging strip.

D. Leaded vinyl sheet, minimum 0.55 inch thick, 0.87 lbs. per sq. ft., 10 dB attenuation in 10 to 10,000 Hz range.

2.04 DUCT TEST HOLES

A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.05 TURNING VANES

A. Double Width: Air foil design double width galvanized turning vanes with 2 inch inside radius.

B. Single Width: Single galvanized turning vane with 2 inch radius and minimum 1" trailing straight leg.

C. Acoustical Vanes: Double width vanes with inner vane of perforated galvanized steel with 3/32 inch holes on 5/32 inch spacing. Fill space between vanes with minimum 1.5 lb/cu ft glass fiber duct liner.

PART 3 EXECUTION

3.01 EXAMINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Verify rated walls are ready for fire damper installation.

C. Verify ducts and equipment installations are ready for accessories.

D. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

3.02 INSTALLATION.

A. Install in accordance with NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 31 00 for duct construction and pressure class.

B. Install back-draft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Access Doors: Install access doors at the following locations and as indicated:

1. Upstream of each reheat coil.
2. Downstream of each VAV box.

D. Access Door Sizes: Install minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Install 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

E. Install temporary duct test holes as required for testing and balancing purposes. Cut or drill in ducts. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

3.03 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Inspect turning vanes for proper and secure installation.
4. Operate remote damper operators to verify full range of movement of operator and damper.

3.04 DEMONSTRATION

A. Division 01 - Execution and Closeout Requirements: Requirements for demonstration and training.

B. Demonstrate re-setting of fire dampers to Owner's representative.

END OF SECTION

SECTION 23 3400
HVAC FANS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Downblast centrifugal roof fans.
   2. Upblast centrifugal roof fans.
   3. Ceiling cabinet fans.
   4. Inline cabinet fans.
   5. Centrifugal square inline fans.

B. Related Sections:
   1. Section 23 0500 - Common Work Results for HVAC.
   2. Section 23 0529 - Hangers and Supports for HVAC Piping and Equipment.
   3. Section 23 0548 - Vibration and Seismic Controls for HVAC Piping and Equipment.
   4. Section 23 0553 - Identification for HVAC Piping, Ductwork and Equipment.
   5. Section 23 0593 - Testing, Adjusting and Balancing.
   6. Section 23 0700 - HVAC Insulation.
   7. Section 23 0923 - Direct-Digital Control System for HVAC.
   8. Section 23 0993 - Sequence of Operations for HVAC Controls.
   9. Section 23 3100 - HVAC Ducts and Casings.
   10. Section 23 3300 - Air Duct Accessories.
   11. Division 26 - Equipment Wiring Connections: Execution and product requirements for connecting equipment specified by this section.

1.02 REFERENCES

A. American Bearing Manufacturers Association:
   1. ABMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
   2. ABMA 11 - Load Ratings and Fatigue Life for Roller Bearings.

B. Air Movement and Control Association International, Inc.:
   1. AMCA 99 - Standards Handbook.
   2. AMCA 204 - Balance Quality and Vibration Levels for Fans.
   3. AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
   4. AMCA 300 - Reverberant Room Method for Sound Testing of Fans.
   5. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

C. National Electrical Manufacturers Association:
   1. NEMA MG 1 - Motors and Generators.
   2. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

D. Underwriters Laboratories Inc.:
   1. UL 705 - Power Ventilators.

1.03 SUBMITTALS

A. Submit shop drawings and product data under provisions of [Division 01]

B. Product Data: Submit data on each type of fan and include accessories, fan curves with specified operating point plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity, electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Submit fan manufacturer’s instructions.

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

1.04 CLOSEOUT SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Operation and Maintenance Data: Submit instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.05 QUALITY ASSURANCE

A. Performance ratings: Conform to AMCA standard 211 and 311. Fans must be tested in accordance with ANSI/AMCA Standard 210-99 and AMCA Standard 300-96 in an AMCA accredited laboratory. Fans shall be certified to bear the AMCA label for sound and air performance seal.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing Work of this section with minimum years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 01 in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs.

1.08 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Greenheck Corp.

B. Loren Cook Company.

C. Twin City.

D. Substitutions: Under provisions of Division 01.

2.02 GENERAL

A. Fans used shall not decrease motor size, increase noise level, or increase tip speed by more than 10 percent, or increase inlet air velocity by more than 20 percent, from specified criteria. Fans shall be capable of accommodating static pressure variations of plus or minus 10 percent.

B. Base performance on sea level conditions unless otherwise noted.

C. Statically and dynamically balance fans to eliminate vibration or noise transmission to occupied areas.

2.03 DOWNBLAST CENTRIFUGAL ROOF FANS

A. Fan Unit: Downblast type. direct drive, with spun aluminum housing; resilient mounted motor; aluminum wire bird screen; square base to suit roof curb with continuous curb gaskets.

B. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

C. Motor: Electronically commutated variable speed.

2.04 CENTRIFUGAL SQUARE INLINE FANS

A. Product Description: Direct drive with galvanized steel housing, integral inlet cone, removable access doors on 3 sides, inlet and outlet duct collar, horizontal hanging brackets.

B. Fan Wheel: Backward inclined centrifugal type, aluminum construction.

C. Motor and Drive Mounting: Out of air stream.

D. Motor: Open drip proof.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof curbs are installed and dimensions are as instructed by manufacturer.

3.02 PREPARATION

A. Coordinate with other trades for installation of roof curbs. Refer to requirements of Division 07 for installation.

3.03 INSTALLATION

A. Secure roof fans and lag screws to curb.

B. Suspended Fans: Install flexible connections between fan and ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

C. Install backdraft dampers on exhaust fans.

3.04 CLEANING

A. Vacuum clean inside of fan cabinet.

3.05 DEMONSTRATION

A. Demonstrate fan operation and maintenance procedures.

3.06 PROTECTION OF FINISHED WORK

A. Do not operate fans for until ductwork is clean, filters in place, bearings lubricated, and fan has been test run under observation.

END OF SECTION

SECTION 23 3600
AIR TERMINAL UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Variable volume terminal units.

B. Integral heating coils.

1.02 RELATED SECTIONS

A. Section 23 0500 - Common Work Results for HVAC.

B. Section 23 0529 - Hangers and Supports for HVAC Piping and Equipment.

C. Section 23 0548 - Vibration and Seismic Controls for HVAC Piping and Equipment.

D. Section 23 0553 - Identification for HVAC Piping, Ductwork and Equipment.

E. Section 23 0593 - Testing, Adjusting and Balancing.

F. Section 23 0700 - HVAC Insulation.

G. Section 23 0923 - Direct-Digital Control System for HVAC.

H. Section 23 2113 - Hydronic Piping.

I. Section 23 2116 - Hydronic Specialties.

J. Section 23 3100 - HVAC Ducts and Casings.

K. Section 23 3300 - Air Duct Accessories.

L. Division 26 - Equipment Wiring Connections: Execution and product requirements for connecting equipment specified by this section.

1.03 REFERENCES

A. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

B. UL 181 - Factory-Made Air Ducts and Connectors.

1.04 SUBMITTALS

A. Submit product data under provisions of Section 23 0500 and Division 01.

B. Submit product data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings which indicate air flow, static pressure, and NC designation.

C. Submit manufacturer's installation instructions under provisions of Section 23 0500 and Division 01 Standard General Provisions.

1.05 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 23 0500 and Division 01.

B. Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.

1.07 WARRANTY

A. Provide warranty under provisions of Division 01.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Titus.

B. Price.

C. Trane.

D. Substitutions: Under provisions of Division 01 Standard General Provisions.

2.02 VARIABLE AIR VOLUME (VAV) TERMINAL UNITS

A. Terminals shall be certified under the ARI Standard 880 Certification Program and carry the ARI Seal. Noncertified terminals may be submitted after testing at an independent testing laboratory under conditions selected by the engineering consultant in full compliance with ARI Standard 880. These tests must be witnessed by the engineering consultant with all costs to be borne by the terminal manufacturer. Testing does not ensure acceptance.

B. The terminal casing shall be minimum 22-gauge galvanized steel, internally lined with engineered polymer foam insulation which complies to UL181 and NFPA 90A. Insulation shall be 1½ pound density, 1" closed cell foam. Exposed fiberglass is not acceptable. The insulation shall be mechanically fastened to the unit casing. The casing shall be constructed to hold leakage to the maximum values shown in the Casing Leakage table.

C. The damper shall be heavy gauge steel with shaft rotating in Delrin® self-lubricating bearings. Nylon bearings are not acceptable. Shaft shall be clearly marked on the end to indicate damper position. Stickers or other removable markings are not acceptable. The damper shall incorporate a mechanical stop to prevent overstroking and a synthetic seal to limit close-off leakage to the maximum values shown in the Damper Leakage table.

D. At an inlet velocity of 2000 fpm, the minumum static pressure required to operate any terminal size shall not exceed 0.13-inch wg for the basic terminal.

E. Hot water reheat coils shall be enclosed in a minimum 20-gauge galvanized steel casing with slip and drive construction for attachment to metal ductwork. Coils shall be factory installed on the terminal discharge. Fins shall be rippled and corrugated heavy gauge aluminum, mechanically bonded to tubes. Tubes shall be copper with minimum wall thickness of 0.016-inch with male solder header connections. Coils shall be leak tested to 300 psi with minimum burst pressure of 1800 psi at ambient temperature. Number of coil rows and circuits shall be selected to provide performance as required per the plans. Coil performance data shall be based on tests run in accordance with ARI Standard 410.

F. Variable air volume supply air terminals for connection to single medium pressure duct, central air system. Provide hot water heating coil at units noted on the drawings.

G. Identify each VAV unit with clearly marked identification label and airflow indicator. Label shall include unit nominal air flow, maximum factory set air flow, minimum factory set air flow, and coil type.

H. Boxes to be able to provide accurate air flow measurements with 1-1/2 diameters or less of straight ductwork prior to unit inlet.

I. Access Doors: Locate an access door in each box, to allow adequate space for cleaning.

J. Assembly: Air volume damper, fans, and controls in single cabinet.

K. Identify each airflow unit with clearly marked identification label and airflow indicator. Label shall include unit nominal airflow, maximum factory set air flow, minimum factory set air flow, and coil type.

L. Locate air volume damper and flow sensor assembly inside unit casing. Construct from extruded aluminum or 20 gauge galvanized steel components. Key damper blades into shaft with nylon fitted pivot points.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide ceiling access doors or locate units above easily removable ceiling components.

C. Support units individually from structure. Do not support from adjacent ductwork.

D. Connect to ductwork in accordance with Section 23 3100.

E. Field verify connection requirements to existing ductwork. Provide ductwork transition as required for connection to existing ductwork.

F. Provide gasketed access door in ductwork downstream of heating coil for access.

END OF SECTION

SECTION 23 3700

AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Diffusers.

B. Registers/Grilles.

1.02 REFERENCES

A. ADC 1062 - Certification, Rating and Test Manual.

B. AMCA 500 - Test Method for Louvers, Dampers and Shutters.

C. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

D. ARI 650 - Air Outlets and Inlets.

E. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.

F. SMACNA - HVAC Duct Construction Standard.

1.03 QUALITY ASSURANCE

A. Test and rate performance of air outlets and inlets in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.

B. Test and rate performance of louvers in accordance with AMCA 500.

1.04 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 90A.

B. Earthquake tabs, in seismic zones, in accordance with IBC Standards.

1.05 SUBMITTALS

A. Submit product data under provisions of Division 01.

B. Provide product data for items required for this project.

C. Review requirements of outlets and inlets as to size, finish, and type of mounting prior to submitting product data.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS – DIFFUSERS, REGISTERS AND GRILLES

A. Krueger.

B. Price.

C. Titus.

D. Substitutions: Under provisions of Division 01.

2.02 RECTANGULAR CEILING DIFFUSERS

A. Square ceiling diffusers shall be of the sizes and mounting types shown on the plans and outlet schedule. The diffusers shall have three cones, which give a uniform face size and appearance when different neck sizes are used in the same area. All cones shall be one piece precision die-stamped; the back cone shall also include an integrally drawn inlet (welded-in inlets and corner joints are not acceptable). The two inner cones shall be constructed as a single, removable inner cone assembly for easy installation and cleaning. The inner cone assembly must have a hole with removable plug in the center to allow quick adjustment of an optional inlet damper without removing the inner cone assembly. Diffusers shall be constructed of 24-gauge steel. The finish shall be #26 white. The finish shall be an anodic acrylic paint, baked at 315°F for 30 minutes. The pencil hardness must be HB to H.

2.03 CEILING SLOT DIFFUSERS

A. Modulinear diffusers shall have the slot spacing of the sizes and mounting types shown on the plans and outlet schedule. Linear slot diffusers shall be available in standard one piece lengths up to 6 feet and 1 to 8 discharge slots.

B. Diffuser lengths greater than 6 feet shall be furnished in multiple sections and will be joined together end-to-end with alignment pins to form a continuous slot appearance.

C. All alignment components to be provided by the manufacturer. The return models shall be constructed the same as supply diffusers without the pattern controllers.

D. The frame and support bars shall be constructed of heavy gauge extruded aluminum. The pattern controller shall be an aerodynamically curved “ice-tong” shaped steel deflector capable of 180° pattern adjustment from the face of the diffuser and shall allow dampering if required. Maximum pattern controller length shall be 3 feet, for diffusers longer than 3 feet pattern controllers shall be furnished in multiple sections.

E. The finish shall be #26 white on the face and #84 black on the pattern controllers. The finish shall be an anodic acrylic paint, baked at 315°F for 30 minutes. The pencil hardness must be HB to H. The paint must pass a 100-hour ASTM B117 Corrosive Environments Salt Spray Test without creepage, blistering or deterioration of film. The paint must pass a 250-hour ASTM D870 Water Immersion Test.

F. The paint must also pass the ASTM D2794 Reverse Impact Cracking Test with a 50-inch pound force applied.

G. Heavy gauge extruded aluminum end borders, end caps and mitered corners shall be available to close off the ends of the diffusers. Plenums shall be manufactured by the same manufacturer of the linear slot diffusers. Optional diffuser curving to a 6-foot minimum radius with fixed deflection shall be available as required.Fabricate of aluminum extrusions with factory baked enamel off-white finish.

2.04 PERFORATED CEILING RETURN GRILLES.

A. Perforated ceiling grilles for return. Grilles shall have a perforated face with 3/16-inch diameter holes on ¼-inch staggered centers and no less than 51 percent free area. Perforated face shall be aluminum. The backpan shall be one piece stamped heavy gauge steel of the sizes and mounting types shown on the plans and outlet schedule. The diffuser neck shall have 1 1/8-inch depth for easy duct connection.

B. The finish shall be #26 white. The finish shall be an anodic acrylic paint, baked at 315°F for 30 minutes. The pencil hardness must be HB to H.

C. The paint must pass a 100-hour ASTM B117 Corrosive Environments Salt Spray Test without creepage, blistering or deterioration of film. The paint must pass a 250-hour ASTM D870 Water Immersion Test. The paint must also pass the ASTM D2794 Reverse Impact Cracking Test with a 50-inch pound force applied.

2.05 EGGCRATE RETURN GRILLES.

A. return grilles shall be the sizes and mounting types as shown on the plans and outlet schedule. Return grilles must provide a free area of at least 90%. Outer borders shall be constructed of heavy extruded aluminum with a thickness of 0.040-0.050 inch and shall have countersunk screw holes for a neat appearance. Border width shall be

B. 1¼ inches on all sides and shall be interlocked at the four corners and mechanically staked to form a rigid frame. Choice of three sizes of aluminum grid: ½ x ½ x ½ inch, ½ x ½ x 1 inch, or 1 x 1 x 1 inch shall be available.

C. The grille finish shall be #26 white. The finish shall be an anodic acrylic paint, baked at 315°F for 30 minutes. The pencil hardness must be HB to H. The paint must pass a 100-hour ASTM B117 Corrosive Environments Salt Spray Test without creepage, blistering or deterioration of

film. The paint must pass a 250-hour ASTM D870 Water Immersion Test. The paint must also pass the ASTM D2794 Reverse Impact Cracking Test with a 50-inch pound force applied.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install items in accordance with manufacturers' instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, regardless of whether dampers are specified as part of the diffuser, or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black.

END OF SECTION

SECTION 23 5700
HEAT EXCHANGERS FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Brazed Plate Heat Exchangers.

B. Accessories and Trim.

1.02 RELATED SECTIONS

A. Section 23 0500 - Common Work Results for HVAC.

B. Section 23 2113 - Hydronic Piping.

C. Section 23 2116 - Hydronic Specialties.

D. Section 23 0519 - Meters and Gauges for HVAC piping.

1.03 REFERENCES

A. ANSI/ASME - Boilers and Pressure Vessels Code.

1.04 REGULATORY REQUIREMENTS

A. Conform to Section 8D of the ANSI/ASME Boilers and Pressure Vessels Code for manufacture of tubular heat exchangers and heat exchanger shells.

1.05 SUBMITTALS

A. Submit product data under provisions of Division 01.

B. Indicate dimensions, locations, and size of tappings and performance data.

C. Submit manufacturer's installation instructions under provisions of Division 01.

D. Submit design data in sufficient detail to verify that heat exchangers meet or exceed specified requirements.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 01.

B. Include start up and shut down instructions, assembly drawings, and spare parts lists.

1.07 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. Protect internals from entry of foreign material by temporary caps on flanged openings.

PART 2 PRODUCTS

2.01 MANUFACTURERS – BRAZED PLATE TYPE HEAT EXCHANGERS

A. Taco.

B. Alfa-Laval.

C. Kelvion.

D. Bell & Gossett.

E. Substitutions: Under provisions of Division 01.

2.02 BRAZED PLATE TYPE HEAT EXCHANGER

A. Plates: Stainless steel Type 316L, vacuumed brazed together with high temperature copper braze, ASME Certified.

B. Nozzles: Threaded connections.

C. Maximum working pressure 150 psig, maximum working temperature 350 Degrees F.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Support heat exchangers on welded steel pipe and angle floor stand.

C. Pipe relief valves to floor drain.

D. .

3.02 WATER TO WATER HEAT EXCHANGER TRIM

A. Water Inlets and Outlets: Thermometer wells, pressure gauge tappings.

B. Heated Water Outlet: Thermometer well for temperature regulator sensor, ASME rated pressure relief valve, valved drain.

END OF SECTION

SECTION 23 7400
PACKAGED OUTDOOR HVAC EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged Roof Top Unit.

B. Heat Exchanger.

C. Refrigeration Components.

D. Unit Controls.

E. Roof Curb.

F. Electrical Power Connections.

G. Roof Mounting Frame and Base.

H. Maintenance Service.

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 23 0900 - Instrumentation and Control for HVAC: Installation of thermostats and other controls components.

B. Section 26 0583 - Wiring Connections: Installation and wiring of thermostats and other controls components.

C. Section 26 0583 - Wiring Connections: Final connection of wiring from unit terminal strip to remote panel.

1.03 RELATED SECTIONS

A. Section 23 0548 - Vibration and Seismic Controls for HVAC.

B. Section 23 0700 - HVAC Insulation

C. Section 26 0583 - Wiring Connections: Electrical supply to units.

1.04 REFERENCES

A. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

B. ARI 210 - Unitary Air-Conditioning Equipment.

C. ARI 240 - Air Source Unitary Heat Pump Equipment.

D. ARI 270 - Sound Rating of Outdoor Unitary Equipment.

1.05 SUBMITTALS

A. Submit product data for manufactured products and assemblies required for this project.

B. Indicate electrical service and duct connections on product data.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 01.

B. Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

1.07 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. Protect units from physical damage by storing off site until roof mounting frames are in place, ready for immediate installation of units.

1.08 EXTRA MATERIALS

A. Provide one set of filters.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Trane.

B. York.

C. Daikin.

D. Substitutions: Under provisions of Division 01.

2.02 GENERAL

A. Manufacturer of packaged unitary rooftop products shall have had a minimum of five years successful experience in the manufacture and service support of the rooftop packages specified herein. Manufacturers with less than five years experience in the production of rooftop units of the sizes and types specified shall not be acceptable.

2.03 GENERAL - HYDRONIC HEATING UNITS

A. Unit(s) furnished and installed shall be hot water heating/cooling, packaged rooftops as specified on the contract documents and within these specifications. Cooling capacity ratings shall be based upon AHRI Standard 360. Unit(s) shall consist of insulated weathertight casing with compressors, air cooled condenser coil, condenser fans, evaporator coil, filters, supply and/or exhaust fan motors and drives, and unit controls, hot water heating coil, and/or gas heating section as applicable.

B. Unit(s) shall be single piece construction as manufactured at the factory. Site assembled sub-assemblies will not be allowed. Package units shall be constructed for installation on a roof curb providing full perimeter support under air handler section and pedestal support under condenser section.

C. Unit(s) shall be factory run tested to include the operation of all fans, compressors, heat exchangers, and control sequences.

D. Unit(s) shall have labels, decals, and/or tags to aid in the service of the unit and indicate caution areas.

2.04 GENERAL – GAS HEATING UNITS

A. Unit(s) furnished and installed shall be gas heating packaged rooftops as specified on the contract documents and within these specifications. Cooling capacity ratings shall be based upon AHRI Standard 340/360. Unit(s) shall consist of insulated weathertight casing with compressors, air cooled condenser coil, condenser fans, evaporator coil, filters, supply and/or relief fan motors and drives, and microprocessor controls.

B. B. Unit(s) shall be double wall, foam injected construction, as manufactured at the factory. Package units shall be constructed for installation on a roof curb providing full perimeter support under air handler section and pedestal support under condenser section.

C. C. Unit(s) shall be factory run tested to include the operation of all fans, compressors, heat exchangers, and control sequences.

D. D. Unit(s) shall have labels, decals, and/or tags to aid in the service of the unit and indicate caution areas.

2.05 UNIT CASING - HYDRONIC HEATING UNITS

A. Cabinet: Galvanized steel, phosphatized, and finished with an air-dry paint coating durable enough to withstand a minimum of 672 consecutive-hour salt spray application in accordance with standard ASTM B 117. Structural members shall be heavy gauge with access doors and removable panels of heavy gauge steel. Roof panels shall be sloped to provide positive drainage of rain water / melting snow away from the cabinet.

B. Hinged Access Doors: Fully gasketed hinged doors doors with fluted knob fasteners and chained "tie-backs" to provide access to filters, heating section, return/exhaust air fan section, supply air fan section and evaporator coil section. These access doors shall feature double wall construction with dual density insulation sandwiched between heavy gauge galvanized steel panels for strength and durability.

C. Insulation: Provide 1/2 inch thick coated fiberglass internal liner on all exterior panels in contact with the conditioned air stream.

2.06 UNIT CASING - GAS HEATING UNITS

A. Cabinet: Exterior panels shall be zinc coated galvanized steel painted with a baked enamel finish durable enough to withstand a minimum of 672 hours consecutive salt spray application in accordance with standard ASTM B117. Screws shall be coated.

B. Refrigeration components and compressor shall be accessible through removable louvered panels as standard.

C. Unit air handling section shall have a pitched roof and laminated double-wall construction with polyurethane foam core injected between sheet metal panels. Insulation value shall be R9. All interior surfaces shall be suitable for cleaning per ASHRAE 62. All access doors and panels shall have closed cell gaskets. All door, roof and base panels shall have a thermal break.

D. Unit base shall be watertight with heavy gauge formed load-bearing members and curb overhang. Unit lifting lugs shall accept chains or cables for rigging. Lifting lugs shall also serve as unit tie down points.

E. Access Doors: Access doors shall be hinged with a single, exterior mounted, height and tension adjustable handle to provide positive latching at three points. Access doors shall provide a door stop mechanism to latch the door in the open position to prevent unsafe door closure by wind. Serviceable compartments in the air handler such as filters, evaporator coil, supply fan and variable frequency drives shall have doors of laminated, double-wall construction. This construction shall use a polyurethane foam core between the exterior sheet metal pane and the interior line, with an insulating value of R9. Three single wall doors shall be provided for access to the control panel.

2.07 ELECTRICAL POWER CONNECTIONS – HYDRONIC HEATING UNITS

A. Provide Unit Interrupt Rating (High Fault Short Circuit Current Rating-SCCR). 65,000 Amp rating (480V) shall be applied to the unit enclosure using a non-fused circuit breaker for disconnect switch purposes. Fan motors, compressors, and electric heat circuits shall be included with protective devices that will provide the elevated level of fault protection. The unit shall be marked with approved cULus markings and will adhere to cULus regulations.

B. Provide unit mounted 115 volt convenience outlet. Shall be wired and powered from a factory mounted transformer. Unit-mounted, non-fused disconnect with external handle shall be furnished with factory powered outlet.

2.08 ELECTRICAL POWER CONNECTIONS – GAS HEATING UNITS

A. Provide Phase Voltage Monitor. Shall protect 3-phase equipment from phase loss, phase reversal and phase imbalance. Any fault condition shall produce a Failure Indicator LED and send the unit into an auto stop condition. cULus approved.

B. Provide Unit Interrupt Rating (Short Circuit Current Rating-SCCR). A 5,000 Amp rating Amp rating shall be applied to the unit enclosure using a non-fused circuit breaker for disconnect switch purposes. Fan motors, compressors, and electric heat circuits shall be provided with series rated circuit breakers that will provide the unit rated level of protection. The unit shall be marked with approved cULus markings and will adhere to cULus regulations

C. Provide Non-Fused Disconnect. External handle mounted on the control box door shall be provided to disconnect unit power with the control box door closed for safety.

D. Provide unit mounted 115 volt convenience outlet. Shall be wired and powered from a factory mounted transformer. Unit-mounted, non-fused disconnect with external handle shall be furnished with factory powered outlet.

2.09 AIR FILTERS

A. Provide Air Filters mounted integral within unit casing and accessible via hinged access panels.

B. Provide MERV 8 panel pre-filters. Filters shall be 2-inch thick, MERV 8 disposable synthetic media, and shall slide into an extruded aluminum rack.

C. Provide MERV 14 cartridge post-filters. Cartridge final filters shall be 12-inch thick, MERV 14 microglass paper media attached to 24 ga galvanized steel frame, and shall slide into a galvanized steel rack.

2.10 SUPPLY FANS – HYDRONIC HEATING UNIT

A. Supply fans shall have two double-inlet, forward-curved fans mounted on a common shaft with fixed sheave drive. Fans shall be factory-tested to reach rated rpm before the fan shaft passes through first critical speed. Fan shaft shall be mounted on two grease lubricated ball bearings designed for 200,000 hours average life. Optional extended grease lines shall allow greasing of bearings from unit filter section. Fan motor and fan assembly shall be mounted on common base to allow consistent belt tension with no relative motion between fan and motor shafts. Entire assembly shall be completely isolated from unit and fan board by double deflection rubber-in-shear isolators, or by optional 2" deflection spring isolation.

B. Mount fan motor(s) and fan on a common base assembly and isolated from unit with 2" spring isolators.

C. Motor shall have a standard T-frame and a minimum service factor of 1.15. All drive components shall be accessible without the use of scaffolds or ladders, to facilitate periodic maintenance checks and for operator safety.

2.11 SUPPLY FANS – GAS HEATING UNIT

A. Supply fan shall be two single width, single inlet 9-blade plenum fans. Fan blades shall be aluminum airfoil. Plenum fans shall be direct-driven. Entire assembly shall be completely isolated from unit and fan board by 2" deflection spring isolation.

B. Beltless fan shall not require routine maintenance such as fan bearing lubrication, belt tensioning and replacement, sheave alignment, and setscrew torque checks.

C. Supply fan motors shall be open drip-proof. All supply fans shall be dynamically balanced in factory. Each motor shall have its own Variable Frequency Drive.

D. Supply fan shall be test run in unit and shall reach rated rpm. All 60 Hz supply fan motors shall meet the Energy Independence Security Act of 2007 (EISA).

E. Provide a Supply Airflow Measurement (Piezometer). The Plenum supply fan shall have an airflow measurement device to measure differential pressure and to calculate fan airflow. The device shall be capable of measuring airflow within ± 5 percent total accuracy when operating within the stable operating region of the fan curve. Fan airflow performance and noise levels shall not be affected by the installation of the device. The fan inlet shall not be obstructed by the airflow measurement device.

2.12 HEATING SECTION – HOT WATER HEATING UNIT

A. Provide factory assembled and installed, non-freeze Type 5W AHRI Certified coil, with hot water modulating valve and actuator. Coils shall insure complete drainage.

2.13 HEATING SECTION – GAS HEATING UNIT

A. Gas-fired units shall be completely assembled and wired. Gas-fired heating system control shall be fully integrated with the unit controls. Units shall be cULus approved specifically for outdoor

applications downstream from refrigerant cooling coils. All gas piping shall be threaded connection with a pipe cap provided. Gas supply connection shall be provided through the side or bottom of unit. All units shall be fire tested prior to shipment.

B. Heat exchangers shall meet 81% steady state efficiency

C. Heat exchangers shall have a tubular design with in-shot burners. Tubes shall be dimpled. Heating system shall incorporate induced draft fans. The unit shall have a chimney that exhausts away from the air intake.

D. Heat exchanger shall be pressure and leak tested.

E. Gas safety controls shall include electronic flame sensing capability. Combustion air is proven prior to ignition and during operation. Direct spark ignition shall be provided.

F. Modulating Gas Heat. Modulating and ultra-modulating gas heaters shall be made from grades of stainless steel suitable for condensing situations. The ultra-modulating turn down ratios will have 16 to 1 for 500 MBH.

2.14 EVAPORATOR COIL SECTION - HYDRONIC HEATING UNIT

A. Provide heavy duty aluminum fins mechanically bonded to copper tubes. Evaporator coil shall be inter- circuited to maintain active coil face area at part load conditions. Coil shall also utilize internally enhanced tubing for maximum efficiency.

B. Provide a thermostatic expansion valve (TXV) for each refrigerant circuit. Factory pressure and leak test coil.

C. Provide pitched galvanized steel drain pan to assure positive drainage of condensate from the unit casing.

2.15 EVAPORATOR COIL SECTION - GAS HEATING UNIT

A. Provide heavy duty aluminum fins mechanically bonded to copper tubes. Evaporator coil shall be inter- circuited to maintain active coil face area at part load conditions. Coil shall also utilize internally enhanced tubing for maximum efficiency.

B. Provide electronic expansion valve. Shall be electronically controlled by the Symbio™ 800 unit controller. This fully integrates expansion valve control with unit operation to ensure optimal equipment reliability and efficiency. Expansion valves shall be 2500 step valves for precise refrigerant control and shall be driven closed during off cycles to minimize refrigerant migration and protect compressors. Valve position shall be displayed at the user interface to assist field diagnostics.

C. Provide stainless steel pressure transducer. Shall provide accurate measurement of high and low side refrigeration system pressure over the entire operating range. System pressures and saturation temperatures shall be displayed at the user interface to improve field diagnostics. The transducer is accessible as it shall be located close to the compressor manifold set. Durable weather proof automotive grade electrical connectors shall be used to ensure reliability.

D. Provide sloped drain pan to assure positive drainage of condensate from the unit casing.

2.16 AIR-COOLED CONDENSER SECTION

A. Condenser coils shall have all Aluminum Microchannel coils. All coils shall be leak tested at the factory to ensure pressure integrity. The condenser coil is pressure tested to 650 psig. Subcooling circuit(s) shall be provided as standard.

B. Provide subcooling circuit(s) integral with condenser coils to maximize efficiency and prevent premature flashing of liquid refrigerant, to a gaseous state, ahead of the expansion valve.

C. Provide vertical discharge, direct drive fans with steel blades, and three phase motors. Fans shall be statically and dynamically balanced. Motors shall be permanently lubricated, with built-in current and thermal overload protection and weathertight slinger over motor bearings.

D. Furnish unit with factory-installed electronic low ambient option to allow for operation down to 0 degrees F.

E. Provide factory-installed louvered steel coil guards around perimeter of condensing section to protect the condenser coils, refrigerant piping and control components. Louvered panels shall be fabricated from heavy gauge galvanized steel and be rigid enough to provide permanent protection for shipping and pre-/post- installation. Course wire mesh is not an acceptable material for coil guards.

2.17 REFRIGERATION SYSTEM

A. Compressor: shall be industrial grade, energy efficient direct drive 3600 RPM maximum speed scroll type. The motor shall of a suction gas cooled hermetic design. Compressor shall have centrifugal oil pump with dirt separator, oil sight glass, and oil charging valve.

B. Provide with thermostatic motor winding temperature control to protect against excessive motor temperatures resulting from over-/under-voltage or loss of charge. Provide high and low pressure cutouts, and reset relay.

2.18 EXHAUST SECTION - HYDRONIC HEATING UNIT

A. Two, double-inlet, forward-curved fans shall be mounted on a common shaft with fixed sheave drive. All fans shall be dynamically balanced and tested in factory before being installed in unit. Exhaust fan shall be test run as part of unit final run test. Unit shall reach rated rpm before fan shaft passes through first critical speed. Fan shaft shall be mounted on two grease lubricated ball bearings designed for 200,000-hour average life. Optional extended grease lines shall be provided to allow greasing of bearings from unit filter section. Fan motor and assembly shall be mounted on common base to allow consistent belt tension with no relative motion between fan and motor shafts. Entire assembly shall be completely isolated from unit and fan board by double deflection, rubber in shear isolators or spring isolation on motor sizes larger than five hp.

B. For VAV rooftops, the 100 percent modulating exhaust discharge dampers (or VFD) shall be modulated in response to building pressure. A differential pressure control system, (Statitrac), shall use a differential pressure transducer to compare indoor building pressure to outdoor ambient atmospheric pressure. The FC exhaust fan shall be turned on when required to lower building static pressure setpoint. The (Statitrac) control system shall then modulate the discharge dampers (or VFD) to control the building pressure to within the adjustable, specified dead band that shall be adjustable at the Human Interface Panel. All 60 Hz exhaust fan motors meet the Energy Independence Security Act of 2007 (EISA).

2.19 RELIEF SECTION - GAS HEATING UNIT

A. The eDrive relief fan shall be two single-width, single-inlet, 5-blade direct-drive plenum fan(s) with backward inclined, high efficiency welded aluminum impeller that is dynamically balanced as an assembly. Fan shall be beltless and maintenance free throughout its operating life. Fan shall be balanced to G6.3 per ISO 21940. No external vibration isolation is necessary. Motor shall be electronically commutated (ECM) and contain power electronics for speed control. Motor modulation shall be managed by the equipment controller.

B. The modulating relief discharge dampers and ECM shall be modulated in response to building pressure. A differential pressure control system, (Statitrac), shall use a differential pressure transducer to compare indoor building pressure to outdoor ambient atmospheric pressure. The relief fan shall be turned on when required to lower building static pressure setpoint.

C. The (Statitrac) control system shall then modulate the discharge dampers and ECM to control the building pressure to within the adjustable, specified dead band that shall be adjustable at the user interface panel.

2.20 OUTSIDE AIRFLOW MEASUREMENT

A. Provide Outside Air Measurement. A factory mounted airflow measurement station (Traq) shall be provided in the outside air opening to measure airflow. The airflow measurement station shall measure from 15 to 100 percent of unit airflow. The airflow measurement station shall adjust for temperature variations

2.21 DAMPERS

A. Provide Standard dampers. The standard dampers shall have a leakage rate of 2.5% at 1.0 in W.C. pressure difference.

2.22 DDC MICROPROCESSOR CONTROLS

A. General - Each unit shall be provided with a factory-installed, programmed and run-tested, stand-alone, microprocessor control system suitable for VAV control as required. This system shall consist of temperature and pressure (thermistor and transducer) sensors, printed circuit boards, and a unit-mounted Human Interface Panel. The microprocessor shall be equipped with on-board diagnostics to indicate that all hardware, software, and all interconnected wiring and sensors are in proper operating condition. The microprocessor's memory shall be non-volatile EEPROM type, thus requiring no battery or capacitive backup to maintain all data during a power loss.

B. The Human Interface Panel shall be readily accessible for service diagnosis and programming without having to open the main control panel on the rooftop unit. Alphanumeric coded displays shall not be acceptable.

1. Human Interface (HI) Panel - shall be a 16 key touch-sensitive membrane key switch panel, password protected to prevent use by unauthorized personnel. The Human Interface Panel display shall consist of a 2 line by 40 characters per line clear English display. The display shall be Supertwist Liquid Crystal Display (LCD) with blue characters, 5 X 7 dot matrix with cursor, on a gray-green background for high visibility and reading ease.

C. Anti-recycle Protection - shall be provided to prevent excessive cycling, and premature wear, of the compressors, contactors and related components.

2.23 ROOF CURB

A. Provide factory supplied roof curb, heavy gauge zinc coated steel with supply and return air gasketing. Ship knocked down and provide instructions for easy assembly.

B. Curb shall be manufactured in accordance with the National Roofing Contractors Association guidelines for rooftop equipment support.

2.24 TRAQ (OUTSIDE AIR MEASUREMENT)

A. Traq shall include Ventilation Control Module (VCM). The VCM shall be linked to the Intellipak UCM to control the minimum fresh air entering the unit. Using a velocity pressure sensing ring, the VCM monitors and controls the quantity of fresh air entering the unit. This allows it to control to the minimum outside airflow setpoint. An optional temperature sensor can be connected to the VCM which enables it to control a field installed fresh air preheater; and an optional carbon dioxide sensor can be connected to the VCM to control the carbon dioxide reset. Option is cULus approved.

2.25 DEMAND CONTROL VENTILATION

A. Provide demand control ventilation (DCV) system fully integrated with unit economizer. Controller shall minimize fresh air intake during periods of low occupancy based on parts per million space CO2 in response to a customer defined parts per million CO2 setpoint. CO2 setpoint, and minimum DCV fresh air damper position shall be programmable at the human interface, or building management system.

B. Note: CO2 sensor used with Demand Control Ventilation must be powered from an external power source or separate 24 VAC transformer.

2.26 BACNET COMMUNICATION INTERFACE MODULE

A. provide control and monitoring of the rooftop by Tracer SC or a 3rd party building management system utilizing BACnet protocol.

2.27 FACTORY POWERED GFI CONVENIENCE OUTLET

A. 15A, 115V Ground Fault Interrupter convenience outlet shall be factory installed. It shall be wired and powered from a factory mounted transformer. Unit-mounted, non-fused disconnect with external handle shall be furnished with factory powered.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that roof is ready to receive work and opening dimensions are as illustrated by the manufacturer.

B. Verify that proper power supply is available.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Mount units on factory built roof mounting frame providing watertight enclosure to protect ductwork and utility services. Install roof mounting frame level.

3.03 MANUFACTURER'S FIELD SERVICES

A. OEM Startup is performed by factory trained and authorized service technicians confirming equipment has been correctly installed and passed specification checklist prior to equipment becoming operational.

B. Package rooftop unitary manufacturers shall maintain service capabilities no more than 50 miles from the jobsite.

END OF SECTION

SECTION 23 8123
COMPUTER-ROOM AIR-CONDITIONERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air Conditioning Units.

1.02 RELATED SECTIONS

A. Section 23 0500 - Common Work Results for HVAC.

B. Section 23 0529 - Hangers and Supports for HVAC Piping and Equipment.

C. Section 23 0548 - Vibration and Seismic Controls for HVAC.

D. Section 23 0553 - Identification for HVAC Piping, Ductwork and Equipment.

E. Section 23 0923 - Direct Digital Control System for HVAC.

1.03 REFERENCES

A. ANSI/ASME - Boilers and Pressure Vessels Code.

B. ANSI/NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

C. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

D. ASHRAE 52 - Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter.

E. FS TT-C-490 - Cleaning Method and Pretreatment of Ferrous Surfaces for Organic Coatings.

F. UL - Underwriters Laboratories.

1.04 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 90A for the installation of computer room air conditioning units.

1.05 SUBMITTALS

A. Submit product data under provisions of Division 01.

B. Indicate water, drain, electrical connections product data.

C. Submit manufacturer's installation instructions under provisions of Division 01.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 01.

B. Include manufacturer's descriptive literature, operating instructions, installation instructions, and maintenance and repair data.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Liebert/Vertiv.

B. Data Aire.

C. Substitutions: Under provisions of Division 01.

2.02 MANUFACTURED UNITS

A. Cabinet Construction: The cabinet and chassis shall be constructed of heavy gauge galvanized steel and designed for easy installation and service access from front and bottom of unit only (water cooled units require end access). Mounting brackets shall be integral to the cabinet design. Internal cabinet insulation shall meet ASHRAE 62.1 requirements for Mold Growth, Humidity & Erosion, tested per UL 181 and ASTM 1338 standards.

B. Air Distribution: The air distribution system shall be constructed with a quiet, direct-drive fan assembly equipped with double-inlet blower, self-aligning ball bearings and lifetime lubrication. Fan motor shall be permanent-split capacitor, high efficiency type, equipped with two speeds for

air flow modulation. The microprocessor controller shall use the lower fan speed for precise dehumidification control. Fan speed shall also be user selectable from the wall controller.

C. Microprocessor Control: The control system shall be microprocessor-based, factory-wired into the system and tested prior to shipment. The wall-mounted controller shall include a 2-line by 16-character liquid crystal display (LCD) providing continuous display of operating status and alarm condition and shall be capable of displaying values in °F or °C. An 8-key membrane keypad for setpoint/ program control, fan speed selection and unit On/Off shall be located below the display. Controller shall be password protected to prevent unauthorized set point adjustments. Field-supplied 4-conductor thermostat wire shall be used to connect the wall-mounted controller to the unit control board. Temperature and humidity sensors shall be located in the wall box, which shall be capable of being located up to 300 ft (91.4m) from the evaporator unit when using a remote temperature/humidity sensor in the conditioned space.

D. Refrigeration: The refrigeration system shall consist of a compressor with vibration isolating grommets, evaporator coil, condenser coil, externally equalized thermostatic expansion valve, high pressure safety switch, filter drier, hot gas bypass circuit, factory R-407C refrigerant charge and externally equalized expansion valve. Hot gas bypass shall be provided to reduce compressor cycling and optimize performance under low load conditions. The hot gas bypass shall be completely contained within the unit. Field installed third refrigerant line shall not be acceptable. Hot gas bypass shall be automatically deactivated upon a call for dehumidification. High pressure switch shall protect the unit from abnormal refrigerant pressure conditions and shall deactivate the compressor and annunciate an alarm at the wall controller. The blower shall continue to circulate air. The wall controller shall be used to manually restart the compressor function after the automatic pressure switch resets. Three high head pressure alarms in a rolling 12-hour period shall lock out the manual restart feature until power is cycled to the evaporator unit.

E. Evaporator Coil: The evaporator coil shall be constructed of copper tubes and aluminum fins. The coil shall be mounted in a condensate drain pan with internally trapped drain line. The evaporator drain pan shall include a factory-installed float switch to shut down the evaporator upon high water condition.

F. Air-Cooled Condenser Coil: The air-cooled condenser section shall contain a factory mounted and piped condenser coil constructed of copper tubes and aluminum fins. No piping, brazing, dehydration or charging shall be required. The condenser coil shall be factory-mounted within the unit cabinet. Air-Cooled Condenser Fan A factory-supplied condenser fan shall be field-mounted to the end of the evaporator cabinet. The system shall be provided with a fan speed control system to permit operation at -20°F (-28.9°C) inlet ambient air temperature and sized to provide full rated cooling capacity at 95°F (35°C) entering air from plenum space. Condenser fan electrical and refrigerant pressure connections shall be field attached to the cooling chassis using factory-provided wiring harness and capillary tube/fitting.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Coordinate installation of computer room air conditioning units with computer room raised floor installer.

C. Provide adequate drainage connections for condensate.

END OF SECTION

SECTION 23 8200
CONVECTION HEATING AND COOLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finned Tube Radiation.

B. Unit Heaters.

C. Cabinet Unit Heaters.

1.02 RELATED SECTIONS

A. Section 23 0900 - Instrumentation and Control for HVAC.

B. Section 23 0993 - Sequence of Operation for HVAC Controls.

C. Section 23 2113 - Hydronic Piping.

D. Section 23 2116 - Hydronic Specialties.

E. Section 23 2123 - Hydronic Pumps.

F. Section 26 0583 - Wiring Connections: Electrical supply to units.

1.03 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

1.04 SUBMITTALS

A. Submit product data under provisions of Division 01.

B. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.

C. Indicate mechanical and electrical service locations and requirements, specifically indicating deviations from indicated products.

1.05 PROJECT RECORD DOCUMENTS

A. Submit record documents under provisions of Division 01.

B. Accurately record actual locations of access doors in radiation cabinets required for access or valving.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 01.

B. Include manufacturer’s descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years’ experience.

1.08 REGULATORY REQUIREMENTS

A. Conform to applicable code for internal wiring of factory wired equipment.

1.09 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. Protect units from physical damage by storing in protected areas and leaving factory covers in place.

1.10 SEQUENCING AND SCHEDULING

A. Install radiation (equipment exposed to finished areas) after walls and ceiling are finished and painted. Avoid damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS - FINNED TUBE RADIATION UNIT HEATERS CABINET UNIT HEATERS

A. Modine.

B. Rittling.

C. Sterling.

D. Trane.

E. Vulcan.

F. Dunham Bush.

G. Substitutions: Under provisions of Division 01.

2.02 FINNED TUBE RADIATION

A. Heating Elements: ¾ inch ID condenser tube, 0.123 inch minimum wall thickness mechanically expanded into evenly spaced steel fins.

B. Element Hangers: Quiet operating, ball bearing cradle type providing unrestricted longitudinal movement, on enclosure brackets.

C. Enclosures: 18 gauge steel up to 18 inches in height, 16 gauge steel over 18 inches in heigh. Provide easily jointed components, with male/female slip joints and 14 gauge gussets, for wall to wall installation. Support rigidly, on wall or floor mounted brackets.

D. Finish: Factory applied baked enamel of color as selected on visible surfaces of enclosure or cabinet.

2.03 UNIT HEATERS

A. Coils: Seamless copper tubing, 0.025 inch minimum wall thickness, silver brazed to steel headers, and with evenly spaced aluminum fins mechanically bonded to tubing.

B. Casing: 18 gauge steel with threaded pipe connections for hanger rods.

C. Finish: Factory apply baked enamel color as selected on visible surfaces of enclosure or cabinet.

D. Fan: Direct drive propeller type, statically and dynamically balanced, with fan guard; horizontal models with permanently lubricated sleeve bearings; vertical models with grease lubricated ball bearings.

E. Air Outlet: Adjustable pattern diffuser on projection models and [two] [four] way louvers on horizontal throw models.

F. Motor: Refer to Section 23 2123; horizontal models with permanently lubricated sleeve bearings; vertical models with grease lubricated ball bearings.

G. Control: Local disconnect switch.

2.04 CABINET UNIT HEATERS

A. Coils: Evenly spaced aluminum fins mechanically bonded to copper tubes, designed for 100 psi and 220º F.

B. Cabinet: 16 gauge steel with exposed corners and edges rounded, easily removed panels, glass fiber insulation and integral air outlet and inlet grilles.

C. Finish: Factory applied baked enamel of color as selected on visible surfaces of enclosure or cabinet.

D. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.

E. Motor: Refer to Section 23 2123; sleeve bearings, resiliently mounted.

F. Control: Multiple speed switch, factory wired, located in cabinet.

G. Filter: Easily removed one inch thick glass fiber throw-away type, located to filter air before coil.

2.05 ELECTRIC CABINET UNIT HEATERS

A. Assembly: UL listed and labeled assembly with terminal box and cover, and built-in controls.

B. Heating Elements: Enclosed copper tube, aluminum finned element of coiled nickel-chrome resistance wire centered in tubes and embedded in refractory material.

C. Cabinet: 16 gauge steel with easily removed front panel with integral air outlet and inlet grilles.

D. Element Hangers: Quiet operating, ball bearing cradle type providing unrestricted longitudinal movement, on enclosure brackets.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work and opening dimensions are as indicated on shop drawings.

B. Verify that required utilities are available, in proper location, and ready for use.

C. Beginning of installation means installer accepts existing surfaces.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Locate finned tube radiation on outside walls and run cover wall-to-wall unless otherwise indicated. Center elements under windows. [Where multiple windows occur over units, divide element into equal segments centered under each window.] [Align cabinet joints with window mullions.] Install wall angles where units butt against walls.

C. Install convectors as indicated. Coordinate to assure correct recess size for recessed convectors.

D. Hang unit heaters from building structure, with pipe hangers anchored to building, not from piping. Mount as high as possible to maintain greatest headroom unless otherwise indicated.

E. Install cabinet unit heaters as indicated. Coordinate to assure correct recess size for recessed units.

F. Protect units with protective covers during balance of construction.

G. Provide hydronic units with shut-off valve on supply and lock-shield balancing valve on return piping. If not easily accessible, extend vent to exterior surface of cabinet for easy servicing. For cabinet unit heaters, fan coil units, and unit heaters, provide float operated automatic air vents with stop valve.

3.03 CLEANING

A. Clean work under provisions of Division 01.

B. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

C. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

D. Install new filters.

END OF SECTION

SECTION 23 8300
RADIANT HEATING UNITS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Description: Furnish and install snowmelt heating system tubing, distribution manifolds with venting/air purge valve, manifold to tubing fittings, circuit isolation and balancing valves, controls and installation specialties, supervision and field engineering required for complete and proper function of the system.

1.02 REGULATORY REQUIREMENTS

A. Tubing shall conform to ASTM F876 and F877, and manufactured using the T. Engle process. Tubing oxygen permeation barrier shall conform to DIN 4726.

B. Installer's Qualification: Installer's shall be qualified in writing as either being certified or certifiable prior to the commencement of the installation.

1.03 REFERENCES

A. ASTM F876 Standard specification for Cross-linked Polyethylene (PEX) Tubing.

B. ASTM F877 Standard specification for Cross-linked Polyethylene (PEX) Plastic Hot - and - Cold Water Distribution Systems.

C. Din 4726 German Standard for Plastic Piping Used in Warm Water Floor Heating Systems.

1.04 SUBMITTALS

A. Provide submittals and shop drawings in accordance with the General Requirements and as specified herein. Submit shop drawings indicating schematic layout of system, including equipment, critical dimensions and tubing/slab penetration details and details for protected exposed PEX tubing.

B. Submit manufacture's technical instructions.

C. Submit installers' certification of training for installation of PEX floor heating systems.

D. Submit data indicating tube sizing and panel performance at tube spacing and warm water temperatures selected.

E. Submit catalog data on all supports, tube guides, spacers and associated items necessary for the installation of the tubing and manifolds.

F. Submit manufacturer approved Design Calculations Records.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver and store tubing and specialties in shipping containers with labeling in place. Do not expose to ultra violet light for more than 90 days.

B. Protect tubing and specialties from entry of contaminating material by installing tape or plugs in all open ends until installation and /or maintain tubing in the original shipping boxes or packing until usage.

C. Unprotected tubes shall not be dragged across the ground or concrete surfaces, and shall be stored on a flat surface with no sharp edges.

D. Tube shall be protected from oil, grease, direct sunlight and other elements as recommended by manufacturer.

1.06 WARRANTY

A. The snowmelt system component manufacturer shall warrant the cross-linked polyethylene tubing and all related water distribution components, except controls, to be free from defects in material and workmanship for a period of twenty-five (25) years. Warranty shall be issued upon presentation of design calculation record forms, and manufacturer approved site inspection reports (SIR).

B. All controls shall be warranted for 18 months and/or two heating seasons.

PART 2 PRODUCTS

2.01 TUBING

A. Material: All snowmelt heating tubing shall be high density cross-linked polyethylene manufactured in accordance with ASTM F877. All tubing shall be fully cross-linked to the specified standard prior to shipment from manufacture.

B. Temperature and Pressure Rating: Tubing shall be rated for not less than 180°F working temperature and 100 psig working pressure.

C. Oxygen Diffusion Barrier: Tubing shall have a co-extruded oxygen diffusion barrier capable of limiting oxygen diffusion through the tube to no greater that 0.40 grams per cubic meter per day at 104°F water temperature. In accordance with DIN 4726.

D. Bend Radius: The minimum bend radius for cold bending of the tubing shall be not less than five (5) times the outside diameter. Bends with a radius less than stated shall require the use of a bending template as supplied by the tube manufacturer.

2.02 FITTINGS

A. Fittings shall be manufactured of brass and shall be supplied by the tubing manufacturer as part of a proven cataloged system.

B. Tube couplings embedded within the thermal mass shall be brass compression type with ribbed insert and compression sleeves as supplied by the tubing manufacturer.

2.03 MANIFOLDS

A. Material: Distribution manifolds shall be a proven cataloged part of the manufacturer’s system.

B. Balancing Manifolds: Where required by the drawings, manifolds shall be equipped with balancing and isolation valves for each circuit.

2.04 MANUFACTURER

A. MrPEX.

B. Rehau.

C. Uponor.

D. Substitutions in accordance with Division 01.

PART 3 EXECUTION

3.01 PREPARATION

A. Concrete Slab on Grade: Subsoil should be compacted, flat and smooth to prevent damage to the tube or insulation.

3.02 INSTALLATION

A. Install in accordance with manufacturer’s published technical manual.

B. Route tubing in orderly manner, according to layout and spacing shown in approved submittal drawings. All notes on drawings shall be followed.

C. At joints and fittings, square and clean end of tube, using a plastic tube cutter and join immediately or cap with tape to seal from contaminants. Where fittings are installed within the thermal mass they shall be wrapped in chloride-free tape.

D. Remove all twists prior to securing tube. Fasten tubing at no more than 3 feet intervals, being careful not to twist the tube. In thin concrete slabs it may be necessary to secure tubing every 2 feet.

E. Tubing that must pass through expansion, stress or control joints shall be sleeved a minimum of 10” on each side of the joint. Provide longer sleeve where required by tubing manufacturer installation instructions.

F. Where tubing exits the floor, a sleeve shall be placed around the tube, with the sleeve extending a minimum of 10” into the floor and exiting by a minimum of 10”.

G. After laying each circuit, cap the end of the tube with tape and label the tube’s circuit numbers (supply and return), or connect to associated manifold and label tube length for balancing.

H. The following precautions shall be taken in areas intended for carpet:

1. Notify carpet layer that hydronic floor heating has been installed.
2. Install metal guards where carpet tack strips will be installed.

I. The heating system should be put into operation after the poured concrete thermal mass has cured a minimum of 28 days. If it is necessary to operate the heating system to prevent freezing, a maximum flow temperature of 59° F must not be exceeded while the thermal mass is curing. Gradually increase the flow temperature by 10° F each day until it reaches the maximum operating temperature.

3.03 FIELD QUALITY CONTROL

A. Filling, Testing and Balancing: Tests of hydronic heating systems shall comply with local codes, and, where required, should be witnessed by the building official.

1. Pressure gauges used must show pressure increments of 1 psig and should be located at or near the lowest points in the distribution system.
2. Air Test: Charge the completed, yet unconcealed tubes with air. Do not exceed 100 psig.
   a. Use liquid gas detector or soap to check for leakage at manifold connections. Relieve air pressure.
3. Water Test: Charge the completed, yet unconcealed tubes with water. Purge all air from tubes. Check system for leakage, especially at all tube joints. Take necessary precautions to prevent water from freezing.
   a. Perform a preliminary pressure test pressurizing the system to 1.5 times the maximum operating pressure, or 100 psi, whichever is greater for 30 minutes. As the tubing expands, restore pressure, first at 10 minutes into the test and again at 20 minutes. At the end of the 30 minute preliminary test, pressure must not fall by more than 8 psig from the maximum, and there shall be no leakage.
   b. After performing the preliminary test, perform the main pressure test immediately. The main pressure test shall last 2 hours. The test pressure should be restored and must not fall more than 3 psig after 2 hours. No leakage should be detected.
4. Pressure shall be maintained during installation of the thermal mass.
5. Complete all inspection and test reports as supplied by the manufacturer of the system.

END OF SECTION

SECTION 26 0126
MAINTENANCE TESTING OF ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Feeder Megohm Testing.

B. Receptacle Branch Circuit Testing.

C. Ground Fault Circuit Interrupter Testing.

D. Separately Derived System Ground Testing.

E. Transformer Testing.

F. Phase Rotation.

G. Additional Testing and Maintenance Requirements in Individual Equipment and System Sections.

1.02 REFERENCES

A. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

B. ANSI/IEEE Std 81-1983 Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.

C. ANSI/TIA/EIA - 568-B.1 and Addendums, General Cabling System Requirements.

1.03 SUBMITTALS

A. Submit data under provisions of Division 01 and Section 26 0500.

B. Product Data: Submit technical information for each test instrument to include manufacturer, model number, serial number, ratings, accuracy, and National Institute of Standards and Technology (NIST) Traceable calibration certification.

1.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit Test Reports per Section 26 0500.

1.05 COORDINATION

A. Provide written 72 hours advance notice of all tests to be performed to allow Owner's Representative to witness testing.

1.06 REQUIRED TEST INSTRUMENTS

A. MEGOHMMETER.

1. Product Description: 1000 Volt DC, portable, insulation and resistance test Megohmmeter.
2. Equipment Accuracy:
   a. 2000 Megohm Range - 3% of full Scale.

B. BRANCH CIRCUIT ANALYZER

1. Product Description: Branch circuit analyzer capable of receptacle testing of voltage drop under load, hot-neutral-ground conductor resistances, common mode (N-G) Voltage, and G.F.C.I. trip point.
2. Manufacturer: Ideal SureTest. Model: 61-164 ST-1THD Wiring/Harmonic Distortion Analyzer or approved equal.
3. Equipment Accuracy:
   a. Accuracy 1% full scale ± 1 digit True RMS.

C. GROUND RESISTANCE CLAMP-ON METER

1. Product Description: Digital, direct reading clamp-on resistance ground tester.
2. Manufacturer: AEMC. Model: 3711 or approved equal.
3. Equipment Accuracy:
   a. 1.0 to 50.0 Ohms 6 (1.5% + 0.1 Ohm).
   b. 50.0 to 100.0 Ohms 6 (2.0% + 0.1 Ohm).
   c. 100 to 200 6 (1.5% + 0.1 Ohm).
   d. 200 to 400 Ohms 6 (1.5% + 0.1 Ohm).
   e. 400 to 600 Ohms 6 (1.5% + 0.1 Ohm).

D. MULTIMETER
1. Product Description: Digital True RMS Multimeter.
2. Equipment Accuracy:
   a. AC Voltage Range: 0.75% 6 3 last single digits at 60 Hz.
   b. AC Current Range: 0.90% 6 3 last single digits at 60 Hz.
   c. DC Voltage Range: 0.25% 6 1 last single digit.
   d. DC Current Range: 0.75% 6 1 last single digit.
   e. Resistance Ranges: 0.50% 6 1 last single digit.
   f. Frequency Range: 0.10% 6 1 last single digit @ 60 Hz.

E. SOUND LEVEL METER
1. Product Description: Sound Level Meter meeting ANSI S.14a Type 2, Specifications for Sound Level Meters. Capable of A-Weighted measurement.

1.07 TEST INSTRUMENT CALIBRATION

A. All test equipment shall be in good mechanical and electrical condition.

B. Provide calibration for each test instrument directly traceable to the National Institute of Standards and Technology (NIST) of higher accuracy than that of the instrument tested.

C. Provide calibration labels visible on all test equipment. Records, which show date and results of instruments calibrated or tested, shall be kept up-to-date.

D. Calibrate instruments in accordance with the following frequency schedule:
1. Field instruments: 12 months maximum.
2. Up-to-date instrument calibration instructions and procedures shall be maintained for each test instrument with the equipment.

1.08 MINIMUM REPORT INFORMATION

A. Report Criteria: After each test, promptly submit one copy of report to the Owner's Representative. Include information on the ASD report form where included within this specification otherwise provide form with the minimum following information:
1. Date issued.
2. Project title and number.
3. Name and Model of Tester and witnesses.
4. Date and time of sampling or inspection.
5. Identification of product and specifications section.
6. Type of inspection or test.
7. Date of test.
8. Results of tests.

9. Indicate compliance or non-compliance with Contract Documents.
10. Final adjustment setting values where applicable.

B. Submit copy of all tests performed in the O&M manual.

1.09 GENERAL REQUIREMENTS

A. Submit test results within 3 working days of each test and included in the O&M manual.

B. Provide qualified personnel at site to perform all testing.

C. Perform specified testing of products in accordance with specified standards or as denoted in this specification whichever is more stringent.

D. Promptly notify Owner's Representative of irregularities or non-conformance of Work or products.

E. Perform additional tests when test is performed incorrectly, deemed inaccurate, or incorrectly documented.

F. The Contractor shall provide all forms, instrumentation and test equipment, loads, and other consumables required to demonstrate the systems to Owner's Representative satisfaction.

G. Perform and submit all testing prior to substantial completion and system acceptance.

H. Retest all material, cables etc. that are disturbed after testing.

I. Replace and retest all material installed which does not meet or exceed the minimum acceptable limits set forth in this specification in accordance with the contract original requirements at no additional charge to Contract Sum/Price.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 FEEDER CONDUCTOR TEST

A. Tests Criteria:

1. Use Megohm meter to test all conductors sized #6AWG and larger.
2. Perform insulation-resistance test on each conductor with respect to ground and adjacent conductors. Applied potential 1000 volts DC for 600 volt rated cable.
3. Perform test immediately after installation.
4. Clean exposed cable ends with clean cloth and alcohol.
5. Test duration shall be one minute.
6. Disconnect conductors from all equipment.
7. Record the resistance of the insulated conductor under test with all other conductors connected together and to ground (metallic raceway, grounding conductor, etc).
8. Perform continuity test to insure correct cable connection.
    a. Submit test results to Owner's Representative.

B. Test Values:

1. Minimum insulation-resistance value: 50 megohms.
2. Investigate deviations between adjacent phases.

3.02 RECEPTACLE GROUND FAULT CIRCUIT INTERRUPTER TEST

A. Test Criteria:

1. Use Branch Circuit Analyzer to perform test of each GFCI protected receptacle.
2. Record trip level in ma for each outlet.
3. Submit test results to Owner's Representative.

B. Test Values:
   1. Trip Range: Between 6-9 mA.

3.03 SEPARATELY DERIVED SYSTEM GROUND TEST

A. Test Criteria:
   1. Use ground resistance clamp-on meter to measure the resistance of service ground with meter clamped between system neutral bond and each grounding electrode. Perform this test on new or existing services and all separately derived systems.
   2. Record resistance value in Ohms.
   3. Submit test results to Owner's Representative.

B. Test Values:
   1. Maximum ground resistance: 10 Ohms.

3.04 TRANSFORMER TEST

A. Electrical Test:
   1. Use Multimeter to perform test.
   2. Measure output voltage under load on secondary side.
   3. Submit test results to Owner's Representative.

B. Test Values:
   1. Voltage Output: Test voltage output per transformer nameplate value.
   2. Adjust transformer taps to provide closet possible output to rated output voltage within plus or minus 5%.

3.05 PHASE ROTATION TEST

A. Test each three phase circuit and feeder for consistent phase rotation for the entire power system with a phase rotation meter.

B. Bump test each motor for proper rotation prior to use.

C. Correct conductor phase relationship to provide proper phase rotation.

D. Record the rotation sequence on each panelboard, MDP and Service circuit schedule.

E. Submit test results of each panelboard, MDP and Service to the Owner's Representative.

3.06 PHASE LOAD BALANCE TEST

A. After energizing building loads conduct a phase load balance test for each new or remodeled panelboard with a clamp on ammeter.

B. Shift loads to provide current balance within 20% of the other phases. Revise circuit directory and all conductor labels to reflect any changes.

C. Notify Owner's Representative at least 72 hours in advance before test.

END OF SECTION

SECTION 26 0500

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General Requirements specifically applicable to Division 26, in addition to Division 01 provisions.

B. The electrical system equipment and installation shall comply with all provisions and requirements of this specification, as well as any and all applicable national, state and local codes and standards.

1.02 WORK SEQUENCE

A. Construct Work in sequence under provisions of Division 01.

1.03 COORDINATION

A. Coordinate the Work specified in this Division under provisions of Division 01.

B. Prepare drawings showing proposed rearrangement of Work to meet job conditions, including changes to Work specified under other Sections. Obtain permission of Architect prior to proceeding.

1.04 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code, latest adopted edition including all state and local amendments.

B. NECA - Standard of Installation.

C. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

D. Electrical Reference Symbols: The Electrical "Legend" on drawings is standardized version for this project. All symbols shown may not be used on drawings. Use legend as reference for symbols used on plans.

E. Electrical Drawings: Drawings are diagrammatic; complimentary to the Architectural drawings; not intended to show all features of work. Install material not dimensioned on drawings in a manner to provide a symmetrical appearance. Do not scale drawings for exact equipment locations. Review Architectural, Civil, Structural, and Mechanical Drawings and adjust work to conform to conditions shown thereon. Field verification of dimensions, locations and levels is directed.

1.05 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 70.

B. Conform to the latest adopted edition of the International Building Code and the International Fire Code including all state and local amendments thereto.

C. Obtain electrical permits, plan review, and inspections from authority having jurisdiction.

1.06 SUBMITTALS

A. Submittal review is for general design and arrangement only and does not relieve the Contractor from any requirements of Contract Documents. Submittal not checked for quantity, dimension, fit or proper operation. Where deviations of substitute product or system performance have not been specifically noted in the submittal by the Contractor, provisions of a complete and satisfactory working installation is the sole responsibility of the Contractor.

B. In addition to requirements referenced in Division 01, the following is required for work provided under this division of the specification.

1. Provide material and equipment submittals containing complete listings of material and equipment shown on Electrical Drawings and specified herein. Separate from work furnished under other divisions.

2. Submittals shall be provided in PDF format with each section indexed in the PDF document. Submittals for Division 26 shall be complete and submitted at one time. Unless given prior approval, partial submittals will be returned unreviewed.
3. Clearly identify all material and equipment by item, name or designation used on drawings and in specifications.
4. Submit only pages which are pertinent; mark catalog sheets to identify pertinent products, referenced to Specification Section and Article number. Show reference standards, performance characteristics, and capacities; wiring diagrams and controls; component parts; finishes; dimensions; and required clearances.
5. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information not applicable.
6. Review submittals prior to transmittal; determine and verify field measurements, field construction criteria, manufacturer's catalog numbers, and conformance of submittal with requirements of Contract Documents.
7. Coordinate submittals with requirements of work and of Contract Documents.
8. Certify in writing that the submitted shop drawings and product data are in compliance with requirements of Contract Documents. Notify Architect/Engineer in writing at time of submittal, of any deviations from requirements of Contract Documents.
9. Do not fabricate products or begin work which requires submittals until return of submittal with Architect/Engineer acceptance.
10. Equipment scheduled by manufacturer's name and catalog designations, manufacturer's published data and/or specification for that item, in effect on bid date, are considered part of this specification. Approval of other manufacturer's item proposed is contingent upon compliance therewith.

1.07 SUBSTITUTIONS

A. In accordance with the General Conditions and the General Requirements, Substitution and Product Options, all substitute items must fit in the available space, and be of equal or better quality including efficiency performance, size, and weight, and must be compatible with existing equipment.

1.08 PROJECT RECORD DRAWINGS

A. Maintain project record drawings in accordance with Division 01.

B. In addition to the other requirements, mark up a clean set of drawings as the work progresses to show the dimensioned location and routing of all electrical work which will become permanently concealed. Show routing of work in permanently concealed blind spaces within the building. Show complete routing and sizing of any significant revisions to the systems shown.

C. Record drawing field mark-ups shall be maintained on-site and shall be available for examination of the Owner’s Representative at all times.

1.09 OPERATION AND MAINTENANCE MANUALS

A. Provide operation and maintenance manuals for training of Owner's Representative in operation and maintenance of systems and related equipment. In addition to requirements referenced in Division 01, the following is required for work provided under this section of the specifications.

B. Manuals shall be separate from work furnished under other divisions. Prepare a separate chapter for instruction of each class of equipment or system. Index and clearly identify each chapter and provide a table of contents.

C. Unless otherwise noted in Division 01, provide one copy of all material for approval.

D. The following is the suggested outline for operation and maintenance manuals and is presented to indicate the extent of items required in manuals.

1. List chapters of information comprising the text. The following is a typical Table of Contents:
   a. Electrical power distribution.
   b. Lighting.
   c. Fire alarm.
   d. Intercom.
   e. Electronic Access Control.
   f. Other chapters as necessary.
2. Provide the following items in sequence for each chapter shown in Table of Contents:
   a. Describe the procedures necessary for personnel to operate the system including start-up, operation, emergency operation and shutdown.
      1) Give complete instructions for energizing equipment and making initial settings and adjustments whenever applicable.
      2) Give step-by-step instructions for shutdown procedure if a particular sequence is required.
      3) Include test results of all tests required by this and other sections of the specifications.
   b. Maintenance Instructions:
      1) Provide instructions and a schedule of preventive maintenance, in tabular form, for all routine cleaning and inspection with recommended lubricants if required for the following:
         a) Lighting fixtures.
         b) Distribution equipment.
         c) Fire alarm and detection equipment.
         d) Intercom.
         e) Electronic Access Control.
      2) Provide instructions for minor repair or adjustments required for preventive maintenance routines, limited to repairs and adjustments which may be performed without special tools or test equipment and which requires no special training or skills.
      3) Provide manufacturers' descriptive literature including approved shop drawings covering devices used in system, together with illustrations, exploded views, etc. Also include special devices provided by the Contractor.
      4) Provide any information of a maintenance nature covering warranty items, etc., which have not been discussed elsewhere.
      5) Include list of all equipment furnished for project, where purchased, technical representative if applicable and a local parts source with a tabulation of descriptive data of all electrical-electronic spare parts and all mechanical spare parts proposed for each type of equipment or system. Properly identify each part by part number and manufacturer.
   c. Inspection Certificate: Include copy of certificate of final inspection and acceptance from the Authority Having Jurisdiction.

1.10 DEMONSTRATION OF ELECTRICAL SYSTEMS

A. During substantial completion inspection:
   1. Conduct operating test for approval under provisions of Division 01.

2. Demonstrate installation to operate satisfactorily in accordance with requirements of Contract Documents.
3. Should any portion of installation fail to meet requirements of Contract Documents, repair or replace items failing to meet requirements until items can be demonstrated to comply.
4. Have instruments available for measuring light intensities, voltage and current values, and for demonstration of continuity, grounds, or open circuit conditions.
5. Provide personnel to assist in taking measurements and making tests.

1.11 CERTIFICATE OF COMPLETION

A. Submit, at time of request for final inspection, a completed letter in the following format:

B. I, ____NAME____ , of ___FIRM____ , certify that the electrical work is complete in accordance with Contract Plans and Specifications, and authorized change orders (copies attached) and will be ready for final inspection as of __DATE___. I further certify that the following specification requirements have been fulfilled:

1. ____ megger readings performed, __ copies of logs attached.
2. ____ ground tests performed, __ copies of method used and results attached.
3. ____ operating manuals completed, _____ DATE.

   _____

   SIGNED.
4. ____ as-built drawings up-to-date and ready to deliver to Architect.
5. ____ fire alarm system final connections, check out and start up completed on _____ DATE by:

   _____

   SIGNED.

   Factory Authorized and Trained Technician
6. ____ Electronic Access Control final connections, check out and start up completed on _____ DATE by:

   _____

   SIGNED.

   Factory Authorized and Trained Technician
7. Instruction of operating personnel completed on _____ DATE by:

   _____

   SIGNED.

   Owner's Representative
8. ____ emergency lighting system final connections, check out and start up completed on _____ DATE by:

   _____

   SIGNED.

   Factory Authorized and Trained Technician
9. ____ all other tests required by specifications have been performed.
10. ____ all systems are fully operational.

    _____

    SIGNED.

1.12 WARRANTY

A. In addition to the requirements of Division 01, or as specified in other sections. Warrant all materials, installation and workmanship for one (1) year from date of acceptance.

B. Copies of manufacturer product warranties for all equipment shall be included in the operation and installation manuals.

1.13 INSTRUCTION OF OPERATING PERSONNEL

A. In accordance with the requirements of Division 01 and this section provide services of qualified representative of supplier of each item or system listed below to instruct designated personnel of Owner in operation and maintenance of item or system.

B. Make instruction when system is complete, of number of hours indicated, and performed at time mutually agreeable.

System or Equipment	Hours of Instruction
Electronic Access Control	4
Fire alarm system	4
Intercom	4
Modify/add other sections as necessary	

C. Certify that an Anchorage based authorized service organization regularly carries complete stock of repair parts for listed equipment or systems, that organization is available and will furnish service within 48 hours after request. Include name, address and telephone number of service organization.

D. Have approved operation and maintenance manuals and parts lists for all equipment on hand at time of instruction.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. All Materials and Equipment shall be new.

B. All Materials and Equipment shall be listed by Underwriter's Laboratories or equivalent third party listing agency for the use intended.

C. Materials and Equipment shall be acceptable to the authority having jurisdiction as suitable for the use intended when installed per listing and labeling instructions.

D. No materials or equipment containing asbestos in any form shall be used. Where materials or equipment provided by this Contractor are found to contain asbestos such items shall be removed and replaced with non-asbestos containing materials and equipment at no cost to the Owner.

E. In describing the various items of equipment, in general, each item will be described singularly, even though there may be numerous similar items.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. Install Work using procedures defined in NECA Standard of Installation and/or the manufacturer's installation instructions.

3.02 TESTS

A. [Perform tests in accordance with Section 26 0126 – Maintenance Testing of Electrical Systems.]

B. Notify the Owner’s representative at least 72 hours prior to conducting any tests.

C. Following completion of installation, test system ground in accordance with the requirements of NETA ATS 7.13. and all feeders in accordance with NETA ATS 7.3. Submit logs of values obtained, and nameplate data of instruments used prior to final inspection. Include a copy of all data in the power distribution section of the Operation and Maintenance Manuals.

D. Perform additional tests required under other sections of these specifications.

E. Perform all tests in the presence of the Owner's representative.

F. The Contractor shall provide written notification to the Owner's representative and the State Electrical Inspector thirty days in advance of requests for rough-in and substantial completion inspections.

3.03 PENETRATIONS OF FIRE BARRIERS

A. Related information to this section appears in Division 07, Fire Stopping.

B. All holes or voids created to extend electrical systems through fire rated floors, walls or ceiling shall be sealed with an asbestos-free intumescent fire stopping material capable of expanding 8 to 10 times when exposed to temperatures 250ºF or higher.

C. Materials shall be suitable for the fire stopping of penetrations made by steel, glass, plastic and shall be capable of maintaining an effective barrier against flame, smoke and gases in compliance with the requirements of ASTM E814 and UL 1479.

D. The rating of the fire stops shall be the same as the time-rated floor, wall or ceiling assembly.

E. Install fire stopping materials in accordance with the manufacturer's instructions.

F. Unless protected from possible loading or traffic, install fire stopping materials in floors having void openings of four (4) inches or more to support the same floor load requirements as the surrounding floor.

G. Seal cable tray penetrations of fire rated floors, walls or ceilings with UL listed, reusable fire stop sealing bags.

END OF SECTION

SECTION 26 0505
SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical Demolition.

1.02 RELATED SECTIONS

A. Division 01 - Alteration Project Procedures.

B. Division 02 - Minor Demolition for Remodeling.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual Sections.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify field measurements and circuiting arrangements are as shown on Drawings.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition Drawings are based on a non-destructive walkthrough and existing record documents. Report discrepancies to Architect/Engineer before disturbing existing installation.

D. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.

B. Coordinate utility service outages with Utility Company.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from Owner at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

E. Existing Fire Alarm System: Maintain existing system in service. Disable system only to make switchovers and connections. Notify Owner and local fire service at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

F. Existing Telephone System: Maintain existing system in service. Disable system only to make switchovers and connections. Notify Owner and Telephone Utility Company at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

G. Existing Electric Access Control: Maintain existing system in service. Disable system only to make switchovers and connections. Obtain permission from the Owner at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Demolish and extend existing electrical work under provisions of Division 01, Division 02, and this Division.

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Remove abandoned wiring to source of supply.

D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.

F. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

G. Repair adjacent construction and finishes damaged during demolition and extension work. T-bar ceiling tiles damaged under normal construction conditions or having voids where junction boxes were removed shall be replaced by the Contractor.

H. Maintain access to existing electrical installations which remain active.

I. Extend existing installations using materials and methods as specified.

J. Where materials or equipment are to be turned over to Owner or reused and installed by the Contractor, it shall be the Contractor's responsibility to maintain condition of materials and equipment equal to the existing condition of the equipment before the work began. Repair or replace damaged materials or equipment at no additional cost to the Owner.

K. Relocate existing lighting fixtures as indicated on Drawings. Test fixture to see if it is in good working condition before installation at new location.

L. Contractor to field verify conduits and electrical items in walls to be demolished prior to start of work. Demolish conduits, boxes, devices, equipment, etc. In walls that are scheduled for demolition. Where conduits pass through the walls or circuits are shared with equipment that is existing to remain, provide all work necessary (including extending and re-routing conduits) to maintain access and provide electrical continuity to existing systems and circuitry.

3.04 EXISTING PANELBOARDS

A. Ring out circuits in existing panel affected by the Work. Where additional circuits are needed, reuse circuits available for reuse. Install new breakers.

B. Tag unused circuits as spare.

C. Where existing circuits are indicated to be reused, use sensing measuring devices to verify circuits feeding Project area or are not in use.

D. Remove existing wire no longer in use from panel to equipment.

E. Provide new updated directories where more than three circuits have been modified or rewired.

3.05 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused.

B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions.

3.06 INSTALLATION

A. Install relocated materials and equipment under the provisions of Division 01.

3.07 DISPOSAL

A. Dispose of all hazardous waste under the provisions of Division 02 and in accordance with all local, State and Federal requirements.

END OF SECTION

SECTION 26 0519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building Wire.

B. Cable.

C. Wiring Connections and Terminations.

1.02 RELATED SECTIONS

A. Section 26 0126 – Maintenance Testing of Electrical Systems.

B. Section 26 0553 – Identification for Electrical Systems.

1.03 REFERENCES

A. Federal Specification FS-A-A59544 – Cable and Wire, Electrical (Power, Fixed Installation).

B. Federal Specification FS-J-C-30B – Cable Assembly, Power, Electrical.

C. ANSI/NEMA WC 70-2009 – Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy.

D. NETA ATS – Acceptance testing specifications for Electrical Power Distribution and Systems.

E. NFPA 70 – National Electrical Code.

F. NFPA 262 – Standard Method of test for flame travel and smoke of wires and cables for use in air-handling spaces.

G. UL 62 – Flexible Cords and Cables.

H. UL 83 – Thermoplastic Insulated Wire and Cable.

I. UL 1063 – Standard for Machine and Tool Wire and Cable.

J. UL 1424 – Standard for Cables for Power-Limited Fire Alarm.

K. UL 1479 – Standard for Fire Tests of Through Wall Penetration Fire Stops.

L. UL 1569 – Standard for Metal Clad Cable.

M. UL 1581 – Reference Standard for Electrical Wires, Cables and Flexible Cords.

1.04 SUBMITTALS

A. Submit data under provisions of Division 01 and Section 26 0500.

B. Product Data: Submit product data for all components provided which fall under this section showing configurations, finishes, and dimensions. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.

1.05 QUALITY ASSURANCE

A. Provide wiring materials located in plenums with peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet (1.5m) when tested in accordance with NFPA 262.

PART 2 PRODUCTS

2.01 BUILDING WIRE

A. Thermoplastic-insulated Building Wire: NEMA WC 70.

B. Feeders and Branch Circuits Larger Than 6 AWG: Copper, stranded conductor, 600 volt insulation, THW, THHN/THWN or XHHW-2 as indicated.

C. Feeders and Branch Circuits 6 AWG and Smaller: Copper conductor, 600 volt insulation, THHN/THWN or XHHW-2. 6 and 8 AWG, stranded conductor; smaller than 8 AWG, solid or stranded conductor.

D. Branch Circuit Wire Color Code:

1. Color code wires by line or phase as follows:

a. Black, red, blue and white for 120/208V systems.

b. Brown, orange, yellow and gray for 277/480V systems.

2. For conductors 6 AWG and smaller, insulation shall be colored. For conductors 4 AWG and larger, identify with colored phase tape at all terminals, splices, and boxes.

3. Grounding conductors 6 AWG and smaller shall have green colored insulation. For 4 AWG and larger, use green tape at both ends and at all other visible points in between, including pull and junction boxes.

E. Control Circuits: Copper, stranded conductor 600 volt insulation, THHN/THNN or XHHW-2.

F. Fire Alarm Notification Appliance Circuits: Copper, solid or stranded conductor 600 volt insulation, THHN/THNN or XHHW-2.

2.02 METAL CLAD CABLE

A. UL 83, 1063, 1479, 1569, and 1581 listed, meets Federal Specification A-A-59544 (formerly J-C-30B). UL rated for installation in cable trays and environmental air handling spaces. Fire wall rated for 1, 2, and 3-hour through penetrations.

B. Type MC Cable, Size 12 Through 10 AWG: Solid copper conductor, 600 volt thermoplastic insulation, rated 90º C dry, 75º wet, insulated green grounding conductor, and galvanized steel or aluminum armor over mylar.

C. Type MC Cable, Size 8 Through 1 AWG: Stranded copper conductor, 600 volt thermoplastic insulation, rated 90º C dry, 75º wet, insulated green grounding conductor, and galvanized steel or aluminum armor over mylar.

D. Fire Alarm/Control Type MC Cable, Size 18 through 12 AWG: Complying with UL 66, 83, 1424, 1479, 1569, 1581, and NFPA 262 (formerly UL 910), solid copper conductor, 300 volt thermoplastic insulation, rated [90°C] 105º C, insulated green grounding conductor, and red-striped galvanized steel armor over mylar. Conductor insulation shall be color-coded in accordance with Section 28 31 00.

E. 0-10V Dimming/Power MC Cable (Type MC-PCS), Size 12 Through 10 AWG With 16-2 Control Cables: Solid copper conductor, 600 volt thermoplastic insulation, rated 90º C dry, 75º wet, insulated green grounding conductor, and galvanized steel or aluminum armor over mylar

F. All metal clad cable shall be provided with color-coded insulation on all ungrounded conductors in accordance with NEC 210.5(C) and Part 3 of this section.

G. IF MC cable is used. Health care listed MC cabling shall be provided in patient care location.

2.03 REMOTE CONTROL AND SIGNAL CABLE

A. Control Cable for Class 1 Remote Control and Signal Circuits: Copper conductor, 600 volt insulation, rated 90º C, individual conductors twisted together, shielded, and covered with an overall PVC jacket; UL listed.

B. Control Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300 volt insulation, rated 90º C, individual conductors twisted together, shielded or unshielded (as required), and covered with a PVC jacket; UL listed.

C. Plenum Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300 volt insulation, rated 90º C, individual conductors twisted together, shielded or unshielded (as required), and covered with a nonmetallic jacket; UL listed for use in air handling ducts, hollow spaces used as ducts, and plenums.

2.04 WIRING CONNECTIONS AND TERMINATIONS

A. For conductors 8 AWG and smaller:

1. Dry interior areas: Spring wire connectors, pre-insulated “twist-on” rated 105 degrees C per UL 468C. Where stranded conductors are terminated on screw type terminals, install crimp insulated fork or ring terminals. Thomas & Betts Sta-Kon or equal.
2. Motor connections: Spring wire connectors, pre-insulated “twist-on” rated 105 degrees C per UL 468C. Provide a minimum of 8 wraps of Scotch 33+ electrical tape around conductors and connector to eliminate connector back off.
3. Wet or exterior: Spring wire connectors, pre-insulated “twist-on”, resin filled rated for direct burial per UL 486D.
4. Fluorescent luminaires: UL listed, 4A, 600V, luminaire disconnect with tin-plated brass contacts, finger-safe polycarbonate female housing, 105º C temperature rating, and two or three-pole configuration to match load served.

B. For conductors 6 AWG and larger:

1. Bus lugs and bolted connections: 600 V, 90 degrees C., two hole long barrel irreversible compression copper tin plated. Thomas & Betts or approved equal.
2. Motor connection: 600 V, 90 degrees C., copper tin plated compression motor pigtail connector, quick connect/disconnect, slip on insulator. Thomas & Betts or approved equal.
3. Two way connector for splices or taps: 600 V, 90 degrees C., compression long barrel, copper tin plated. Thomas & Betts or approved equal. Insulate with Scotch 23 rubber insulating base covering and Scotch 33+ outer wrap.

PART 3 EXECUTION

3.01 GENERAL WIRING METHODS

A. Use no wire smaller than 12 AWG for power and lighting circuits, and no smaller than 18 AWG for control wiring.

B. Use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 75 feet, and for 20 ampere, 277 volt branch circuit home runs longer than 200 feet.

C. Splice only in junction or outlet boxes.

D. Neatly train and lace wiring inside boxes, equipment, and panelboards.

E. Make Conductor lengths for parallel circuits equal.

F. Wiring in lighting fixture channels shall be rated for 90º C minimum.

G. Do not share neutral conductors. Provide a dedicated neutral conductor for each branch circuit that requires a neutral.

3.02 WIRING INSTALLATION IN RACEWAYS

A. Pull all conductors into a raceway at the same time. Verify that raceway is complete and properly supported prior to pulling conductors. Use UL listed wire pulling lubricant for pulling 4 AWG and larger wires.

B. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.

C. Do not install XHHW-2 conductors when ambient temperatures are below –5 degrees C and THHN/THWN conductors when ambient temperatures are below 0 degrees C.

D. Conductors shall be carefully inspected for insulation defects and protected from damage as they are installed in the raceway. Where the insulation is defective or damaged, the cable section shall be repaired or replaced at the discretion of the Owner and at no additional cost to the Owner.

E. Place an equal number of conductors for each phase of a circuit in same raceway or cable.

F. Route conductors from each system in independent raceway system and not intermix in the same raceway, enclosure, junction box, wireway, or gutter as another system unless otherwise shown on the plans.

G. No more than six current carrying conductors shall be installed in any homerun unless otherwise indicated on the drawings or without prior approval from the Engineer.

H. Completely and thoroughly swab raceway system before installing conductors.

I. When two or more neutrals are installed in one conduit, identify each with the proper circuit number in accordance with Section 26 0553.

3.03 CABLE INSTALLATION

A. Provide protection for exposed cables where subject to damage.

B. Support cables above accessible ceilings; do not rest on ceiling tiles. Use spring metal clips or cable ties to support cables from structure. Do not support cables from ceiling suspension system. Include bridle rings or drive rings.

C. Use suitable cable fittings and connectors.

3.04 WIRING CONNECTIONS AND TERMINATIONS

A. Stranded wire shall not be wrapped around screw terminals.

B. Splice only in accessible junction boxes.

C. Thoroughly clean wires before installing lugs and connectors.

D. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.

E. Terminate spare conductors with twist on connectors or heat shrink insulation to proper voltage rating.

F. Control systems wiring in conjunction with mechanical, electrical or miscellaneous equipment to be identified in accordance with wiring diagrams furnished with equipment.

G. Code sound and signal systems wiring and any special equipment in accordance with manufacturer's diagrams or recommendations.

H. Do not exceed manufacturer's recommended pull tensions.

3.05 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 01 and Section 26 0126.

B. Inspect wire and cable for physical damage and proper connection.

C. Torque conductor connections and terminations to manufacturer's recommended values.

3.06 WIRE AND CABLE INSTALLATION SCHEDULE

A. All Locations: Building wire and/or remote control and signal cable in raceways.

B. At the Contractor’s option, Metal Clad cable may be used for branch circuit wiring other than homeruns. Homeruns shall be building wire in raceway. Metal Clad cable used for branch circuit wiring from a light switch to the light fixture shall include a neutral conductor.

C. At the Contractor’s option, portions of the fire alarm wiring in dry, concealed locations may be installed in Fire Alarm Metal Clad cable.

END OF SECTION

SECTION 26 0526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Power System Grounding.

B. Electrical Equipment and Raceway Grounding and Bonding.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, Section 26 0500 – Common Work Results for Electrical, Division 27 and Division 28.

B. Section 26 0126 – Maintenance Testing of Electrical Systems.

C. Section 26 0519 – Low-Voltage Electrical Power Conductors and Cables.

1.03 REFERENCE STANDARDS

A. ANSI/NEMA GR-1, Ground Rod Electrodes and Ground Rod Electrode Couplings.

B. ANSI/NFPA 70 – National Electrical Code.

C. ASTM B 3 – Standard Specification for Soft or Annealed Copper Wire.

D. AWS A5.8/A5.8M – Specification for Filler Metals for Brazing and Braze Welding.

E. IEEE Std 81 – Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.

F. IEEE Std 142 – Recommended Practice for Grounding of Industrial and Commercial Power System.

G. UL 467 – Standard for Grounding and Bonding Equipment.

1.04 SYSTEM DESCRIPTION

A. Provide a complete grounding system for equipment as required by State and Local Codes, NEC, applicable portions of other NFPA codes, and as indicated herein.

1.05 SUBMITTALS

A. Product Data: Submit product data for all components provided, showing material type and dimensions. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.

1.06 CLOSEOUT SUBMITTALS

A. Project Record Drawings

1. Show the actual installed routing of grounding electrode conductor, and size/type of bonding conductors.

1.07 COORDINATION

A. Division 01 – Administrative Requirements: Requirements for Coordination.

B. Complete grounding and bonding of building reinforcing steel prior to concrete placement.

PART 2 PRODUCTS

2.01 MATERIALS

A. Bonding Conductors: Solid bare copper wire for sizes No. 8 AWG and smaller diameter. Stranded bare copper wire for sizes No. 6 AWG and larger diameter. Conductors may be insulated conductors if used provide green insulation.

B. Grounding Conductors: Copper conductor bare or green insulated.

C. Mechanical Grounding and Bonding Connectors: Non-reversible crimp type lugs only. Use factory made compression lug for all terminations.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide a separate, insulated equipment-grounding conductor in all feeder and branch circuits. Terminate each end on a grounding lug, bus, or bushing. Multiple conductors on single lug not permitted. Each grounding conductor shall terminate on its own terminal lug.

B. Bond together exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing and fuel systems.

C. Grounding conductors for branch circuits shall be sized in accordance with NEC, except minimum size grounding conductor shall be No. 12 AWG.

D. Grounding conductor is in addition to neutral conductor and in no case shall neutral conductor serve as grounding means.

3.02 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Continuity Test: Continuity test shall be performed on all power receptacles to ensure that the ground terminals are properly grounded to the facility ground system.

END OF SECTION

SECTION 26 0529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Section included hangers and supports for Power Systems, Communication Systems and Electronic Safety and Security Systems.

B. Conduit Supports.

C. Formed Steel Channel.

D. Spring Steel Clips.

E. Sleeves.

F. Mechanical Sleeve Seals.

G. Equipment Bases and Supports.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, and Section 26 0500 – Common Work Results for Electrical, Division 27 and Division 28.

B. Section 26 0548 - Vibration and Seismic Controls for Electrical Systems.

1.03 REFERENCES

A. International Building Code (IBC), Chapter 16 – Structural Design.

1.04 SUBMITTALS

A. Division 01: Requirements for submittals.

B. Product Data: Submit product data for specialty supports.

1.05 COORDINATION

A. Coordinate size, shape and location of concrete pads with Division 03.

1.06 QUALITY ASSURANCE

A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 PRODUCTS

2.01 CONDUIT SUPPORTS

A. Manufacturers:
   1. Allied Tube & Conduit Corp.
   2. Minerallac Fastening Systems.
   3. O-Z Gedney Co.
   4. Substitutions: per Division 01

B. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads.

C. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.

D. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.

E. Conduit clamps - general purpose: One-hole malleable iron for surface mounted conduits.

F. Cable Ties: High strength nylon temperature rated to 185 degrees F. self-locking.

2.02 FORMED STEEL CHANNEL

A. Manufacturers:
   1. B-Line Systems.
   2. Allied Tube & Conduit Corp.
   3. Unistrut Corp.
   4. Substitutions: per Division 01.

B. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

2.03 SLEEVES

A. Sleeves Through Non-fire Rated Floors: 18 gage thick galvanized steel.

B. Sleeves Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.

C. Sleeves Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.

D. Fire-stopping Insulation: Glass fiber type, non-combustible.

2.04 MECHANICAL SLEEVE SEALS

A. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Division 01: Verification of existing conditions before starting work.

B. Verify openings are ready to receive sleeves.

3.02 PREPARATION

A. Obtain permission from Owner’s Representative before using powder-actuated anchors.

B. Obtain permission from Owner’s Representative before drilling or cutting structural members.

3.03 INSTALLATION - GENERAL

A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using precast insert system, expansion anchors, preset inserts, beam clamps, or spring steel clips.

B. Use toggle bolts or hollow wall fasteners in hollow masonry 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 support raceways, low voltage pathways, cables, telecommunication pathways or boxes from ceiling suspension wires or suspended ceiling systems. Provide support from building structure independently to allow ceiling removal and replacement without removal of electrical system. If dedicated support wires are used, wires and wire clips must be painted or color-coded. Exception: Outlet boxes for ceiling-mounted light fixtures, speakers, motion sensors, CCTV cameras, and smoke detectors may be mounted in the ceiling system.

D. Do not fasten supports to piping, ductwork, mechanical equipment, conduit, or ceiling suspension system.

E. Do not penetrate by drilling or screwing into metal roof decking. All penetrations into metal roof decking must be approved by the Project Manager in writing.

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. Install surface-mounted cabinets and panelboards with minimum of four anchors.

H. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.

I. Securely fasten fixtures and equipment to building structure in accordance with manufacturer's recommendations and to provide necessary earthquake anchorage.

J. Provide wall attached fixtures and equipment weighing less than 50 pounds with backing plates of at least 1/8" x 10" sheet steel or 2" x 10" fire retardant treated wood securely built into the structural walls. Submit attachment details of heavier equipment for approval.

K. Earthquake Anchorages:
   1. Equipment weighing more than 50 pounds shall be adequately anchored to the building structure to resist lateral earthquake forces.
   2. Total lateral (earthquake) forces shall be 1.5 times the equipment weight acting laterally in any direction through the equipment center of gravity. Provide adequate backing at structural attachment points to accept the forces involved.

L. Provide one seismic support wire for all fixtures weighing less than 10lbs. two minimum color-coded dedicated seismic support wires for each ceiling mounted light fixture weighing less than 50 pounds. Attach support wires to building structure independent from ceiling system and on opposing corners of the light fixtures to not allow fixture to drop more than 6 inches upon ceiling failure. Secure each end with three tight wraps within 1 inch at each end of the wire. Provide four supports on fixtures >50 lbs.

M. Attach the supporting cables for all pendant fixtures to both the building structure and to the ceiling grid which they pass through.

3.04 INSTALLATION - SLEEVES

A. Exterior watertight entries: Seal with adjustable interlocking rubber links.

B. Conduit penetrations not required to be watertight: Sleeve and fill with silicon foam.

C. Set sleeves in position in forms. Provide reinforcing around sleeves.

D. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

E. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.

F. Where conduit or raceway penetrates floor, ceiling, or wall, close off space between conduit or raceway and adjacent work with fire stopping insulation and caulk. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

G. Install chrome plated steel escutcheons at finished surfaces.

END OF SECTION

SECTION 26 0533
RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Metal Conduit.

B. Flexible Metal Conduit.

C. Liquidtight Metal Conduit.

D. Electrical Metallic Tubing.

E. Fittings and Conduit Bodies.

F. Wall and Ceiling Outlet Boxes.

G. Pull and Junction Boxes.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 - General Requirements and Section 26 0500 – Common Work Results for Electrical.

B. Division 07 - Thermal and Moisture Protection.

C. Division 08 - Openings: Access Doors and Frames.

D. Section 26 0519 – Low-Voltage Electrical Power Conductors and Cables.

E. Section 26 0526 – Grounding and Bonding for Electrical Systems.

F. Section 26 0529 – Hangers and Supports for Electrical Systems.

G. Section 26 0553 – Identification for Electrical Systems.

H. Section 26 2726 – Wiring Devices.

I. Section 27 0528 - Pathways for Communications Systems.

J. Section 27 1000 – Structured Cabling.

1.03 REFERENCES

A. American National Standards Institute (ANSI):

1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
2. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.

B. American Society for Testing and Materials (ASTM):

1. ASTM A 123 – Specification for Zinc Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strip.

C. National Electrical Manufacturers Association (NEMA):

1. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
2. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

D. Underwriters Laboratory (UL):

1. UL 6 - Rigid Steel Conduit, Zinc Coated.
2. UL 514B – Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

E. National Fire Protection Association (NFPA):

1. NFPA 70 - National Electrical Code.

F. Telecommunications Industry Association (TIA) and Electronics Industries Association (EIA):

1. ANSI/TIA/EIA 568-B Commercial Building Telecommunications Cabling Standard.

G. Building Industry Consulting Service International (BICSI):

1. BICSI Telecommunication Design Methods Manual.

H. International Building Code (IBC):

1. IBC chapters 16 and 17 seismic requirements.

1.04 RACEWAY AND BOX INSTALLATION SCHEDULE

A. Raceway minimum size:

1. Above Grade: Provide ¾" inch minimum, unless otherwise noted. Raceway may be reduced to ½" inch for final connection of raceway up to 6feet of connection to fixture or device where maximum conduit entry size is ½ inch.

B. In or through CMU walls:

1. Raceway: Provide rigid steel conduit or intermediate metal conduit. EMT conduit may penetrate through CMU walls where the EMT is installed in a sleeve and does not come in direct contact with the CMU. All conduit in contact with concrete or block shall be rigid steel conduit half lapped wrapped with pipe wrap or be plastic-coated conduit.
2. Boxes and Enclosures: Provide concrete tight cast and sheet metal steel metal boxes.

C. Outdoor Above Grade, Damp or Wet Interior Locations:

1. Raceway: Provide rigid steel conduit or intermediate metal conduit.
2. Boxes and Enclosures: Provide weatherproof malleable iron for branch circuit junction and outlet boxes. Provide weatherproof NEMA 3R sheet metal enclosures for safety and disconnect switches and NEMA 4 sheet metal enclosures with gaskets for motor controllers and control panels.
3. Fittings: Provide galvanized malleable iron with gaskets. Provide Myers threaded hubs for all conduit entries into top and side of sheet metal enclosures.

D. Concealed Dry Locations:

1. Raceway: Provide rigid steel conduit, intermediate metal conduit, or electrical metallic tubing.
2. Boxes and Enclosures: Provide sheet-metal boxes. Provide vapor barrier boxes in exterior walls and the ceiling.
3. Fittings: Provide galvanized malleable iron and steel.

E. Exposed Dry Locations:

1. Raceway: Provide rigid steel conduit or intermediate metal conduit. EMT conduit may be used where exposed conduit is allowed [where it is not subject to physical damage or] where installed on the ceiling or a minimum of ten feet above the floor.
2. Boxes and Enclosures: Provide sheet-metal boxes with raised steel covers.
3. Fittings: Provide galvanized malleable iron and steel.
4. Surface Raceway and Boxes. Where specifically noted on the Drawings, provide surface raceway and boxes.

F. Branch Circuits 60 Amperes or Larger and Feeders:

1. Raceway: Provide rigid steel conduit or intermediate metal conduit.
2. Boxes and Enclosures: Provide sheet-metal boxes.

3. Fittings: Provide galvanized malleable iron and steel.

G. Equipment Connections: Provide short extensions (three feet maximum) of flexible metal conduit for connections to light fixtures, motors, transformers, vibrating equipment or equipment that requires removal for maintenance or replacement. Use Liquidtight flexible conduit and fittings for motors and equipment in damp or wet locations or subject to spilling of liquids as at pumps, kitchen equipment, in mechanical rooms, boiler rooms, pump rooms, etc.

H. Liquidtight flexible nonmetallic conduit and electrical nonmetallic tubing are not approved raceway systems for this project.

1.05 DESIGN REQUIREMENTS

A. Raceway Minimum Size:

1. Below Grade: Provide 1 inch minimum, unless otherwise noted.

2. Above Grade or Slab on Grade: Provide 1/2 inch minimum, unless otherwise noted. Raceway may be reduced to ½ inch for final connection of raceway up to 6 feet for connection to fixture or device where maximum conduit entry size is ½ inch.

3. Line Voltage Circuits: Raceway is sized on the drawings for copper conductors with 600-Volt type XHHW insulation, unless otherwise noted. Where a raceway size is not shown on the drawings, it shall be calculated to not exceed the percentage fill specified in the NEC Table 1, Chapter 9 using the conduit dimensions of the NEC Table 4, Chapter 9 and conductor properties of the NEC Table 5, Chapter 9.

4. Fire Alarm, Telecom, Intercom and other Low-Voltage Circuits: Where installed in raceways, the raceway size shall be calculated to not exceed the percentage fill specified in the NEC Table 1, Chapter 9, using the conduit dimensions of the NEC Table 4, Chapter 9, and cable diameter provided by the manufacturer.

B. Box Minimum Size: Provide all boxes sized and configured per NEC Article 370 and as specified in this section.

C. Seismic Support: Provide support in accordance with section 26 0529 – Hangers and Supports for Electrical Systems and 26 0548 – Vibration and Seismic Support for Electrical Systems.

D. Telecommunication Pathways Layout and Configuration: BICSI Telecommunication Design Methods Manual and ANSI/TIA/EIA 568-B Commercial Building Telecommunications Cabling Standard.

1.06 SUBMITTALS

A. Product Data: Submit data for products to be provided.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

PART 2 - PRODUCTS

2.01 RIGID METAL CONDUIT (RMC)

A. Rigid Steel Conduit: ANSI C80.1, UL 6.

B. Fittings and Conduit Bodies: NEMA FB 1, UL 514B; Galvanized malleable iron with threaded hubs for all conduit entries. Provide threaded connections and couplings only. Set Screw and running thread fittings are not permitted.

C. Provide insulated throat bushings at all conduit terminations.

2.02 INTERMEDIATE METAL CONDUIT (IMC)

A. Product Description: ANSI C80.6, UL 1242; Galvanized Steel Conduit.

B. Fittings and Conduit Bodies: NEMA FB 1, UL 514B; use fittings and conduit bodies specified above for rigid steel conduit.

C. Provide insulated throat bushings at all conduit terminations.

2.03 FLEXIBLE METAL CONDUIT (FMC)

A. Product Description: UL 1, FS WW-C-566; galvanized or zinc-coated flexible steel, full or reduced-wall thickness.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel or malleable iron with insulated throat bushings. Die cast zinc or threaded inside throat fittings are not acceptable.

2.04 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Product Description: UL 360, flexible metal conduit with interlocked steel construction and PVC jacket.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; liquid tight steel or malleable iron with insulated throat bushings. Die cast fittings are not acceptable.

2.05 ELECTRICAL METALLIC TUBING (EMT)

A. Product Description: ANSI C80.3, UL 797; galvanized steel tubing.

B. Fire Alarm EMT: Provide EMT with factory-applied red topcoating.

C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel or malleable iron, compression or set screw type with insulated throat bushings. Zinc die cast, set screw, or indentor fittings are not acceptable.

D. Maximum size shall be 2". Provide factory elbows on sizes 1-½" and larger.

2.06 OUTLET BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, UL514A galvanized steel, with plaster ring where applicable.

1. Minimum Size: 4 inches square or octagonal, 1-1/2 inches deep, unless otherwise noted.
2. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch male fixture studs where required. Minimum Size: 4 inches square or octagonal, 2-1/8 inches deep.
3. Concrete and Masonry: Concrete type with field installed tape cover to prevent concrete entry to raceway system. Minimum Size: 4 inches square, 2-1/8 inches deep.
4. Telecommunications Outlets: Minimum size 4-11/16 inches square, 2-1/8 inches deep.

B. Vapor Barrier Boxes: Airtight box with vapor barrier flange and integral wire entry seal. Lessco, Nutek, Enviroseal, or approved equal.

C. Cast Boxes: NEMA FB 1, Type FD, galvanized malleable iron. Furnish gasketed cover by box manufacturer. Furnish threaded hubs. “Bell” boxes are not acceptable.

D. Wall Plates: As specified in Section 26 2726.

2.07 PULL AND JUNCTION BOXES

A. Sheet Metal Pull and Junction Boxes: ANSI/NEMA OS 1, UL514A galvanized steel.

1. Minimum Size: 4 inches square or octagonal, 1-1/2 inches deep, unless otherwise noted.

B. Cast Metal Boxes for Outdoor and Wet Location Installations: NEMA 250, Type [4] [4X] [6]; flat-flanged, surface mounted junction box, UL listed as raintight:

1. Material: Galvanized cast iron [or copper-free cast aluminum].
2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover and screws.

2.08 FLOOR BOXES

A. Floor Boxes for Installation in Cast-In-Place Concrete Floors: Full adjustable, cast iron, or formed steel.

B. Concealed Service Floor Boxes: Wiremold #Evolution series or approved equal fully adjustable box with cast iron base and PVC housing constructed in accordance with UL514A/C. Box shall contain 6 or 8 enclosed wiring compartments capable of accommodating duplex receptacles, GFCI receptacles, modular telecom jacks, audio-visual jacks, etc.. Provide with all faceplates required to accommodate installed devices. Provide with flush aluminum cover with carpet insert.

2.09 EXPANSION FITTINGS

A. Galvanized malleable iron, galvanized with grounding bond jumper.

2.10 BUSHINGS

A. Non-grounding: Threaded impact resistant plastic.

B. Grounding: Insulated galvanized malleable iron/steel with hardened screw bond to raceway and conductor lug.

2.11 LOCKNUTS

A. Threaded Electro Zinc Plated Steel designed to cut through protective coatings for ground continuity.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Ground and bond raceway and boxes in accordance with Section 26 0526.

B. Provide seismic support and fasten raceway and box supports to structure and finishes in accordance with Section 26 0529.

C. Identify raceway and boxes with origin and destination in accordance with Section 26 0553.

D. Unless otherwise noted, do not inter-mix conductors from separate panelboards or any other system in the same raceway system or junction boxes.

3.02 INSTALLATION - GENERAL RACEWAY

A. Install raceway for all systems, unless otherwise noted.

B. Install an equipment grounding conductor inside of all raceways containing line voltage conductors.

C. Provide raceways concealed in construction unless specifically noted otherwise, or where installed at surface cabinets, motor and equipment connections and in Mechanical and Electrical Equipment rooms. Do not route conduits on roofs, outside of exterior walls, or along the surface of interior finished walls unless specifically noted on the plans.

D. Raceway routing and boxes are shown in approximate locations unless dimensioned. Where raceway routing is not denoted, field-coordinate to provide complete wiring system.

E. Do not route raceways on floor. Arrange raceway and boxes to maintain a minimum of 6 feet 6 inches of headroom and present a neat appearance. Install raceways level and square to a tolerance of 1/8” per 10 feet. Route exposed raceways and raceways above accessible ceilings parallel and perpendicular to walls, ceiling, and adjacent piping.

F. Maintain minimum 6-inch clearance between raceway and mechanical and piping and ductwork. Maintain 12-inch clearance between raceway and heat sources such as flues, steam pipes, heating pipes, heating appliances, and other surfaces with temperatures exceeding 104 degrees F.

G. Do not install raceway imbedded in spray applied fire proofing. Seal raceway penetrations of fire-rated walls, ceilings, floors in accordance with the requirements of Section 26 0500 and Division 07.

H. Where raceway penetrates fire-rated walls and floors, [provide mechanical fire-stop fittings with UL listed fire rating equal to wall or floor rating,] seal opening around conduit with UL listed firestop sealant or intumescent firestop, preserving the fire time rating of the construction. Install in accordance with Section 07 8400 Firestopping.

I. Raceways and boxes penetrating vapor barriers or penetrating areas from cold to warm shall be taped and sealed with a non-hardening duct sealing compound to prevent the accumulation of moisture, and shall include a vapor barrier on the outside.

J. Conduit embedded in concrete or solid masonry shall not be larger than 1/3 the thickness of the wall or slab and shall be spaced not less than three diameters apart. No cutting of reinforcing bars shall be permitted unless specifically approved. Should structural members prevent the installation of conduit or equipment, notify the Contracting Officer before proceeding.

K. Arrange raceway supports to prevent misalignment during wiring installation. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

L. Do not attach raceway to ceiling support wires or other piping systems and do not fasten raceway with wire or perforated pipe straps. Remove all wire used for temporary raceway support during construction, before conductors are pulled. Raceway shall be installed to permit ready removal of equipment, piping, ductwork, or ceiling tiles.

M. Group raceway in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps, as specified in Section 26 0529. Provide space on each rack for 25 percent additional raceway.

N. Cut conduit square; de-burr cut ends. Bring conduit to the shoulder of fittings and couplings and fasten securely. Where locknuts are used, install with one inside box and one outside with dished part against box.

O. Use threaded raintight conduit hubs for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations. Sealing locknuts are not acceptable.

P. Install no more than the equivalent of three 90-degree bends between boxes.

Q. Install conduit bodies to make sharp changes in direction, such as around beams. “Goosenecks” in conduits are not acceptable.

R. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2 inch size.

S. Provide protective plastic bushings or insulated throat bushings at each raceway termination not installed to an enclosure. Bushings shall be threaded to the raceway end or connector.

T. Avoid moisture traps; install junction box with drain fitting at low points in raceway system.

U. Install fittings and flexible metal conduit to accommodate 3-axis movements where raceway crosses seismic joints.

V. Install fittings designed and listed to accommodate expansion and contraction where raceway crosses control and expansion joints.

W. Use cable sealing fittings forming a watertight non-slip connection to pass cords and cables into conduit. Size cable sealing fitting for the conductor outside diameter. Use Appleton CG series or equal cable sealing fittings.

X. Use suitable caps to protect installed raceway against entrance of dirt and moisture.

Y. Paint all exposed conduit to match surface to which it is attached or crosses. Clean greasy or dirty conduit prior to painting in accordance with paint manufacturer's instructions. Where raceway penetrates non-rated ceilings, floors or walls, provide patching, paint and trim to retain architectural aesthetics similar to surroundings.

3.03 INSTALLATION – GENERAL BOXES

A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance. All electrical box locations shown on Drawings are approximate unless dimensioned.

B. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only. Where installation is inaccessible, install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaries. Coordinate locations and sizes of required access doors with Division 08.

C. Coordinate layout and installation of boxes to provide adequate headroom and working clearance. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

D. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.

E. Use multiple-gang boxes where more than one device are mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems and where normal and emergency power circuits occur in the same box.

F. Verify location of floor boxes in offices and work areas prior to rough-in. Set boxes level and flush with finish flooring material.

G. Adjust box location up to 6 feet prior to rough-in to accommodate intended purpose.

H. Orient boxes to accommodate wiring devices oriented as specified in Section 26 2726.

I. Unless otherwise specifically noted, locate outlet boxes for light switches within 6 inches of the door jamb on the latch side of the door.

J. Position outlets to locate luminaires as shown on reflected ceiling plans.

K. Locate and install boxes to maintain headroom and to present a neat appearance.

L. Locate flush-mounted box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

M. Provide knockout closures for unused openings.

N. Install boxes in walls without damaging wall insulation or reducing its effectiveness.

O. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. For outlet boxes in walls with combustible finished surfaces such as wood paneling or fabric wall coverings, position box to be flush with finished surface per NEC requirements.

P. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes. Accurately position bridges to allow for surface finish thickness.

Q. Do not install flush mounted boxes back-to-back in walls; install with minimum 6 inches separation.

R. Install with minimum 24 inches separation in fire rated walls. Limit penetrations in fire rated walls to 16 square inches each and a maximum total combined penetration area of 100 square inches in any given 100 square feet of wall. Where penetrations are in excess of these requirements provided UL listed fire stop wrap acceptable to Authority having Jurisdiction.

S. Do not fasten boxes to ceiling support wires or other piping systems.

T. Support boxes independently of conduit.

U. Clean interior of boxes to remove dust, debris, and other material and clean exposed surfaces and restore finish.

V. Provide blank covers or plates for all boxes that do not contain devices.

3.04 INSTALLATION – TELECOMMUNICATION RACEWAYS AND SLEEVES

A. Provide continuous pathway system for all telecommunication cables. Provide cable pathway support in accordance with section 27 0528.

B. Provide separation clearances in accordance with Section 27 1000.

C. Install the telecommunication pathways in accordance with requirements for Installation of General Conduit and General Boxes above unless superseded by more stringent requirements of this section or ANSI/EIA/TIA568-B and the latest published edition of the BICSI Telecommunication Distribution Methods Manual guidelines and recommendations.

D. Provide pathways for all telecommunication cables with Surface Raceway, Conduit, Cable tray, J-hooks, and chases for the entire length of each cable. Provide pathway capacity throughout entire system for each telecommunication outlet served sized to accommodate a minimum of four 4-pair 100-Ohm UTP cables from each outlet location to telecommunication room denoted on the plans.

E. Conduit Pathways:

1. Install pull boxes in continuous straight runs of conduit longer than 100 feet.
2. Contain no more than two 90-degree bends or de-rate conduit capacity 15% for up to one additional 90-degree bend. Conduits less than 33 feet long, oversized one trade size or with one of the 90-degree bends within 12 inches of a pull box may have up to three 90 degree bends without de-rating.
3. Rate each offset as a 90-degree bend.
4. Bond each conduit to telecommunication ground system.
5. Condulets (LB fittings) shall not be installed in any telecommunications raceway.
6. Do not use flexible metal conduit unless specifically noted on the plans or approved by the engineer where it is the only practical alternative. Increase raceway one trade size above required size where flexible metal conduit is used.
7. Terminate conduits routed to cable trays within 6 inches of tray. Provide conduit support to building structure within 24 inches of cable tray.
8. Terminate conduits and chases that protrude through floor in telecommunication rooms to 3 inches above finished floor. Terminate conduits and chases that protrude through finished ceiling or above within 12 inches of ladder rack, distribution frame or cable organizer.
9. Provide bend radius of 6 times of the internal conduit diameter of conduits up to 2 inches; 10 times of the internal conduit diameter of conduits above 2 inches and for all fiber optic raceways.
10. Provide conduit pathways through walls with insulated bushings on each end for all wall penetrations of cables.
11. Provide minimum conduit size of ¾ inch. Size all other conduits, sleeves and chases according to the following table:

Conduit Trade size	Conduit maximum cable capacity is based on two 90 degree bends and < 100 ft of EMT (Inches OD of Cable)							
	(0.18”)	(0.20”)	(0.22”)	(0.24”)	(0.26”)	(0.28”)	(0.31”)	(0.35”)
0.75”	6	5	4	3	3	2	2	2
1”	9	8	6	5	5	4	3	2
1.25”	16	13	11	9	8	7	5	4
1.5”	22	18	15	13	11	9	8	6

2”	37	30	25	21	18	15	12	10
2.5”	64	52	43	36	31	27	22	17
3”	97	79	65	55	47	40	33	26
3.5”	127	103	85	71	61	52	43	34
4”	162	131	109	91	78	67	55	43

F. Provide J-Hooks in accordance with Section 27 0528 to provide telecommunication pathway anywhere cable tray, conduit, or ladder rack is not denoted on the plans and one or more telecommunication cables are routed.

G. Provide innerduct the entire length in conduits denoted to contain innerducts. Size innerducts to use entire available capacity of the outer conduit.

H. Do not install innerduct and other cables in the same raceway.

3.05 INSTALLATION – TELECOMMUNICATION BOXES

A. Boxes:

1. All boxes shall be readily accessible.
2. Do not use boxes for angle pulls or change pathway direction. Locate pull boxes in straight through sections of horizontal conduit pathways.
3. Provide pull boxes for 3/4-inch and 1-inch through pull for horizontal UTP cabling. Provide all other boxes sized per the following table:

Maximum Trade Size Conduit	Minimum Size of Pull Box in Inches			For each additional conduit increase width in inches
	Width	Length (direction of conduit)	Depth	
0.75”	4	12	3	2
1”	4	16	3	2
1.25”	6	20	3	3
1.5”	8	27	4	4
2”	8	36	4	5
2.5”	10	42	5	6
3”	12	48	5	6
3.5”	12	54	6	6
4”	15	60	8	8

END OF SECTION

SECTION 26 0548

VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section includes requirements for vibration and seismic restraints for electrical equipment installed in seismic categories C, D, E or F.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, Section 26 0500 – Common Work Results for Electrical, Division 27 and Division 28.

B. Section 26 0533 - Raceway and Boxes for Electrical Systems.

C. Section 26 0529 – Hangers and Supports for Electrical Systems.

D. Section 26 2200 – Low Voltage Transformers.

E. Section 26 2416 – Panelboards.

F. Section 26 5000 –Lighting.

G. Section 28 4600 – Fire Detection and Alarm.

1.03 DESCRIPTION

A. Provide seismic anchorage and restraint of electrical systems including, equipment, raceways, lighting fixtures, etc.

B. Seismic Category D, E and F:

1. All electrical items that are of Importance Factor (Ip) = 1.5 are required to be seismically braced. This applies to the following:
    a. The component is required to function for life safety purposes after an earthquake, including fire protection systems, fire alarm systems, emergency lighting, etc.
    b. The component contains hazardous materials.
    c. The component is in or attached to an Occupancy Category IV structure (Hospitals, fire station, police station, emergency shelters, etc. per ASCE 7-05, Table 1-1) and it is needed for continued operation of the facility or its failure could impair the continued operation of the facility.

C. All other electrical equipment shall be assigned a component importance factor (Ip) = 1.0 and are required to be seismically braced unless one of the following conditions is satisfied:

1. Component is MOUNTED (connection to structure) at less than 4' above the floor (to the center of gravity of the component), and weighs less than 400 lbs.
2. Component is mounted higher than 4' (to the center of gravity of the component), but weighs less than 50 lbs (if it is concealed).
3. Component is mounted higher than 4' (to the center of gravity of the component), but weighs less than 100 lbs (if it is exposed).
4. Flexible connections between the components and associated conduit are provided.
5. All runs or groupings of conduits on or off of trapezes shall be seismically braced, unless the distribution system (including conduit, wiring and fittings) weighs less than 5 pounds per linear foot.

6. Lighting fixtures, lighted signs and ceiling fans that are not rigidly connected to ducts or piping, that are supported by chains or otherwise suspended from structure, are not required to be seismically braced, as long as:
    a. The attachment points can carry at least 140% of the weight of the fixture, and
    b. The swinging light will not create a falling debris problem by bumping into ceiling of other finishes, and
    c. Connections to structure allow for movement of the fixture without damaging the connections.

D. In accordance with ASCE 7-10 13.6.4, all electrical components with Ip = 1.5 shall also satisfy the following requirements:
1. Provisions shall be made to eliminate seismic impact between components.
2. Loads imposed on the components by attached utility or service lines that are attached to separate structures shall be evaluated.
3. Batteries on racks shall have wrap-around restraints to ensure that the batteries will not fall from the rack. Spacers shall be used between restraints and cells to prevent damage to cases. Racks shall be evaluated for sufficient lateral load capacity.
4. Internal coils of dry type transformers shall be positively attached to their supporting substructure within the transformer enclosure.
5. Electrical control panels, computer equipment, and other items with slide-out components shall have a latching mechanism to hold the components in place.
6. Electrical cabinet design shall comply with the applicable National Electrical Manufacturers Association (NEMA) standards. Cutouts in the lower shear panel that have not been made by the manufacturer and reduce significantly the strength of the cabinet shall be specifically evaluated.
7. The attachments of additional external items weighing more than 100 lbs shall be specifically evaluated if not provided by the manufacturer.
8. Where conduit, cable trays, or similar electrical distribution components are attached to structures that could displace relative to one another and for isolated structures where such components cross the isolation interface, the components shall be designed to accommodate the seismic relative displacements defined in ASCE 7-10 Section 13.3.2.

E. Unless otherwise exempted above, electrical component supports and the means by which they are attached to the component shall be designed for the Seismic Category they are installed in accordance with ASCE 7-10 Section 13.6.5.

1.04 REFERENCE STANDARDS

A. Seismic anchorage and restraints shall be designed and installed in accordance with codes and standards as enforced by authorities having jurisdiction in [Anchorage,]Alaska. Authorities shall include Owner's insurance company.

B. Where applicable, building standards supersede those of other evaluation or listing agencies referenced in specification.

C. International Building Code (IBC), Chapter 16 – Structural Design.

D. ASCE 7-10 Chapter 13.

1.05 SUBMITTALS

A. Provide structurally engineered shop drawings for seismic restraint of all electrical equipment required by the International Building Code (IBC), Chapters 16, 17. Structural design shall be based on the Seismic Use Category and Seismic Design Category as designated in these chapters.

B. Provide complete calculations, drawings and details.

C. Shop drawings shall be stamped by a professional engineer registered in the State of Alaska.

D. Submittals shall be coordinated with building Structural engineer.

E. Submit for approval, seismic restraint calculations, drawings and details to authorities having jurisdiction as required by those authorities.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials and devices shall be in accordance with applicable codes and standards and shall be appropriate for intended use.

B. Anchors and attachments to building structure shall be as approved by building Structural engineer.

C. Seismic restraints used in conjunction with vibration isolators may consist of loose cables, telescoping pipes or box sections, angles or sections, flat plates used as limit stops or snubbers, or other types of housing used either integral with or separate from vibration isolators to accomplish necessary seismic restraint.

2.02 EQUIPMENT

A. Equipment available with seismic rating shall be provided with rating applicable to seismic zone of project location.

PART 3 EXECUTION

3.01 INSTALLATION

A. Secure stationary equipment, raceways and equipment supports to structure, concrete bases, or special supports to provide protection against earthquakes and to restrain lateral or vertical movement. Where vibration isolators are used, seismic restraints shall be designed to limit lateral or vertical movement during earthquake without short-circuiting vibration isolation system.

B. Coordinate seismic restraints with building Structural engineer and incorporate building Structural engineer's requirements.

C. Seismic restraint methods and materials shall be supplementary to support devices specified in other sections of this specification and together shall serve as equipment support criteria.

D. Installation of devices shall be in accordance with seismic Structural engineer's drawings and details and in accordance with seismic guidelines.

E. Coordinate installation of devices with other trades and incorporate their requirements.

F. Modify raceway and equipment locations as required for seismic restraint system.

G. Seismic restraint systems shall not interfere with installation of other building systems or access.

END OF SECTION

SECTION 26 0553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates and Tape Labels.

B. Wire and Cable Markers.

C. Wire Markers.

D. Conduit Markers.

E. Working Clearance Striping.

F. Power One-line Diagram and Panel Map.

G. Low-voltage One-line Diagrams and System Maps.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, and Section 26 0500 – Common Work Results for Electrical.

B. Section 26 0519 – Low-Voltage Electrical Power Conductors and Cables.

C. Section 26 0533 – Raceway and Boxes for Electrical Systems.

D. Section 26 2416 – Panelboards.

E. Section 26 2726 – Wiring Devices.

F. Section 27 1000 – Structured Cabling.

G. Section 28 4600 – Fire Detection and Alarm.

1.03 SUBMITTALS

A. Division 01 and Section 26 0500 – Common Work Results for Electrical.

B. Product Data:

1. Submit manufacturer's catalog literature for each product required.
2. Submit electrical identification schedule including list of wording, symbols, letter size, color-coding, tag number, location, and function.

1.04 CLOSEOUT SUBMITTALS

A. Electrical One-Line Diagrams and Panel Maps: Provide electronically in PDF format, submitted with the O&M manuals.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Install labels and nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

PART 2 PRODUCTS

2.01 NAMEPLATES

A. Product Description: Laminated three-layer plastic with engraved white letters on black background. Nameplate for service disconnect shall be engraved white letters on red background.

B. Letter Size:

1. 1/4-inch high letters for identifying individual panel or equipment.
2. 1/8-inch high letters for remaining lines with 1/8 inch spacing between lines.

C. Minimum nameplate size: 1/8 inch thick with a consistent length and height for each type of nameplate wherever installed on the project.

2.02 TAPE LABELS

A. Product Description: Adhesive tape labels, with 3/16 inch Bold Black letters on clear background made using Dymo Rhino series label printer or approved equal.

B. Embossed adhesive tape will not be permitted for any application.

2.03 WIRE MARKERS

A. Power and Lighting Description: Machine printed heat-shrink tubing, cloth or wrap-on type, for all neutrals and Phase conductors.

B. Low Voltage System Description: Self-adhesive machine printed label with unique wire number that is shown on shop drawing for system.

C. Telecommunications Cable Markers: Self-laminating vinyl with translucent band and minimum 1”W x .5”H printable area with matte white finish. Brady #B-427 series or approved equal.

2.04 FIRE ALARM CONDUIT AND BOX IDENTIFICATION

A. Product Description: Red spray paint for fire alarm boxes.

B. Fire alarm conduit shall have red finish, as specified in Section 26 0533.

2.05 WORKING CLEARANCE STRIPING

A. Product description: 2” wide epoxy yellow paint with 2 inch high block letters within the clearance area to read: “ELECTRICAL CLEARANCE – NO STORAGE WITHIN THIS ZONE”.

2.06 POWER DISTRIBUTION SYSTEM ONE-LINE DIAGRAM AND PANEL MAP

A. Product Description: One-line diagram and building floor plan panel map. One-line diagram shall show the complete building power system for each MDP. Panel map shall show the plan view location of all distribution panels and branch panelboards. Minimum size shall be 11”x17” but larger maps are recommended. All text shall be legible without magnification.

B. Install one-line and panel map behind a Plexiglas cover screwed to wall on four corners, adjacent to each MDP.

2.07 LOW-VOLTAGE SYSTEMS ONE-LINE DIAGRAMS AND MAPS

A. Provide one-line diagrams and system maps for low-voltage and special systems, such as fire, security, telecommunications, intercom, etc. Requirements are specified in individual specification sections for each system.

PART 3 EXECUTION

3.01 GENERAL INSTALLATION

A. Degrease and clean surfaces to receive nameplates and tape labels.

B. Install nameplates and tape labels parallel to equipment lines.

C. Underground Warning Tape Installation: Install underground warning tape along length of each underground conduit, raceway, or cable 6 to 8 inches below finished grade, directly above buried conduit, raceway, or cable.

3.02 NAMEPLATE INSTALLATION

A. Secure nameplates to equipment fronts using machine screws tapped and threaded into panelboard, or using rivets. The use of adhesives is not acceptable. Machine screws to not protrude more than 1/16 inch on back side.

B. Distribution Panel Nameplates:

1. Provide overall equipment identification.
    a. Line 1: Distribution panel name.
    b. Line 2: Source which panelboard is fed.
    c. Line 3: Voltage, phase and wire configuration.
    d. Line 4: AIC rating of the panel.

e. Line 5: Where applicable, indicate that panel is series-rated.

2. Provide circuit breaker identification for each feeder breaker.
   a. Line 1: Name of panelboard or equipment served.
   b. Line 2: Location of served panelboard.

C. Branch Panelboard Nameplates:
1. Provide nameplate for each panelboard with the following information:
   a. Line 1: Panelboard name.
   b. Line 2: Source from which the panelboard is fed.
   c. Line 3: Voltage, phase and wire configuration.
   d. Line 4: AIC rating of the panelboard.

D. Transformers:
1. Provide nameplate for each transformer with the following information:
   a. Line 1: Transformer name.
   b. Line 2: Source from which the transformer is fed.
   c. Line 3: Primary and secondary voltage, phase and wire configuration.
   d. Line 4: Secondary load and location.

E. Disconnects, Starters, or Contactors:
1. Provide nameplate for each device with the following information:
   a. Line 1: Load served.
   b. Line 2: Panelboard and circuit number from which the device is fed.
   c. Line 3: Fuse or Circuit amperage and poles. Where fused disconnect is installed, denote the maximum fuse size to be installed.

F. Control or Low Voltage System Panels:
1. Provide nameplate for each control panel with the following information:
   a. Line 1: Unique panel name as shown on the shop drawings.
   b. Line 2: System description such as Fire Alarm, Intercom, BAS, Security, etc.
   c. Line 3: Panelboard and circuit number from which the panel is fed if applicable.

3.03 LABEL INSTALLATION

A. Conduit Feeder Labels - Provide conduit labels on all feeder raceways as follows:
1. Distribution Panels – “PANEL xxxx IN ROOM #xxx”.
2. Panelboards – “PANEL xxxx FED FROM MDP xxx”.

B. Spare Raceways: Provide raceway label on each individual raceway denoting the source and termination point at each end.

C. Fire Alarm Device Labels: As specified in Section 28 3100.

D. Low-Voltage System Device Labels: Provide label on each device, denoting device ID or address where applicable. Affix label to device faceplate for ceiling-mounted devices or wall-mounted devices above 8’-0” AFF. Affix label inside backbox for exterior devices.

3.04 WIRE IDENTIFICATION

A. Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Identification shall be as follows:
1. Markers shall be located within one inch of each cable end, except at panelboards, where markers for branch circuit conductors shall be visible without removing panel deadfront.

2. Each wire and cable shall carry the same labeled designation over its entire run, regardless of intermediate terminations.
3. Color code phases, neutral, and ground per NEC requirements and Section 26 0519.
4. Color-code all low-voltage system wires and cables in accordance with the individual sections in which they are specified.
5. For power and lighting circuits, identify with branch circuit or feeder number.
6. Control Circuits: Control wire number as indicated on schematic and shop drawings.
7. Fire Alarm Circuits: Provide cable markers showing NAC or SLC loop identification number at all fire alarm junction boxes and pullboxes.
8. Provide cable markers on each cable, indicating device designation (e.g. “Camera 27”) for all security, intercom, door control, and CCTV systems. Cables shall be labeled at each end, as well as at any intermediate junction boxes or pullboxes.

B. Provide pull string markers at each end of all pull strings. Marker shall identify the location of the opposite end of the pull string.

3.05 JUNCTION BOX IDENTIFICATION

A. Fire Alarm: In accessible ceiling spaces, exposed ceiling spaces, mechanical/electrical rooms, and other non-public spaces, paint fire alarm junction boxes and pullboxes with red spray paint. In all finished spaces where fire alarm boxes are visible, they shall be painted to match the surrounding finish. If there are any questions as to whether fire alarm boxes shall be painted red in a specific area, the Contractor shall get clarification from the Owner prior to painting.

B. Label each lighting and power junction box with the panelboard name and circuit number.

C. Label all junction boxes for intercom, door control, and CCTV systems with the type of system cables contained in the box.

D. For junction boxes above ceilings, mark the box cover with the circuit or system designation using permanent black marker. For junction boxes in finished areas, mark the inside of the cover with the circuit or system designation using permanent black marker.

3.06 DEVICE PLATE IDENTIFICATION

A. Label each receptacle device plate or point of connection denoting the panelboard name and circuit number.

B. Install adhesive label on the top of each plate.

3.07 PANELBOARD IDENTIFICATION

A. Provide panelboard circuit directories in accordance with Section 26 2416.

B. Install one-line and panel map adjacent to each MDP.

3.08 LOW-VOLTAGE SYSTEM IDENTIFICATION

A. Install all labeling in accordance with the requirements of this section and of each section where the individual systems are specified.

3.09 WORKING CLEARANCE STRIPING

A. Working clearance striping paint shall be applied in front of panels located in mechanical rooms, electrical rooms, storage rooms, and other non-public areas with exposed concrete floors.

B. Striping paint shall not be applied in front of panels located in corridors and other public spaces, or spaces with finished floor surfaces (e.g., carpet, tile, vinyl, etc.).

END OF SECTION

SECTION 26 08 00
ELECTRICAL SYSTEMS COMMISSIONING

PART 1 GENERAL

1.01 DESCRIPTION

A. Electrical Systems commissioning process includes the following tasks:
   1. Testing and startup of selected Electrical Systems.
   2. Equipment and system pre-functional verification checks.
   3. Assistance in functional performance testing to verify testing and balancing, and equipment and system performance.
   4. Provide qualified personnel to assist in commissioning tests.
   5. Ensure all equipment and systems are fully operational and ready for functional performance testing.
   6. Provide equipment, materials, and labor necessary to correct deficiencies found during commissioning process to fulfill contract and warranty requirements.
   7. Provide operation and maintenance information to Commissioning Authority for review.

B. Provide labor, tools, instruments, and materials as required to participate in the commissioning process and to commission the electrical systems as defined in Division 01 and within these specifications.

C. It is anticipated most of the functional performance testing and data acquisition will be performed prior to occupancy. It is also anticipated that, in the process of testing system deficiencies will be identified. Where these deficiencies are the result of construction work not complete in compliance with the contract documents, the affected work shall be promptly repaired or replaced by the Contractor.

D. This section will in no way diminish the responsibility of the Contractors and suppliers in performing all aspects of the work and testing as outlined in the contract documents.

1.02 COORDINATION

A. All testing and startup procedures and documentation requirements specified within Division 26.

B. Division commissioning requirements in addition to this section as follows:
   1. Section 01 91 13 - Commissioning
   2. Section 23 08 00 - Mechanical Systems Commissioning

1.03 SUBMITTALS

A. Section 01 81 00 - Commissioning: Submittals.

B. Draft Forms: Submit draft of start-up plan, pre-functional verification checklists.

C. Test Reports: Indicate data on pre-functional verification checklists for each piece of equipment and system as specified.

D. Field Reports: Indicate deficiencies preventing completion of equipment or pre-functional verification checklists or system to achieve specified performance.

PART 2 PRODUCTS

2.01 GENERAL

A. Provide test equipment and instrumentation as necessary for functional performance testing of mechanical systems and completion of functional performance tests.

PART 3 EXECUTION

3.01 SYSTEMS/EQUIPMENT TO BE COMMISSIONED

A. Systems that shall be included in the commissioning process as follows:
   1. Lighting Control System.
   2. Generator

3.02 CONTRACTOR / SUPPLIER RESPONSIBILITIES

A. Attend meetings conducted by the commissioning agent to review the overall commissioning process and procedures.

B. Assist the General Contractor in developing a commissioning schedule for completion of the commissioning work.

C. Review draft commissioning plan prepared by the Commissioning Authority.

D. Develop pre-functional verification checklists.

E. Review the Functional Performance Test procedures that describe the step-by-step process to functionally test the system.

F. Develop electrical startup and initial checkout plan.

G. Prior to startup, inspect, check, and verify correct and complete installation of equipment and system components for pre-functional verification checks.

H. Perform and document completed startup and pre-functional verification checklists.

I. Assist commissioning authority in performing functional performance tests on equipment and systems.

K. Provide the Commissioning Authority with completed equipment start-up forms, pre-functional verification checklists, point-to-point checklists, balancing logs, pre-test acquisition forms and other information appropriate to the commissioning process.

L. Provide and assign qualified individuals with working knowledge of the operating system to operate the system during the Startup and Functional Performance Test. Provide manufacturer's representatives to execute starting of equipment where specified.

N. Operate the systems and equipment during functional performance testing and provide manpower to assist the commissioning team in the execution of the commissioning plan.

P. Correct deficiencies discovered by the commissioning team and report their resolution.

Q. Ensure the installation work is complete, is in compliance with the Contract Documents, and is ready for commissioning. Coordinate testing and commissioning effort with commissioning team, subcontractors, suppliers, vendors, and controls contractor.

R. Execute the commissioning plan and perform the functional performance tests. This shall include operating the systems and equipment and demonstrating the proper sequences of operation and function of indicators, accessories, alarms, shut downs, and any other features as required for completion of the functional performance test procedures.

S. Provide instrumentation and take measurements and readings of system and equipment performance characteristics as required for functional performance testing and completion of the functional performance test procedures and the commissioning work.

END OF SECTION

SECTION 26 0923
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This Section includes stand-alone (non-networked) automatic lighting control devices.
   1. Occupancy sensors.
   2. Occupancy sensor wall switches.
   3. Power Packs and Supplies.

1.02 RELATED SECTIONS

A. Section 26 0500 - Common Work Results for Electrical.

B. Section 26 0519 – Low-Voltage Electrical Power Conductors and Cables.

C. Section 26 0533 - Raceway and Boxes for Electrical Systems.

D. Section 26 2726 – Wiring Devices: Manual Light Switches.

E. Section 26 5000 –Lighting.

1.03 SUBMITTALS

A. Product Data: Submit product data for all components provided that are specified in this section showing configurations, finishes, and dimensions. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.

B. Fixture Compatibility: Submitted occupancy [and daylight] sensors shall have wattage ratings to match the circuits on which they are connected and shall be compatible with submitted lamps and ballasts/drivers in the fixtures which they will control.

C. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. Include manufacturer's installation and troubleshooting instructions.

1.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Manuals: Submit manufacturer's instructions for occupancy sensor maintenance and adjustment.

1.05 COORDINATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression system, and partition assemblies.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS – OCCUPANCY SENSORS

A. Wattstopper.

B. Sensor Switch.

C. Hubbell.

D. Leviton.

E. Substitutions: Under provisions of Division 01.

2.02 OCCUPANCY SENSORS

A. Ceiling-Mounted Dual-Tech Occupancy Sensor: Dual-technology PIR and ultrasonic or microphonic sensor with white housing, self-adjusting settings, automatic dual-mode operation, built-in circadian calendar for testing, red/green LEDs for indication of PIR/ultrasonic or microphonic activity, and non-volatile memory to retain automatic and manual settings during power outages. Provide specific coverage area and either 180° or 360° coverage patterns, as required in the space to prevent unintentional tripping in adjacent spaces. Sensor shall have

selectable timer settings. Sensor shall retain all manually adjusted or “learned” settings in event of a power outage.

B. Ceiling-Mounted Ultrasonic or Microphonic Occupancy Sensor: Ultrasonic or microphonic sensor with white housing, self-adjusting settings, built-in circadian calendar for testing, green LED for indication of ultrasonic or microphonic activity, and non-volatile memory to retain automatic and manual settings during power outages. Provide specific coverage area as required in the space to prevent unintentional tripping in adjacent spaces. Sensor shall have four selectable timer settings. Sensor shall retain all manually adjusted or “learned” settings in event of a power outage. Device color shall match wall switches.

C. Wall-Mounted Dual-Technology Occupancy Sensor: Multi-technology PIR and ultrasonic or microphonic sensor with 1600 sq. ft. coverage area, white housing, self-adjusting settings, automatic dual-mode operation, built-in circadian calendar for testing, red/green LEDs for indication of PIR/ultrasonic or microphonic activity, and non-volatile memory to retain automatic and manual settings during power outages. Provide specific coverage area and either 180° or 360° coverage patterns, as required in the space to prevent unintentional tripping in adjacent spaces. Sensor shall have four selectable timer settings between 30 seconds and 20 minutes. Sensor shall retain all manually adjusted or “learned” settings in event of a power outage.

D. Wall-Mounted PIR Occupancy Sensor: Passive infrared sensor with white housing, 1600 sq. ft. wide angle coverage area, self-adjusting settings, built-in circadian calendar for testing, red LED for indication of PIR motion, and non-volatile memory to retain automatic and manual settings during power outages. Sensor shall have four selectable timer settings between 30 seconds and 20 minutes. Sensor shall retain all manually adjusted or “learned” settings in event of a power outage.

E. Single-Relay, Dual-Tech Occupancy Sensor Wall Switch: Decora style, dual-technology, PIR and ultrasonic or microphonic sensor with self-adjusting delayed-OFF time interval, self-adjusting ambient light override, 180° adjustable field of view, manual ON/OFF pushbutton, LED indicator light to verify that detection is active, and non-volatile memory to retain automatic and manual settings during power outages. Sensor shall have selectable timer settings. Device color shall match other switches.

F. Combination Wall Dimmer/Occupancy Sensor Switch for 0-10V LED Circuits: Decora-style, commercial grade preset wall dimmer switch/PIR occupancy sensor, 0-10V control for 0-10V fluorescent ballasts/LED drivers (50 mA max control current); no power pack required to switch line voltage load (8 A, 120-277 V); adjustable high-end and low-end trim. PIR occupancy sensor with adjustable time, mode and sensitivity settings with no dip switches. Color: White. Handle: Paddle switch for on/off operation with small, discrete, captive linear slide for dimmer adjustment. Provide single pole unless otherwise indicated on Plans. Dimmer shall be fully compatible with all loads connected for smooth operation in accordance with the manufacturer’s recommendations. Lutron #Maestro or approved equal.

G. Sensor Masking: Infrared and dual-technology sensors shall include masking segments for adjusting the coverage of the infrared sensor to avoid false-tripping. If masking is not included with sensor, it shall be provided by Contractor at no additional cost to the Owner.

2.03 POWER (RELAY) PACKS AND SUPPLIES

A. Sensor Power Packs: Provide sensor power packs as recommended by the sensor manufacturer and as required for all connected devices and the specified sequence of operation. Note that control of fixtures with multi-level switching may require additional power packs. Power Packs shall be UL listed, plenum rated, and accept 120 or 277 VAC.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install occupancy sensor wall switches 48 inches above floor.

B. Unless otherwise noted install wall sensor switches within 6 inches of the door jamb on the strike side, however the final layout shall be coordinated with furniture and equipment locations to avoid false OFF signals, due to obstruction of sensors.

C. Locate power packs and similar devices in concealed, accessible areas.

3.02 SENSOR TESTING AND CALIBRATION

A. Occupancy Sensors:

1. Activate test setting on sensor. Walk past the room entrance and confirm that the sensor is not picking up unwanted motion from adjacent spaces such as hallways. Provide masking on infrared lens to restrict field of view if necessary and re-test.
2. Walk into room and confirm that the sensor immediately picks up the motion and turns the lights ON.
3. Walk around the room and confirm that the sensor is picking up small motion. Relocate sensor or add additional sensors as required to provide complete coverage throughout the space.
4. Adjust the PIR and ultrasonic or microphonic sensitivity settings as required to avoid false tripping due to air movement.
5. Adjust range on sensor to match room size, as a percentage of total sensor coverage. Example: For a 10’ x 10’ room, the maximum sensing distance in front of the sensor (40’) is adjusted down to the minimum setting of 36% coverage.
6. Confirm that the sensor is performing the lighting control sequence of operation as noted on the Plans. Make adjustments as required until the sequence is met.
7. Put sensor back into normal mode [and document the final settings on all occupancy sensor (time delay, PIR sensitivity, occupancy logic and trigger settings, etc.) in tabular form and include in the Project Record Drawings].

3.03 LIGHTING CONTROL SEQUENCE OF OPERATIONS

1. See Plans for lighting control sequence for each space. Provide all programming, adjustment and field changes as required to perform the specified lighting control sequence.
2. Where no lighting control sequences are shown on the Plans, coordinate with the Owner to determine if the occupancy sensor default factory settings are suitable for their needs in each space and adjust accordingly.

3.04 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
2. Operational Test: Verify operation of each lighting control device, and adjust time delays.

B. Lighting control devices that fail tests and inspections are defective work.

3.05 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit occupied conditions.

3.06 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

SECTION 26 2200
LOW-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Dry Type Two Winding Transformers.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements and Section 26 0500 – Common Work Results for Electrical.

B. Section 26 0526 – Grounding and Bonding for Electrical System.

C. Section 26 0533 – Raceway and Boxes for Electrical Systems.

D. Section 26 0548 – Vibration and Seismic Controls for Electrical Systems.

E. Section 26 0553 – Identifications for Electrical Systems.

1.03 REFERENCES

A. ANSI/NEMA ST 20 - Dry Type Transformers for General Applications.

1.04 SUBMITTALS

A. Submit product data under provisions of Division 01.

B. Include outline and support point dimensions of enclosures and accessories, unit weight, voltage, KVA, and impedance ratings and characteristics, loss data, efficiency at 25, 50, 75 and 100 percent rated load, sound level, tap configurations, insulation system type, and rated temperature rise.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store and protect products under provisions of Division 01.

B. Store in a warm, dry location with uniform temperature. Cover ventilating openings to keep out dust.

C. Handle transformers using only lifting eyes and brackets provided for that purpose. Protect units against entrance of rain, sleet, or snow if handled in inclement weather.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - DRY TYPE TWO WINDING TRANSFORMERS

A. Siemens.

B. No Substitutions.

2.02 DRY TYPE TWO WINDING TRANSFORMERS

A. Dry Type Transformers: ANSI/NEMA ST 20; factory-assembled, air cooled dry type transformers; ratings as shown on the Drawings.

B. Insulation system and average winding temperature rise for rated KVA as follows:

Rating	Class	Rise (º C)
16-500	220	150

C. Case temperature shall not exceed 35ºC rise above ambient at its warmest point.

D. Winding Taps, Transformers Less than 15 KVA: Two 5 percent below rated voltage, full capacity taps on primary winding.

E. Winding Taps, Transformers 15 KVA and Larger: ANSI/NEMA ST 20.

F. Sound Levels: per ANSI/NEMA ST 20 as follows:

KVA Rating	Sound Level
1-9	40 dB
10-50	45 dB
51-150	50 dB
151-300	55 dB
301-500	60 dB
501-700	62 dB

G. Basic Impulse Level: 10 KV for transformers less than 300 KVA.

H. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

I. Mounting: Transformers 75 KVA and less shall be suitable for wall, floor, or trapeze mounting; transformers larger than 75 KVA shall be suitable for floor or trapeze mounting.

J. Coil Conductors: Continuous copper windings with terminations brazed or welded.

K. Enclosure: ANSI/NEMA ST 20; Type 1. Provide lifting eyes or brackets.

L. Isolate core and coil from enclosure using vibration- absorbing mounts.

M. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise.

PART 3 EXECUTION

3.01 INSTALLATION

A. Set transformer plumb and level.

B. Use flexible conduit, 2 ft. minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

C. Mount transformers on vibration isolating pads suitable for isolating the transformer noise from the building structure.

D. Provide seismic restraints.

E. All dry type transformers shall have signage for arc hazard installed. The marking shall be located to be clearly visible to qualified personnel before examination, adjustment, servicing or maintenance of the equipment. At a minimum the signage shall state the following:

Warning

Arc Flash and Shock Hazard

Appropriate PPE Required

3.02 FIELD QUALITY CONTROL

A. Check for damage and tight connections prior to energizing transformer.

B. Measure primary and secondary voltages under normal building and make appropriate tap adjustments.

END OF SECTION

SECTION 26 2416
PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Lighting and Appliance Branch Circuit Panelboards.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, and Section 26 0500 – Common Work Results for Electrical.

B. Section 26 0526 – Grounding and Bonding for Electrical Systems.

C. Section 26 0553 – Identification for Electrical Systems.

D. Section 26 0548 – Vibration and Seismic Control for Electrical Systems.

1.03 REFERENCES

A. NEMA AB 1 - Molded Case Circuit Breakers.

B. NEMA PB 1 - Panelboards.

C. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

D. NEMA PB 2.2 - Application Guide for Ground-fault Protective Devices for Equipment.

E. UL 50 – Enclosures for Electrical Equipment.

F. UL 67 – Panelboards.

G. UL 489 – Molded Case Circuit Breakers and Circuit Breaker Enclosures.

H. Federal Specification W-C-375B/Gen – Circuit Breakers, Molded Case, Branch Circuit and Service.

1.04 SUBMITTALS

A. Submit data under provisions of Division 01 and Section 26 0500.

B. Product Data: Submit product data for all components provided which fall under this section showing configurations, finishes, and dimensions. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.

C. Shop drawings: Submit shop drawings for each panelboard indicating features and device arrangement and size. Include outline and support point dimensions, voltage, main bus ampacity, and integrated short circuit ampere rating.

1.05 CLOSEOUT SUBMITTALS

A. Project Record Drawings: Submit final record panel schedules as hardcopy and in Microsoft Excel format. Submit under Section 26 0500.

B. Operation and Maintenance Manuals: Provide product data and shop drawing information including replacement parts list. Provide installation, operation and maintenance information per manufacturer.

C. Panel Schedules: Prior to Substantial Completion, submit copies of all panel schedules for review by the Owner. The Owner will note any changes to the room numbers/names and the Contractor shall provide revised typed panel schedules to reflect all changes, at no additional cost to the Owner.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Division 01.

B. Upon arrival at the site inspect equipment and report on any damage.

C. Handle carefully on site to avoid any damage to internal components, enclosures and finishes.

D. Store in a clean, dry environment. Maintain factory packaging and provide an additional heavy canvas or plastic cover to protect enclosures from dirt, water, construction debris and traffic.

1.07 WARRANTY

A. Manufacturer shall warrant specified equipment to be free of defects for a period of one year from the date of installation.

1.08 SPARE PARTS

A. Keys: Furnish 2 each to Owner.

PART 2 PRODUCTS

2.01 MANUFACTURES – PANELBOARDS

A. Siemens

B. No substitutions.

2.02 MAIN AND DISTRIBUTION CIRCUIT BREAKER PANELBOARDS

A. Panelboards: Existing.

B. Thermal Magnetic Molded Case Circuit Breakers: NEMA AB 1; provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits. Breaker ampacity and AIC rating shall be visible on breaker without removing panel deadfront or cover.

2.03 BRANCH CIRCUIT PANELBOARDS

A. Lighting and Appliance Branch Circuit Panelboards: NEMA PB 1; circuit breaker type.

B. Enclosure: NEMA PB 1; Type 1 as indicated on Drawings. Boxes shall be galvanized steel constructed in accordance with UL50 requirements. Interiors shall be field convertible for top or bottom incoming feed. Main lug interiors up to 400 amperes shall be field convertible to main breaker. Interior leveling provisions shall be provided for flush mounted applications.

C. Cabinet Size: 6 inches deep; 20 inches wide minimum.

D. Provide surface cabinet front as indicated on the Drawings with [door-in-door cover] concealed trim clamps, concealed hinge and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

E. Provide panelboards with copper bus, ratings as scheduled on Drawings. Provide one continuous bus bar per phase each. Panelboards shall have sequentially phased branch circuit connectors suitable for bolt-on branch circuit breakers. Bussing shall be fully rated.

F. Integrated Short Circuit Rating: Provide panelboards with short circuit ratings as shown on the Drawings. Minimum ratings shall be 10,000 amperes RMS symmetrical for 250 volt panelboards; 14,000 amperes RMS symmetrical for 600 volt panelboards.

G. Main/Sub Feed Circuit Breakers: NEMA AB 1; Provide vertical mount main and/or sub feed circuit breaker in panelboards as shown on the drawings.

1. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip-free. Automatic tripping of the breaker shall be clearly indicated by the handle position. Contacts shall be nonwelding silver alloy and arc extinction shall be accomplished by means of DE-ION arc chutes. A push-to-trip button on the front of the circuit breaker shall provide a local manual means to exercise the trip mechanism.

2. Lugs shall be UL Listed to accept copper and aluminum conductors and shall be suitable for 90^{o}C rated wire, sized according to the 75 ^{o}C temperature rating per NEC Table 310-16. Lug body shall be bolted in place.

H. Branch Circuit Breakers: NEMA AB 1; Provide panelboards with bolt-on type thermal magnetic trip circuit breakers.

1. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip-free with common trip handle for all poles.
2. Lugs shall be UL Listed to accept copper and aluminum conductors and shall be suitable for 90°C rated wire, sized according to the 75 °C temperature rating per NEC Table 310-16. Lug body shall be bolted in place.
3. Provide circuit breakers UL listed as type HACR for use with heating, air conditioning and refrigeration equipment.
4. Provide UL Class A ground fault interrupter circuit breakers where scheduled on Drawings.

2.04 PANELBOARD IDENTIFICATION

A. For each new panelboard and each existing panelboard where circuits are added or modified, provide typed schedule denoting each circuit load by the load type and final name and room number actually designated by the Owner. Schedule shall not be typed with names shown on the Contract Drawings unless names are acceptable to the Owner.

B. Provide panel schedule in O&M manual for every new panelboard [and every existing panelboard where circuits are added or modified.

C. Where more than one nominal voltage system is present on the premises, the conductor color-coding legend shall be permanently posted at each branch circuit and distribution panelboard per NEC requirements.

D. All panelboards shall have signage for arc hazard installed. The marking shall be located to be clearly visible to qualified personnel before examination, adjustment, servicing or maintenance of the equipment. At a minimum the signage shall state the following:

Warning

Arc Flash and Shock Hazard

Appropriate PPE Required

PART 3 EXECUTION

3.01 INSTALLATION

A. Install panelboards plumb and flush with wall finishes, in conformance with NEMA PB 1.1.

B. Height: 6 feet, 6 inches to top of panelboard.

C. Provide filler plates for unused spaces in panelboards.

D. Panel Schedules: Revise schedules to reflect circuiting changes required to balance phase loads.

E. Stub 5 empty one inch conduits to accessible location above ceiling [below floor] out of each recessed panelboard.

3.02 FIELD QUALITY CONTROL

A. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance the phase loads within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits.

B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers.

END OF SECTION

SECTION 26 2726
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall Switches.

B. Wall Dimmers.

C. Receptacles.

D. Device Plates and Box Covers.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 - General Requirements and Section 26 0500 – Common Work Results for Electrical.

B. Section 26 0526 – Grounding and Bonding for Electrical Systems.

C. Section 26 0533 – Raceway and Boxes for Electrical Systems.

D. Section 26 0533.16 – Boxes for Electrical Systems.

E. Section 26 0553 – Identification for Electrical Systems.

1.03 REFERENCE STANDARDS

A. FS W-C-596 – Federal Specification for Electrical Power Connector, Plug, Receptacle, and Cable Outlet.

B. FS W-S-896 – Federal Specification for Switches, Toggle (Toggle and Lock), Flush Mounted.

C. NEMA WD 1 - General Color Requirements for Wiring Devices.

D. ANSI/NEMA WD 6 – Wiring Devices – Dimensional Requirement.

E. UL 20 – General-Use Snap Switches.

F. UL 498 - Attachment Plugs and Receptacles.

G. UL 943 – Ground-Fault-Circuit-Interrupters.

1.04 SUBMITTALS

A. Product Data: Submit product data for all components provided that are specified in this section showing configurations, finishes, and dimensions. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - WALL SWITCHES

A. Hubbell.

B. Leviton.

C. Pass & Seymour.

D. Arrow Hart

E. Substitutions: Under provisions of Division 01.

2.02 WALL SWITCHES

A. Wall Switches for Lighting Circuits: UL 20; ANSI/NEMA WD-6; and Federal Specification FS W-S-896 AC industrial grade snap switch with toggle handle, rated 20 amperes and 120-277 volts AC. Handle: White nylon. Provide single-pole, 3-way, or 4-way switches as indicated on Plans.

2.03 ACCEPTABLE MANUFACTURERS - WALL DIMMERS

A. Lutron.

B. Leviton.

C. Substitutions: Under provisions of Division 01.

2.04 WALL DIMMERS

A. Wall Dimmers for 0-10V Loads: UL 1472; ANSI/NEMA WD-6; Decora-style, commercial grade preset wall dimmer switch, 0-10V control for LED drivers (8 A, 120-277 V); adjustable high-end and low-end trim. Color: White. Handle: Paddle switch for on/off operation with small, discrete, captive linear slide for dimmer adjustment. Provide single pole unless otherwise indicated on Plans. Provide power pack as required to accommodate loads larger than 8 A. Dimmer shall be fully compatible with all loads connected for smooth, flicker-free dimming operation.

2.05 ACCEPTABLE MANUFACTURERS - RECEPTACLES

A. Hubbell.

B. Leviton.

C. Pass & Seymour.

D. Arrow Hart

E. Substitutions: Under provisions of Division 01.

2.06 RECEPTACLES

A. Convenience and Straight-blade Receptacles: UL 498, ANSI/NEMA WD-6 and Federal Specification FS W-C-596 industrial grade receptacle.

B. Locking-Blade Receptacles: NEMA WD 5.

C. Convenience Receptacle Configuration: ANSI/NEMA WD-6; Type 5-20R, white [ivory] nylon face.

D. Specific-use Receptacle Configuration: NEMA WD 5; type as indicated on Drawings, black phenolic face.

E. GFCI Receptacles: ANSI/NEMA WD-6; 20A, duplex convenience receptacle with integral class ‘A’ ground fault current interrupter, LED indicator lamp and integral lockout.

F. Tamper-Resistant Receptacles: ANSI/NEMA WD-6; Complying with the requirements of UL 498 (section 131) and NEC 406.12-14.

G. Weather-Resistant Receptacles: ANSI/NEMA WD-6; Listed to the weather-resistant supplement of UL498 and complying with the requirements of NEC 406.9.

2.07 DEVICE PLATES

A. Decorative Cover Plate: Smooth 430 or 302 stainless steel with metal, counter sunk screws to match device plate.

B. Weatherproof Cover Plate: UL listed, cast aluminum, hinged outlet cover/enclosure, with gasket between the enclosure and the mounting surface, suitable for wet locations while in use and identified as “Extra Duty” per NEC 406.9 (B)(1).

C. Exposed Work Cover Plate: ½ inch raised, square, pressed, galvanized or cadmium plated steel cover plate supporting devices independent of the outlet box.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install wall switches 48 inches above floor, OFF position down.

B. Unless otherwise noted install wall switches within 6 inches of the door jamb on the strike side.

C. Install wall dimmers 48 inches above floor; derate ganged dimmers as instructed by manufacturer; do not use common neutral.

D. Install convenience receptacles 18 inches above floor, 4 inches above counters or backsplash, grounding pole on bottom.

E. Install specific-use receptacles at heights shown on Contract Drawings.

F. Unless otherwise noted, mounting heights are for finished floor to center line of outlet.

G. Install decorative plates on switch, receptacle, and blank outlets in finished areas. Use midsize or jumbo plates for outlets installed in masonry walls, where required to cover up imperfections in the wall opening.

H. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface-mounted outlets.

I. Install devices and wall plates flush and level.

J. Ground receptacles to boxes with a grounding wire. Grounding through the yoke or screw contact is not an acceptable alternate to the ground wire.

K. Install circuit label on each receptacle and light switch in accordance with Section 26 0553.

END OF SECTION

SECTION 26 2816
ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed Switches.

B. Fuses.

C. Enclosures.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements and Section 26 0500– Common Work Results for Electrical.

B. Section 01 4000 – Quality Requirements.

C. Section 26 0526 – Grounding and Bonding for Electrical Systems.

D. Section 26 0548 – Vibration and Seismic Controls for Electrical Systems.

E. Section 26 0553 – Identification for Electrical Systems.

1.03 REFERENCE STANDARDS

A. ANSI/UL 198E - Class R Fuses.

B. ANSI/UL 98 Enclosed and Dead Front Switches.

C. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

D. NEMA FU 1 – Low Voltage Cartridge Fuses.

E. NEMA AB-1 – Molded Case Circuit Breakers and Molded Case Switches.

F. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum).

G. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.04 SUBMITTALS

A. Product Data: Submit product data for all components provided, showing electrical characteristics, material, and dimensions. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.

B. Shop Drawings: Submit shop drawings include outline drawings with dimensions, and equipment ratings for voltage, capacity, horsepower, and short circuit current interrupting rating.

1.05 CLOSEOUT SUBMITTALS

A. Project Record Drawings: Accurately indicate actual location of enclosed switches, circuit breakers and ratings of actual installed fuses.

1.06 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.07 EXTRA STOCK

A. Provide extra stock under provisions of Division 01.

B. Fuses: Provide one set of 3 fuses of each size and type of fuse installed.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - ENCLOSED SWITCHES

A. Siemens.

B. No Substitutions.

2.02 ENCLOSED SWITCHES

A. Fusible Switch Assemblies: NEMA KS 1; Heavy Duty type; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: Designed to accommodate Class R fuses and reject all other classes of fuse.

B. Nonfusible Switch Assemblies: NEMA KS 1; Heavy Duty type; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

C. Enclosures: NEMA KS 1; Type 1, 3R or 4 as indicated on Drawings.

2.03 ACCEPTABLE MANUFACTURERS - FUSES

A. Cooper-Bussmann.

B. Ferraz-Shawmut.

C. Economy.

D. Substitutions: Under provisions of Division 01.

2.04 FUSES

A. Fuses 600 Amperes and Less: ANSI/UL 198E, Class RK1; RK5; dual element, current limiting, time delay, one-time fuse, 600 volt.

B. Interrupting Rating: 200,000 rms amperes.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install enclosed switches were indicated on Drawings, and where required for NEC required disconnect of equipment specified under other divisions, but installed under Division 26.

B. Install fuses in fusible disconnect switches.

C. All enclosed switches shall have signage for arc hazard installed. The marking shall be located to be clearly visible to qualified personnel before examination, adjustment, servicing or maintenance of the equipment. At a minimum the signage shall state the following:

Warning

Arc Flash and Shock Hazard

Appropriate PPE Required

3.02 FIELD QUALITY CONTROL

A. Field inspecting, testing, adjusting and balancing.

B. Inspect and test in accordance with NETA ATS, exception Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.5.

END OF SECTION

SECTION 26 2913
ENCLOSED CONTROLLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manual Motor Starters.

B. Magnetic Motor Starters.

C. Combination Magnetic Motor Starters.

1.02 RELATED SECTIONS

A. Division 21 – Fire Suppression.

B. Division 22 – Plumbing.

C. Division 23 – Heating, Ventilating, and Air Conditioning (HVAC).

D. Section 26 0548 – Vibration and Seismic Controls for Electrical Systems.

E. Section 26 0529 – Hangers and Supports for Electrical Systems.

F. Section 26 0553 – Identification for Electrical Systems.

1.03 REFERENCES

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements.

B. ANSI/NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

C. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.

1.04 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Provide product data on motor starters and combination motor starters, relays, pilot devices, and switching and overcurrent protective devices.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Include recommended maintenance procedures and intervals.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - MOTOR STARTERS

A. Siemens.

B. No Substitutions.

2.02 MANUAL MOTOR STARTERS

A. Fractional Horsepower Manual Starter: NEMA ICS 2; AC general-purpose Class A manually operated, number of poles as required by the load served, full-voltage controller for fractional horsepower induction motors, with thermal overload unit, red pilot light, and toggle operator.

B. Enclosure: ANSI/NEMA ICS 6; Type 1, 3R or 4. As indicated on the Drawings.

2.03 MAGNETIC MOTOR STARTERS

A. Magnetic Motor Starters: NEMA ICS 2; AC general-purpose Class A magnetic controller for induction motors rated in horsepower.

B. Full Voltage Starting: Non-reversing type.

C. Coil Operating Voltage: 120 volts, 60 Hertz.

D. Size: NEMA ICS 2; size as required by the load served.

E. Overload Relay: NEMA ICS 2; bimetal.

F. Enclosure: NEMA ICS 6; Type 1 or 3R as shown on the drawings.

G. Combination Motor Starters: Combine motor starters with motor circuit protector disconnect in common enclosure.

H. Auxiliary Contacts: NEMA ICS 2; two field convertible contacts in addition to seal-in contact.

I. Indicating Lights: NEMA ICS 2; RUN: red LED light in front cover.

J. Selector Switches: NEMA ICS 2; HAND/OFF/AUTO, in front cover.

K. Control Power Transformers: 120 volt secondary, VA capacity as required by the load served in each motor starter.

L. Power Monitor: Include a three-phase power monitor in each magnetic starter connected to shut down the motor on loss of any phase, phase reversal, or low voltage on any phase. Power monitor shall automatically reset and restart motor when phase and voltage conditions return to normal. Provide oversize starter enclosures as required to install power monitor.

2.04 CONTROLLER OVERCURRENT PROTECTION AND DISCONNECTING MEANS

A. Motor Circuit Protector: NEMA AB 1; circuit breakers with integral instantaneous magnetic trip in each pole.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install motor control equipment in accordance with manufacturer's instructions.

B. Select and install heater elements in motor starters to match installed motor characteristics.

C. Motor Data: Provide neatly typed label inside each motor starter enclosure door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.

D. After final connections are made, check and correct the rotation of all motors.

E. Field adjust the trip settings of all motor starter magnetic trip only circuit breakers to approximately 11 times motor full load current. Determine full load current from motor nameplate following installation.

END OF SECTION

SECTION 26 5000
LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior and Exterior Luminaires and Accessories.

B. Lamp Modules.

C. Drivers.

D. Exit Signs and Emergency Lighting Units.

E. Emergency Driver Power Supplies.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under General Conditions of the Contract General Requirements, and Section 26 0500 – Common Work Results for Electrical.

B. Division 09 – Finishes: Painting and Ceilings.

C. Section 26 0519 – Low Voltage Electrical Power Conductors and Cables.

D. Section 26 0526 - Grounding and Bonding for Electrical Systems.

E. Section 26 0529 - Hangers and Supports for Electrical Systems: General Supports for Luminaires.

F. Section 26 0533 – Raceway and Boxes for Electrical Systems.

G. Section 26 0548 - Vibration and Seismic Controls for Electrical Systems: Seismic Supports for Luminaires.

H. Section 26 0553 – Identification for Electrical Systems.

I. Section 26 0923 – Lighting Control Devices: Compatibility with Dimming Switches.

J. Section 26 2726 – Wiring Devices.

1.03 DEFINITIONS

A. CCT: Correlated Color Temperature.

B. CRI: Color Rendering Index.

C. Driver: LED Power Supply.

D. Fixture: See "Luminaire."

E. IES: Illuminating Engineering Society of North America

F. IP: International Protection or Ingress Protection Rating.

G. Lamp Module: Replaceable LED board array/light engine including a plug-in connector.

H. LED: Light-emitting diode.

I. Lumen: Measured output of lamp and luminaire, or both.

J. Luminaire: Complete lighting unit, including lamp or lamp module, driver, reflector, and housing.

K. THD: Total Harmonic Distortion.

1.04 REFERENCE STANDARDS

A. NECA/IESNA 500 – Recommended Practice for Installation Indoor Commercial Lighting System.

B. IES TM-21-11 Projecting Long Term Lumen Maintenance of LED Light Sources.

C. IES LM-80 IES Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays and Modules.

D. UL 924 - Emergency Lighting and Power Equipment.

1.05 SUBMITTALS

A. Product Data: Submit the following:

1. Luminaires: Include manufacturer's product data sheets and/or shop drawings including outline drawings showing support points, weights, and accessory information for each luminaire type. Clearly indicate all options being provided. Arrange data for luminaires in the order of fixture designation.

2. Prior to preparing submittals, coordinate with the reflected ceiling plan for ceiling finishes and provide all necessary kits, brackets, stems, trim, etc. to install the specified fixtures in the ceilings provided. Clearly note these configurations on the product data sheets.

B. Shop Drawings: Provide detailed shop drawings for specialty luminaires as required by the manufacturer.

C. Warranty: Provide copies of manufacturer's warranty information for each luminaire. If warranty information is the same for a group of manufacturer's luminaires, provide a letter or schedule clearly indicating what warranty applies to each fixture.

D. LED Luminaire Substitutions: Due to the constantly evolving technology, it is difficult to evaluate a true "equal" LED luminaire since the wattage, LED life, lumen output, etc. vary significantly from fixture to fixture, even for luminaires that have a similar shape and style. The luminaires shown on the Plans in the Fixture Schedule are not intended to be sole sourced but are considered a Basis of Design. If a substitution is proposed by the contractor, it will be evaluated based on the following criteria:

1. Does it have the same basic shape/style and characteristics? Note that there may be space constraints above the ceiling.

2. Does the luminaire have the same (or superior) light output and distribution? If not, would it still produce enough light to illuminate the space per minimum IES recommendations or other project specific lighting levels? Note that the Engineer may request .ies files or lighting calculations be provided by the Contractor to evaluate substitution requests.

3. Does it use the same (or less) wattage than the specified fixture? If it uses slightly more power, does it provide enough value to the Owner by adding additional light to offset the additional power used? Is that appropriate for the project compliance requirements. (LEED, ASHRAE 90.1, etc.)

4. Does it have the same nominal color temperature and CRI values? Note that for certain luminaires this may be more important where [medical procedures are being performed or where] artwork or merchandise is illuminated.

5. Does it have an equal or better lamp life as calculated in accordance with IES TM-21 and LM-80?

6. Does the manufacturer offer an equal or better warranty than the specified fixture?

7. Are the LED lamps modules and LED boards field changeable? What guarantees does the manufacturer have that replacement parts will be available in the future?

8. Submit point-by-point lighting calculations on 2'x2' grid showing compliance of all substitute luminaires in each room with IESNA recommended lighting levels and uniformity.

1.06 CLOSEOUT SUBMITTALS

A. Project Record Drawings: Indicate actual locations and mounting heights of all lighting fixtures and accessories on the project record drawings. Update part numbers and description on the

Lighting Fixture Schedule to match the actual luminaires installed. Submit under Section 26 05 00.

B. Operation and Maintenance Manuals:

1. Provide recommended luminaire cleaning and re-lamping schedule. If any luminaire lenses require special lubricants for cleaning, include this in the schedule.
2. Provide detailed bill of materials for all items purchased in this section including distributor's contact name, phone number and pertinent information.
3. Provide luminaire manufacturer's installation instructions.
4. Provide manufacturer's step-by-step installation instructions showing how to replace the LED lamp modules and drivers for each luminaire.
5. Include any specific warranty information provided by the manufacturer for luminaires, LED boards and drivers.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site, store and protect in a clean, dry environment under provisions of General Conditions of the Contract.

1.08 EXTRA MATERIALS

A. Provide spare parts under provisions of Division 01.

B. Lenses: One of each size and type.

C. Drivers: One of each size and type installed.

D. LED Lamp Modules: Provide a minimum of 2 of each unique type of lamp module used on the project. Ship LED lamp modules (i.e. LED board) in protective packaging and label each lamp module to indicate the fixture type that it may be installed in. (i.e. Type A or Type D1).

E. LED Luminaire: Where the specified or substitute luminaire does not have a replaceable lamp or lamp module, provide one spare luminaire per size and type installed.

PART 2 PRODUCTS

2.01 INTERIOR AND EXTERIOR LUMINAIRES AND ACCESSORIES

A. Luminaires: Provide UL listed luminaires as scheduled on the drawings or as approved equal.

B. Listing: Luminaires shall be listed for use in the environment in which they are installed. For example, luminaires installed in return air plenums, direct contact with insulation, or in hazardous, wet, damp, or corrosive locations shall be UL listed for such application.

C. Accessories: Provide all mounting kits, supports, interconnecting wiring, power supplies, trim kits, gaskets, etc. for a complete installation.

D. Housing:

1. Metal parts shall be free of burrs and sharp corners and edges. Form and support to prevent warping and sagging.
2. Doors, Frames and Other Internal Access: Smooth operating, free of light leakage under operating conditions. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
3. Luminaires shall be factory painted and free of discoloration. Color as scheduled.

2.02 LAMP MODULES – LED

A. All LED's shall be nominal 3500 degrees Kelvin (nominal) within a 3-step MacAdam Ellipse unless special circumstances require a different color temperature application, see Luminaire Schedule on Plans.

B. Color Rendering: Minimum CRI as scheduled on the Plans for each fixture. Under no circumstances shall the CRI be less than 70.

C. Lamp Life: Minimum lamp life shall be calculated in accordance with IES LM-80. Lamp life for each luminaire shall be equal or greater than scheduled on the Plans. Under no circumstances shall an interior luminaire have a minimum rated life (L70) less than 50,000 hours at 75 degrees F average indoor ambient temperature and an outdoor luminaire less than 75,000 hours at 40 degrees F average outdoor ambient temperature.

D. Replaceable: Unless otherwise scheduled, all LED modules shall be field replaceable with quick disconnect connections.

E. Luminaires and lamps installed outdoors shall be rated for starting and operating at a minimum of -20F.

2.03 DRIVERS - LED

A. LED Driver: Provide UL listed power supply as recommended by the LED fixture manufacturer for operation of the specified LED lamps. Power supply shall be integral to the luminaire unless otherwise noted on the Plans. Power supply shall be dual voltage (120/277V) where available or operate at the supply voltage indicated on the Plans.

B. LED Dimming Driver: UL listed 0-10V dimming driver as recommended by the LED fixture manufacturer for operation of the specified LED lamps, fully compatible with the dimming system or dimming switch controlling the fixture. Driver shall be integral to the fixture and capable of dimming the luminaire down to 1% output unless otherwise scheduled on the Plans. Power supply shall be dual voltage (120/277V) where available and operate at the supply voltage indicated on the Plans.

2.04 EXIT SIGNS AND EMERGENCY LIGHTING UNITS

A. Luminaires: Provide UL listed exit signs and emergency lighting units as scheduled on the drawings or as approved equal.

2.05 EMERGENCY DRIVERS

A. LED Unit: UL listed self-contained emergency LED driver with automatic transfer to battery supply on power failure, optional test switch, AC ON pilot light, fully-automatic two-rate charger, Ni-cad battery, and power supply capable of operating an LED load of up to the rated fixture wattage (as shown on the Plans) at rated current (700mA) for a minimum of 90 minutes. Bodine #BSL series or approved equal.

B. Test Switches:

1. Standard and Low-Profile Units:

   a. Recessed Linear led Fixtures: Mount test switch in driver channel so that it is accessible from below. Affix red driver identification label (supplied with driver) to door trim on fixture to denote location of emergency driver.

   b. Pendant Fixtures: Mount test switch in end cap of fixture, at end closest to driver. Affix red driver identification label (supplied with driver) to bottom of fixture housing below test switch to denote location of emergency driver.

2. High Output Unit: Self-testing, as specified above.

3. Recessed Downlights: Mount test switch in ceiling, in recessed single-gang box adjacent to downlight.

PART 3 EXECUTION

3.01 INSTALLATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction items that penetrate ceilings or are supported by them, including luminaires, occupancy sensors, HVAC equipment, smoke detectors, fire-suppression system, IP video cameras, and partition assemblies. Adjust locations as required.

B. Unless otherwise noted on Plans, provide drivers integral to luminaires, pre-wired and installed at the factory, suitable for use with the selected LED lamps.

C. Support surface-mounted luminaires directly from building structure. Install level and parallel/perpendicular with ceiling or wall surfaces.

D. Install recessed luminaires to permit removal from below. Use plaster frames in hard ceilings.

E. Support luminaires in suspended ceilings from structure above in accordance with Section 26 0529.

F. Rigidly align continuous rows of lighting fixtures for true in-line appearance.

G. Provide luminaire disconnecting means in the wiring compartment of each luminaire. Where the luminaire is fed from a multi-wire branch circuit, provide multi-pole disconnect to simultaneously break all supply conductors to the ballast, including the grounded conductor.

H. LED Power Supplies: Install power supplies to be readily accessible. Where power supplies are installed in plenum areas, provide plenum rated listing. Where remote power supplies are used, install in concealed, accessible locations or in utility room that provides adequate sound dampening. Locate driver to allow free air movement in accordance with manufacturer's installation instructions and securely mount to structure.

I. Mechanical Rooms: Lighting fixture locations shown on Plans in mechanical and electrical equipment rooms are approximate. Coordinate mounting height and location of lighting fixtures to clear mechanical, electrical and plumbing equipment and to adequately illuminate meters, gauges and equipment. Support all lighting fixtures independently of duct work or piping.

J. Tandem wiring: Provide factory harness for all tandem mounted light fixtures.

K. Support exterior surface-mounted luminaires directly from building structure. Maintain wall waterproofing.

L. Aim directional lampheads of emergency lighting units to illuminate the path of egress.

M. Install emergency driver {or single fixture emergency transfer device} in the driver channel of the fixtures [or the mounting tray of downlight fixtures] indicated on the drawings. Provide an unswitched source of power to the emergency driver from the same circuit that powers the fixture the driver is installed in.

N. Coordinate location of wall mounted emergency lighting units with mechanical equipment, ductwork, piping, or any other obstruction that would impact the lighting output.

O. Wiring installed between a luminaire and an emergency lighting inverter or remote emergency driver is considered "emergency" wiring and shall be separated from the normal wiring and installed in a dedicated raceway per NEC 700.9.

3.02 RELAMPING

A. Re-lamp or replace luminaires that have failed lamps at completion of work.

3.03 ADJUSTING AND CLEANING

A. Align luminaires and clean lenses and diffusers at completion of work. Clean paint splatters, dirt, and debris from installed luminaires.

B. Touch up luminaire finish at completion of work.

3.04 FIELD QUALITY CONTROL

A. Tests: Perform tests listed below according to manufacturer's written instructions. Test unit functions, operations, and protective features. Adjust to ensure operation complies with Specifications. Perform tests required by NFPA 70, Articles 700 and 701. Perform tests on completion of unit installation and after building circuits have been energized. Provide instruments to permit accurate observation of tests. Include the following tests:

1. Simulate power outage: Verify proper operation of each individual emergency power supply.

2. Verify emergency supply duration.
3. Verify operation of remote test switches.
4. Provide reports for load test conducted on individual batteries.

B. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

3.05 ADJUSTING

A. Aim lamps on wall-mounted emergency lighting units to obtain the following illumination of egress pathway:

1. An average of 1 foot-candle.
2. A minimum at any point of 0.1 foot-candle measured along the path of egress at floor level.
3. Maximum-to-minimum illumination uniformity ratio of 40 to 1 shall not be exceeded.

B. Test emergency lighting equipment in accordance with the manufacturer's instructions and NECA/IESNA 500.

3.06 DEMONSTRATION

A. Walk owner's representative through the emergency lighting system. Note how to maintain, test and troubleshoot all units. Provide maintenance schedule for NFPA required testing and note locations of remote test switches, and which units have self-diagnostic features.

END OF SECTION

SECTION 27 0528
PATHWAYS FOR COMMUNICATION SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cable Trays.

B. Cable Tray Accessories.

C. Cable Runway.

D. J-Hooks.

E. Fire-rated Cable Pathway Device.

1.02 RELATED SECTIONS

A. Section 26 0533 – Raceway and Boxes for Electrical Systems.

B. Section 26 0529 – Hangers and Supports for Electrical Systems

C. Section 26 0526 – Grounding and Bonding of Electrical Systems.

D. Section 27 1000 – Structured Cabling.

1.03 REFERENCES

A. NEMA VE 1 - Cable Tray Systems.

B. National Electric Code (NFPA 70) Article 250 - Grounding.

C. National Electric Code (NFPA 70) Article 770 - Optical Fiber Cables and Raceways.

D. National Electric Code (NFPA 70) Article 800 - Communications Circuits.

E. ANSI/TIA/EIA-568-B -- Commercial Building Telecommunications Cabling Standards.

F. BICSI Telecommunications Distribution Methods Manual - Latest published edition.

G. UL Standards - UL 94HB, UL 723, and UL 2043.

1.04 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Indicate tray type, dimensions, support points, and finishes.

1.05 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 01.

B. Include cleaning and bolt-tightening procedures for cable tray.

1.06 PROJECT RECORD DRAWINGS

A. Record actual routing of cable tray on “As-built” drawings required in Section 27 1000.

PART 2 PRODUCTS

2.01 MANUFACTURERS – CABLE TRAY

A. Cablofil “EZ-Tray”.

B. GS Metals “FlexTray”.

C. CMS “Snake Tray”.

D. Substitutions: Under provisions of Division 01.

2.02 FLEXIBLE CABLE TRAYS

A. Tray: U.L. listed, continuous, rigid, welded steel wire mesh cable tray with welded intersections and continuous safety edge T-welded wire lip.

B. Material and Finish of Tray, Fittings, and Accessories:

1. Material: Carbon steel wire, ASTM A 510, Grade 1008. Wire welded, bent, and surface treated after manufacture. [Stainless steel wire, AISI 316L, 2B, finished cold drawn wire.]
2. Finish: Electro-Plated Zinc Galvanizing: ASTM B 633, Type III, SC-1.

C. Nominal Dimensions:
1. Mesh: 2 by 4 inches.
2. Straight Section Lengths: 118 inches.
3. Width: 12 inches.
4. Internal Depth: 2 inches.
5. Wire Diameter: .177 inch, minimum.

D. Fittings: Field fabricated from straight sections in accordance with manufacturer's instructions.

E. Accessories and Fittings: Manufacturer's standard clamps, hangers, brackets, splice plates, reducer plates, blind ends, shielding divider strips, connectors, elbows, tees, crosses, risers, dropouts, grounding lugs and other accessories as required for a complete system.

2.03 WARNING SIGNS

A. Engraved Nameplates: ½ inch high black letters on yellow laminated plastic nameplate, engraved with the following wording:

WARNING! DO NOT USE CABLE TRAY AS [WALKWAY, LADDER, OR] SUPPORT. USE ONLY AS MECHANICAL SUPPORT FOR CABLES AND TUBING!

2.04 CABLE RUNWAY

A. Cable Runway: 12 inch wide, 3/8 inch x 1-1/2 inch x 0.065 inch thick rectangular steel tubing with cross members 12 inches on center.

B. Cable Runway Radius Drop: Stringer or cross member as required. Provides 3-inch minimum bend radius.

C. Fittings: Provide factory elbows, tees, bends, splices, connections and hardware by the same manufacturer.

2.05 J-HOOKS

A. All cables not installed in conduit shall be supported using Caddy CableCat series or approved equal J-hooks with galvanized finish. J-hooks shall have a cable retainer strap to provide containment of cables within the hanger. The cable retainer strap shall be removable and reusable and be suitable for use in air handling spaces. The minimum J-hook size shall be equivalent to Caddy #Cat32. Size all J-hooks to support the quantity of cables installed, plus a minimum of 25% spare capacity. Fiber optic cables shall be routed in 1” innerduct that is supported on a separate J-hook above the J-hook supporting the copper cables.

PART 3 EXECUTION

3.01 INSTALLATION – GENERAL

A. Provide continuous pathway system for all low voltage cable systems. Where multiple cable systems (e.g. telecom, security, intercom) are installed along the same J-hook pathway, provide separate J-hooks for each system. J-hooks may utilize the same vertical support.

B. Coordinate all pathway runs with other trades prior to installation. Report conflicts to Owner.

C. Maintain a minimum EMI separation clearance in conformance with Section 27 1000.

D. Support pathway from building to support structure or sub structure in accordance with Section 26 0529. Do not support pathway from ceiling tiles, ceiling grid, hanger wires, ductwork, piping, or other equipment hangers that are not part of the cable pathway support system.

E. In areas with accessible ceilings where cable is not installed in cable tray, provide J-hooks spaced every 4 to 5 feet, varying the distance between each support.

F. Provide a minimum of 12 inches headroom above all types of cable supports.

G. Provide a minimum of 3 inches clear vertical space above ceiling system at cable lowest point.

H. Provide cable support within 18 inches of each transition of pathway system types. This includes transitioning from any one to any other of the following cable support systems such as raceway, sleeves, chases, cable trays, cable runways, or J-hooks.

I. Set J-hooks so that changes in direction do not exceed 45 degrees.

J. Install firestopping in accordance with Division 07 to sustain ratings when passing cable tray through fire-rated elements.

3.02 INSTALLATION – CABLE TRAY

A. Note: In many corridor areas, the cable tray will be routed through very congested spaces and the Contractor shall carefully coordinate with all traces to ensure that there are no conflicts and that all cable tray sections remain accessible, without being blocked by mechanical piping or ductwork. It is understood that there may be short sections (3' or less) where piping and ductwork crossings may make tray access difficult but tray shall be accessible on either side of these areas for pulling cable.

B. Installation: In conformance with NEMA VE 1 requirements and in accordance with manufacturer's instructions.

C. Assemble cable trays so that joints are not made at support brackets. Install trays level, straight and true to line or grade within plus or minus 1/8 inch in 10 feet and within an accumulative maximum of ½ inch. Make vertical structures plum within a tolerance of 1/8 inch. Install trays to leave no exposed raw edges.

D. Use expansion connectors where indicated in NEMA VE 1.

E. Install warning signs at 50-foot centers along route of cable tray, located to be visible.

F. Cut standard straight sections to length in field. Cut wires in one clean cut using side action bolt cutters to eliminate grinding or touch-up.

G. Provide bonding continuity between cable tray sections and fittings in accordance with manufacturer's instructions. Make connections to aluminum tray and fittings using an anti-oxidant compound.

H. Lay all wire parallel and straight in the tray.

I. Where multiple cable systems are installed in a horizontal cable tray, separate each set of cables and loosely bundle each set using Velcro "One-Wrap" or approved equal reusable straps with a minimum ¾ inch width.

J. Where cable tray penetrates fire rated floors, ceilings, or walls, firestop the opening in accordance with Section 26 0500 and Division 07.

3.03 INSTALLATION – CABLE RUNWAY

A. Provide cable runway above each row of telecom racks, with a tee runway to the telecom backboard.

B. Support to wall with triangular support bracket.

C. Provide bonding of cable runway system to provide electrically continuous system. Bond runway to telecommunications main grounding busbar (TMGB) in accordance with Section 26 0526 and as indicated on the Drawings.

D. Provide protective end caps for all exposed cable runway ends.

E. Provide cable runway radius drop protective plates (waterfalls) at each point where cables route down from the cable runway to a rack, or where there is a change in elevation between cable runways.

END OF SECTION

SECTION 27 10 00
STRUCTURED CABLING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for the design and installation of a complete and functional telecommunications cabling system including communications cable, patch panels, telecommunications jacks, raceways, and other equipment or components as required to achieve the specified function.

1.02 RELATED SECTIONS

A. Section 26 05 33 – Raceway and Boxes for Electrical Systems.

B. Section 26 05 29 – Hangers and Supports for Electrical Systems.

C. Section 26 05 53 – Identification for Electrical Systems.

D. Section 26 09 43 – Network Lighting Controls

E. Section 27 05 28 – Pathways for Communication Systems.

1.03 PROJECT RECORD DOCUMENTS

A. Submit documents under the provisions of Division 01.

B. Accurately record location of jacks, pull boxes and equipment racks, routing of all telecommunications raceways and cables, numbering scheme and identification number of all cables and jacks.

C. Submit test results for all cables prior to Substantial Completion.

1.04 LISTINGS AND STANDARDS

A. Furnish products listed and classified by Underwriters Laboratories, Inc. and suitable for purpose specified and indicated.

B. Where a UL Standard is in effect equipment shall meet that standard and shall bear the UL label.

1.05 REFERENCE CODES AND STANDARDS

A. The publications listed below form a part of the specification to the extent referenced. The publications are referred to in the text by basic designation only. The reference codes and standards are minimum requirements:

1. ANSI/NFPA 70 National Electrical Code, latest adopted version.
2. BICSI Telecommunications Distributions Methods Manual, current version.
3. TIA/EIA 568-C Commercial Building Telecommunications Cable Standard, current version.
4. TIA/EIA 569-C Commercial Building Standard for Telecommunications Pathways and Spaces, current version.
5. TIA/EIA 606-A Administration Standards for the Telecommunications Infrastructure of Commercial Buildings, current version.
6. J-STD-607-A Commercial Building Grounding and Bonding Requirements for Telecommunications, current version.

1.06 QUALITY ASSURANCE

A. Install all work in accordance with the above reference standards and codes. The Owner reserves the right to reject all or a portion of the work performed either on technical or aesthetic grounds.

B. All telecommunications cabling system layout and installation shall be overseen by a BICSI-certified Registered Communications Distribution Designer (RCDD). The installer shall either have an RCDD on permanent staff or shall have an RCDD on contract for the duration of the project. The RCDD shall sign and attest to all cable distribution design submittals and project

record drawings and shall attest to the completeness and accuracy of the system layout and installation.

C. All workmen employed for installation of equipment and cabling specified under this section shall be specifically trained and certified in the installation of the specified Category 6A UTP system, and shall have at least three years' experience installing, terminating, and testing Category 6A UTP on this size and complexity of project.

D. The intended function of the telecommunications cable system is to transmit voice and data signals from a central location to individual telecommunications outlet locations. Upon completion of the work, the UTP cable system shall be capable of transmitting a data signal that meets and exceeds the following requirements:

1. Category 6A: Supports data rates up to and including 10 Gb/s.

1.07 SUBMITTALS

A. Submit product data under provisions of Division 01. Provide factory test results for cables and connectors. Provide product data for the following products:

1. UTP Telecommunications Cable.
2. UTP Telecommunications Jacks and Faceplates.
3. UTP Modular Patch Panel.
4. UTP Patch Cables.
5. Cable Management Panels.
6. UTP Telecommunications Cable Tester.
7. UTP Sample Test Report (with all required testing parameters shown).

B. Submit certification for RCDD.

C. Submit qualifications and certifications to install the specified cabling system.

D. Submit scaled drawings showing the locations of all telecommunications jacks, equipment racks, telecommunications pullboxes, raceway and cable routing, and all penetrations of fire-rated walls and ceilings. Drawings shall show jack labels and cable counts. Submit elevations of each equipment rack. Provide a complete schedule of all telecommunications jacks with their jack numbers and associated cable number. Shop drawings shall be approved prior to installation of any portion of the telecommunications system. Electronic AutoCAD® drawings of the facility are available upon request for preparation of the shop drawings.

1.08 LABELING SYSTEM

A. Labeling shall conform to ANSI/TIA-606 standards, Section 26 05 53, and this Section.

B. Telecommunications Outlets:

1. Labels on all outlets shall have minimum 1/8-in. high characters and shall be installed behind recessed clear plastic covers on faceplate.
2. Label room outlets with two labels on the faceplate as follows:
    a. Top Label: Shows the telecommunication room the cable is run to (TR1, TR2, etc), followed by rack number (1, 2, etc.) followed by patch panel identification expressed as a letter (A), followed by port in patch panel the outlet is located (xx). Example: TR1-2B:38 (where TR1 indicates closet, 2 is the second rack, B is the second patch panel in the rack, 38 is the port in patch panel).
    b. Bottom Label: Shows the room number (room 103), followed by the jack/outlet number (J2) from the left when entering the room, followed by the quantity of ports within the outlet faceplate (1-6). Example: 103 J2:1 (where 103 is the room number, J2 is the 2nd jack/outlet from the left in the room, and 1 is the single port in the faceplate). Where the faceplate has multiple ports, the last part of the ID shall indicate the quantity.

Example: 103 J2:1-4 (where 103 is the room number, J2 is the 2nd jack/outlet from the left in the room, and 1-4 represents the four ports in the faceplate).

C. Copper Patch Panels:

1. Label each patch panel with each unique patch panel name, expressed as a letter. Example: A for 1st patch panel, B for 2nd, C for third, etc.
2. Label each port on the patch panels with a 1-line identifier as follows:
   a. Show the room number (room 103), followed by the jack/outlet number (J2) from the left when entering the room, followed by the port number within the outlet faceplate (1-6). Example: 103 J2:3 (where 103 is the room number, J2 is the 2nd jack/outlet from the left in the room, and 3 is the 3rd port in the faceplate).

D. Telecommunications Closet:

1. Label cable with wire number to denote the station outlet with appended cable number at each end. Cable ID tags shall be attached within 2 inches of cable end so that ID tag is visible within box.
2. Provide an updated floor plan and list of telecommunication outlets cross-referenced to the rack, patch panel and port. Mount behind Plexiglas cover as specified in Section 26 05 53.

E. Copper Horizontal Cable:

1. Label the end of each cable with the same designation used on the equipment where the cable is terminated (i.e. the patch panel or telecommunications outlet). Labels shall be installed within one inch of the end of the cable insulation, after the insulation has been cut back to allow for termination.

F. Provide computer-generated Project Record Drawing drawings showing outlet locations, type, and designation. Turn these drawings over to the Owner's Representative two (2) weeks prior to substantial completion, to allow the Owner's Personnel to connect and test Owner-provided equipment in a timely fashion.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS – STRUCTURED CABLING SYSTEM

A. Throughout this specification, specific manufacturers and manufacturer's catalog numbers are cited. These citations are for the purpose of establishing quality and performance criteria and are not intended to be proprietary. All products in the structured cabling system shall be provided from one of the approved manufacturing partnerships listed below, or an alternate system shall be substituted under the provisions of Division 01. All decisions regarding approval of non-specified manufacturers and products will be at the discretion of the Owner.

1. Ortronics/Superior Essex.
2. CommScope Uniprise.
3. Corning Cable Systems (fiber products).
4. Belden.
5. Hubbell/Mohawk.
6. Leviton/Berk-Tek.
7. TE Connectivity (formerly ADC/Krone/Amp).
8. Substitutions: Under provisions of Division 01.

B. Structured Category 6A cabling systems shall include, but not be limited to, UTP telecommunications cable, UTP jacks, faceplates, modular patch panels, and UTP patch cables.

2.02 TELECOMMUNICATIONS BACKBOARD

A. Material: ACX Plywood, painted to match the surrounding walls with fire-rated paint.

B. Size: (1) 4'x8' sheet at location indicated, ¾" thick.

C. Grounding Busbar: Wall-mounted, solid copper, 12 inch by 4 inch by ¼ inch thick busbar with two insulators and standoff brackets. Chatsworth #40153-012 or approved equal.

D. Cable Support: Provide cable management rings and cable support straps for all cables routed on backboard.

2.03 TELECOMMUNICATIONS EQUIPMENT RACKS

A. Telecom Racks: Existing.

2.04 UTP TELECOMMUNICATIONS CABLE

A. Category 6A: All UTP telecommunications cables that stay within the building envelope shall be UL listed, plenum-rated CL2P, Category 6A, 4 pair, 16-20 AWG, solid copper conductor.

1. Superior Essex “10GAIN” CMP or approved equal.

2.05 UTP TELECOMMUNICATIONS JACKS - STATION

A. All UTP telecommunications jacks shall be Category 6A, T568A/B, 8P8C, single, white finish, telecommunications jack with flush exit. Unless otherwise noted on the drawings, install each telecommunications jack in a single gang faceplate at each telecommunications outlet. The quantity of faceplate openings shall match the quantity of jacks at each location. The Contractor shall verify the actual wiring configuration (T568A or 568B) with the Owner prior to submittal.

B. UTP Jacks:

1. Category 6A: Ortronics “TracJack Clarity 6A” #OR-TJ6A or approved equal.

2.06 TELECOMMUNICATIONS OUTLET FACEPLATES

A. Unless otherwise noted, all faceplates shall be single-gang plastic faceplates with white finish. The number of openings in each faceplate shall match the jack count of each outlet shown on the Drawings. (x in part numbers = designation for number of openings in faceplate).

1. Ortronics “TracJack” #OR-4030054x or approved equal.

2.07 UTP MODULAR PATCH PANEL

A. Provide and install high-density, unloaded angled patch panels in each equipment rack. The patch panels shall be populated with T568A/B, 8P8C Category 6A compliant jacks upon cable termination. The jacks shall be factory wired to a 110 type IDC connector. The complete assembly shall exceed the requirements of TIA/EIA 568-B (Category 6A), and be factory tested to 1000 Mbps data rates. Install the number of patch panels in each equipment rack as shown on the drawings or as required to terminate all UTP cables at the rack plus 25% spare capacity. The Contractor shall verify the actual wiring configuration (T568A or 568B) with the Owner prior to submittal.

1. 48-port Panel: Ortronics #OR-PHAHJU48 or approved equal.

2.08 UTP CABLE MANAGEMENT PANELS

A. Horizontal Cable Manager (new closets only): Chatsworth “Evolution Series” #35441-702 or approved equal 2RMU horizontal cable manager with black finish. Provide one cable manager at the top of the rack and one at the middle of the rack.

2.09 UTP PATCH CABLES

A. All patch cables shall be factory manufactured to match the applicable cable/connectivity solution (i.e. the Ortronics/Superior Essex system shall use Ortronics manufactured patch cords, etc.).

B. Provide Category 6A patch cables with blue jacket for installation between network equipment in the rack and data ports in the telecommunications patch panels. Provide the following: 3’ Cords: 600, 6’ Cords: 100.

1. Ortronics #OR-MC6Axx-06 or approved equal.

C. Wireless Access Point Connections: Provide 3-foot Category 6A patch cables with white jacket for connection to wireless access points. Provide two patch cables for each access point location shown on the Drawings.

1. Ortronics #OR-MC6A03-09 or approved equal.

2.10 CABLE SUPPORT

A. All cables not installed in conduit shall be supported in accordance with Section 27 05 28.

B. All cables not installed in conduit or routed on cable tray shall be supported using J-hooks, Caddy CableCat series or approved equal. Size all J-hooks to support the quantity of cables installed, plus a minimum of 25% spare capacity.

C. Cables shall be bundled using Velcro “One-Wrap” or approved equal reusable straps with a minimum ¾ inch width. Plastic tie-wraps or cinch-straps are not allowed.

2.11 EXTRA MATERIALS

A. Furnish to the owner the following spares parts:

1. Five (5) percent of each type of UTP telecommunications jack.
2. Five (5) percent of each type of telecommunications faceplate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

3.02 GENERAL INSTALLATION

A. Follow cable manufacturer’s specification regarding handling methods, retaining/support methods, bending radius and maximum pulling tension limitations. Where manufacturer does not provide bending radius information, minimum bending radius shall be 10 times the diameter of the cable. Use a tension-monitoring device to ensure that the maximum pulling tension that may be applied to the cable to be pulled into a conduit section is not exceeded. Provide replacement cable if cable manufacturer’s maximum pulling tension is exceeded at any time during a pull.

B. Cable shall be carefully inspected for sheath defects or other irregularities as it is paid out from the reel. When defects are detected, pulling shall stop immediately and the cable section shall be repaired or replaced at the discretion of the Contracting Agency. A system of communications shall be maintained between pulling and feed locations so that pulling can be stopped instantly, when required.

C. Adequate care shall be exercised when handling and storing reels of cable to prevent damage to the cable. Cable with dents, flat spots, or other sheath distortions shall not be installed.

D. Install termination backboards plumb, and attach securely at each corner.

E. Store a maximum of one foot of slack UTP cable for each UTP jack at each telecommunications outlet.

F. In the telecommunications closet, ten feet of slack UTP cable shall be provided at the racks. Route the service loop around the cable runway above the racks. No cables shall encroach or interfere with rack equipment space. All cables shall be protected from physical damage and should not be routed on the floor. Coiling the slack cable adjacent to the rack is not acceptable. The intent of this installation method is to provide slack cable for future work without causing increased inductance by coiling the cables.

G. All cabling shall be run continuous with no splices from each telecommunications jack to the cable connector at the patch panels. Telecommunications cables shall be terminated at each end on their respective jack. No cable run shall exceed 90 meters (295 feet) in length from the jack on the peripheral end to the patch panel.

H. All cable shall be routed in such a way as to minimize EMI and RFI interference. Cables shall be routed to maintain the following minimum distances from noise producing devices:

1. Open or Nonmetallic Communications Pathways:

a. 12 inches from electrical equipment and power lines of 3 kVA or less.

b. 12 inches from LED fixtures.

c. 36 from electrical equipment and power lines greater than 5 kVA.

d. 48 inches from transformers and motors.

2. Grounded Metal Conduit Communications Pathways:

a. 3 inches from electrical equipment and power lines of 2 kVA or less.

b. 6 inches from electrical equipment and power lines of 2 kVA to 5 kVA.

c. 12 inches from 5 kVA or greater power lines.

3.03 TERMINATIONS

A. The jacket of UTP cables shall be maintained to a point within one inch of the telecommunications jack. The twists on the individual pairs shall be maintained as close as possible to the contacts of the termination points but shall in no case exceed 1/2 inch.

B. Pairs from each cable shall be terminated sequentially from left to right, top to bottom starting with the lowest assigned number at the upper left-hand corner of the panel.

3.04 PATHWAYS AND RACEWAYS

A. Unless otherwise noted, all cables shall be installed in conduit from the telecommunications jack to the space above the accessible ceiling, within 18” of the J-hook pathway. Portions of cables not installed in conduit or supported via cable tray shall be supported in accordance with TIA/EIA standards at intervals not exceeding four (4) feet in length using J-hooks. The cable shall not be supported from ducts, pipes, conduits, ceiling grid hangar wires, etc. At any point where the cable changes direction, slack shall be provided to prevent rubbing or binding on the corner supports. Extreme care shall be taken to ensure that the cable is not compressed, kinked or otherwise deformed during installation. Any cable that is stretched, compressed, kinked or otherwise deformed shall be replaced at no cost to the Owner.

B. Cables to be installed in raceway, cable tray, continuous cable support system or J-hooks (as specified above) for the entire length of each cable. Provide raceway through areas that will not be accessible for future cable replacement or additions.

C. Provide pathway capacity throughout entire system for each telecommunication outlet served, sized to accommodate a minimum of four 4-pair cables from each outlet location to the designated telecommunication room, as shown on the plans.

D. Telecommunication cables shall not be installed in the same raceway or pathway as power cables.

E. Install polyethylene pulling string in each empty conduit containing a bend or over 10 feet in length.

F. Install all telecommunications outlets in outlet boxes under the provisions of Section 26 05 33. Unless otherwise noted on the Drawings or in the Specifications, outlets shall be mounted at 18 inches above floor, 4 inches above counters or backsplash, with the jacks oriented in the standard “pins down” position.

G. Support raceways, cable tray, outlet boxes, junction boxes and equipment racks under the provisions of Section 26 05 29.

3.05 LABELING

A. Label equipment racks as noted here-in and under the provisions of Section 26 05 53.

B. Furnish and install labels and documentation to identify all cables, jacks, and connections in accordance with TIA/EIA standards, as shown on the Drawings, and under the provisions of Section 26 05 53. As a minimum each jack in each faceplate shall have a unique identifier that matches the identifier at the patch panel. Identifiers shall be installed on the front of the telecommunications faceplate, on the cable behind the faceplate, and on the front of the patch panel at the associated jack.

3.06 CABLE ACCEPTANCE TESTING

A. Each UTP cable shall be tested for compliance with TIA/EIA Category 6A standards after installation using a Fluke #DTX or approved equal tester that has been calibrated within the last 30 days. At a minimum, the Contractor shall perform the following tests with the maximum frequency of the tester set at 500MHz:

1. Signal Attenuation / Insertion Loss.
2. Near End Cross Talk (NEXT).
3. Far End Cross Talk (FEXT).
4. Power Sum Near End Cross Talk (PS-NEXT).
5. Attenuation to Crosstalk Ratio – Far End (ACR-F).
6. Attenuation to Crosstalk Ratio – Near End (ACR-N).
7. Power Sum Attenuation to Crosstalk Ratio – Near End (PSACR-N).
8. Power Sum Attenuation to Crosstalk Ratio – Far End (PSACR-F).
9. Propagation Delay.
10. Delay Skew.
11. Return Loss.
12. Wiremap.
13. Overall Cable Length.

B. Test, analyze, and record compliance for the following network protocols:

1. 10 Base-T.
2. 100 Base-T.
3. 1000 Base-T (1 Gb/s).
4. 10GBase-T (10 Gb/s).

C. The Contractor shall provide 100% testing for each “permanent link” (i.e. from the work area outlet to the patch panel). Provide test results for all tests noted above in the form of printouts from the test equipment and provide an electronic copy of the test data for each cable on CD. If proprietary software is used, the submitted CD shall include any necessary software required to view test results. If the results are delivered in a standard format such as Excel or Access, the viewing software need not be provided. At the front of the test report, the Contractor shall provide an index showing the pass/fail results of each cable, along with the cable length and a corresponding cable label.

D. Where any portion of the system does not meet the Specifications, the Contractor shall correct the deviation and repeat any applicable testing at no additional cost to the Owner.

E. Provide three working days advance notice of tests. The Owner’s Representative shall reserve the right to be present during the testing of any or all cables in the system. Submit a copy of the test report for each cable prior to substantial completion of the project.

F. Acceptance of the telecommunications system shall be based on the results of the above tests, functionality, and the receipt of documentation.

G. Prior to Substantial Completion, submit the measured values for the telecommunications rack AC ground resistance and the voltage at the dedicated plug strip on the telecommunications rack.

END OF SECTION

SECTION 28 1000
ACCESS CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Access control system requirements.

B. Access control units and software.

C. Access control point peripherals, including readers and keypads.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware: Electrically operated door hardware, for interface with access control system.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems.

C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 28 2000 - Video Surveillance: For interface with access control system.

E. Section 28 3111 - Building Intrusion Detection: For interface with access control system.

F. Section 28 4600 - Fire Detection and Alarm: For interface with access control system.

1.03 DEFINITIONS

A. Access Control Cloud Services: Subscription-based hosted application utilizing Software as a Service (SaaS) delivery model in lieu of on-premises servers/software.

1.04 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 294 - Access Control System Units; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other installers to provide suitable door hardware as required for both access control functionality and code compliance.
   2. Coordinate the placement of readers with millwork, furniture, equipment, etc. installed under other sections or by others.
   3. Coordinate the work with other installers to provide power for equipment at required locations.
   4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meetings:
   1. Conduct meeting with facility representative to review reader and equipment locations.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Include plan views indicating locations of system components and proposed size, type, and routing of conduits and/or cables. Include elevations and details of proposed equipment arrangements. Include system interconnection schematic diagrams. Include requirements for interface with other systems.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for each system component. Include ratings, configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

E. Manufacturer’s detailed field testing procedures.

F. Project Record Documents: Record actual locations of system components and installed wiring arrangements and routing.

G. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

H. Software: One copy of software not resident in read-only memory.

1.07 QUALITY ASSURANCE

A. Comply with the following:
1. NFPA 70.
2. The requirements of the local authorities having jurisdiction.
3. Applicable TIA/EIA standards.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Access Control Units - Basis of Design: Brivo, as indicated under product descriptions below; www.brivo.com/#sle.

B. Access Control Units - Other Acceptable Manufacturers:
1. Bosch Security Systems; _____: www.boschsecurity.us/#sle.
2. Honeywell International, Inc; _____: www.honeywellaccess.com/#sle.
3. Substitutions: See Section 01 6000 - Product Requirements.

C. Access Control Cloud Services - Basis of Design: Brivo, as indicated under product descriptions below; www.brivo.com/#sle.

D. Readers and Keypads - Basis of Design: Brivo, as indicated under product descriptions below ; www.brivo.com/#sle.

E. Readers and Keypads - Other Acceptable Manufacturers:
1. Bosch Security Systems; _____: www.boschsecurity.us/#sle.
2. Honeywell International, Inc; _____: www.honeywellaccess.com/#sle.
3. Substitutions: See Section 01 6000 - Product Requirements.

F. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

G. Source Limitations: Where possible, furnish system components and accessories produced by a single manufacturer and obtained from a single supplier.

2.02 ACCESS CONTROL SYSTEM REQUIREMENTS

A. Provide new access control system consisting of required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Surge Protection:
   1. Provide equipment power surge protection where electrical distribution system surge protection is not provided.

C. Access Control Points:

D. Interface with Other Systems:
   1. Provide products compatible with other systems requiring interface with access control system.
   2. Interface with electrically operated door hardware as specified in Section 08 7100.
      a. Capable of locking/unlocking/releasing controlled doors.
      b. Capable of receiving input from integral door hardware switches.
   3. Interface with intrusion detection system as specified in Section 28 3111.
      a. Capable of affecting access for controlled doors for selected intrusion detection system events.
      b. Capable of affecting intrusion detection system status for selected access control system events.
   4. Interface with video surveillance system as specified in Section 28 2000.
      a. Capable of affecting camera/video operation for selected access control system events.
   5. Interface with fire alarm system as specified in Section 28 4600.
      a. Capable of affecting access for designated doors for selected fire alarm system events.

E. Provide products listed, classified, and labeled as suitable for the purpose intended.
   1. Access Control Units and Readers: Listed and labeled as complying with UL 294.

2.03 ACCESS CONTROL UNITS AND SOFTWARE

A. Provide access control units and software compatible with readers to be connected.

B. Unless otherwise indicated, provide software and licenses required for fully operational system.

2.04 ACCESS CONTROL POINT PERIPHERALS

A. Provide devices compatible with control units and software.

B. Provide devices suitable for operation under the service conditions at the installed location.

C. Readers and Keypads:
   1. General Requirements:
      a. Provide readers compatible with credentials to be used.
      b. Color: To be selected by Architect from manufacturer's available standard colors.
      c. Proximity Readers:
         1) Utilize 125 kHz RF communication with compatible credentials.
   2. Proximity Reader:

D. Door Position Switches:
   1. Magnetic Contacts: Encapsulated reed switch(es) and separate magnet; designed to monitor opened/closed position of doors.

E. Request to Exit Devices:
   1. Motion Sensors: Passive infrared.

F. Door Locking Devices (Electric Strikes and Magnetic Locks): Comply with Section 08 7100.

2.05 ACCESSORIES

A. Provide components as indicated or as required for connection of access control system to devices and other systems indicated.

B. Unless otherwise indicated, credentials to be provided by Contractor.
   1. Provide credentials compatible with readers and control units/software to be used.

C. Unless otherwise indicated, network switches required for network connections to system components to be provided by Contractor.

D. Provide cables as indicated or as required for connections between system components.

E. Provide accessory racks/cabinets as indicated or as required for equipment mounting.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings and configurations of system components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive system components.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to system.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install access control system in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Provide grounding and bonding in accordance with Section 26 0526.

D. Identify system wiring and components in accordance with Section 26 0553.

3.03 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. See Section 01 7900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

D. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

END OF SECTION

SECTION 28 4600
FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Contractor designed and installed of extension of existing addressable fire alarm and smoke detection system. This is a performance type specification describing the minimum acceptable fire alarm system. The Contractor shall design and install the fire alarm and smoke detection system in accordance with the requirements of NFPA 72 and ICC/ANSI A117.1. The fire alarm devices on the drawings are shown in suggested locations. The final locations of all devices shall be solely determined by the Contractor and shall be in accordance with NFPA 72 and ICC/ANSI A117.1.

1.02 RELATED SECTIONS

A. Division 21 - Sprinkler System.
B. Division 25 – Mechanical: Fire/Smoke Dampers.
C. Section 26 0519 – Low-Voltage Electrical Power Conductors and Cables.
D. Section 26 0533 – Raceway and Boxes for Electrical Systems.
E. Section 26 0553 – Identification for Electrical Systems.

1.03 REFERENCES

A. NFPA 72 - National Fire Alarm Code.
B. NFPA 101 - Life Safety Code.
C. International Mechanical Code (IMC).
D. Americans with Disabilities Act (ADA) and ADA Guidelines for Buildings and Facilities (ICC/ANSI A117.1).
E. ANSI S3.41 - Audible Emergency Evacuation Signals.
F. ANSI/ASME A17.1 - Safety Code for Elevators and Escalators.

1.04 REGULATORY REQUIREMENTS

A. System: UL and FM listed.
B. Conform to the requirements of UL 864.
C. Conform to requirements of NFPA 101.
D. Conform to requirements of ICC/ANSI A117.1.
E. Install system in accordance with NFPA 72.
F. Comply with requirements of ANSI A17.1.

1.05 SYSTEM DESCRIPTION

A. Existing fire alarm system panel is an Edwards EST2. All new fire alarm devices and installation thereof must be compatible with the existing panel and devices. Provide extension of existing signaling line circuit and notification appliance circuit as required and System Supervision: Provide extension to electrically-supervised class B, addressable fire alarm system with fault tolerant supervised signaling line circuits and notification appliance circuits. Occurrence of single ground or open condition in signaling line circuit or notification appliance circuit places circuit in TROUBLE mode. Component or power supply failure places system in TROUBLE mode.

1.06 QUALIFICATIONS

A. The installation of the system shall conform to the State of Alaska requirements and be supervised by a representative with a current State Fire Alarm License.
B. Manufacturer: Company specializing in addressable smoke detection and fire alarm systems with five years documented experience.
C. System Supplier: Factory trained to provide the submitted fire alarm system.
D. Installer: Installation of the system shall be 100% field checked by a factory trained and authorized NICET Level III technician certified in the Fire Alarm System Program. The actual supervising technician must be approved prior to start of work.

1.07 SUBMITTALS

A. Submit product data and shop drawings under the provisions of Division 01.
B. Submit shop drawings prepared and signed by a NICET Level III technician certified in fire alarm systems under the provisions of Division 01. Shop drawings shall have the following requirements:
    1. The Shop Drawings shall be reproduced electronically from a Master Copy supplied in digital format. Electronic copy of the Contract Drawings will be available at no charge to use as base plan for generation of electronic submittal. Shop Drawings shall be printed at Contract Drawing size and scale of floor plans on Shop Drawings shall match Contract Drawings.
    2. All text on the drawings shall be legible without magnification when the shop drawings are reduced to 11" x 17".
    3. Provide minimum 1/8" scale floor plans with all new fire alarm control and auxiliary panels, field devices, raceway and conductor routing, quantities and connection requirements for every component.
    4. Provide point-to-point system wiring diagrams showing interconnection of all devices.
    5. Provide a riser diagram showing all devices on each NAC, SLC, and auxiliary circuit connected to the fire alarm control panel. Individual device addresses on riser diagram are not required for initial shop drawing submittal but shall be provided on the as-built drawings.
    6. Provide calculations to support battery size selection. Provide voltage drop calculations for each SLC and NAC circuit. Show the voltage drop at the furthest notification appliance from the control panel. Show all formulas and acceptable limits for all calculations. All calculations shall be shown on the shop drawings.
C. Submit shop drawings and product data to the local [State] Fire Marshal for review and approval. All shop drawings and product data shall be reviewed and approved by the authority having jurisdiction prior to procurement and installation of materials or devices for the system.
D. Device Names: All device names that are displayed on the LCD text annunciators in the fire alarm panel [and remote text annunciator panels] shall be approved by the Owner. The Contractor shall request a list of approved room names for the facility prior to programming the fire alarm panel or any field devices.

1.08 PROJECT RECORD DRAWINGS

A. Submit documents under the provisions of Division 01.
B. Accurately indicate actual locations of notification appliances, initiating devices, fire alarm control panel, annunciators, etc.
C. Provide Point to Point as-built wiring diagrams of the entire Life Safety System as installed. This shall include all connected devices with actual addresses and locations of all T-taps. All drawings shall be provided in AutoCAD .DWG format. Paper plots of each sheet shall also be provided.

1.09 OPERATION AND MAINTENANCE DATA

A. Submit operating instructions and maintenance and repair procedures under the provisions of Division 01.
B. Include manufacturer representative's letter stating the system is operational.
C. Include an 11" x 17" set of the fire alarm system project record drawings.
D. Include a completed copy of the NFPA 72 Inspection and Testing Form.

1.10 DEMONSTRATION AND TRAINING

A. The Manufacturer's Representative shall be responsible for an on-site demonstration of the operation of the system and initial staff training.
B. Under the provisions of Division 01 and Section 26 0500, provide formal instruction in the operation, maintenance, and troubleshooting of all equipment, provided at the project site with manufacturer's representative with the Owner's personnel.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site, store and protect, under provisions of Division 01.

1.12 EXTRA MATERIALS

A. Provide spare parts under provisions of Division 01.
B. Provide two keys of each type.
C. Provide four addressable smoke detectors.
D. Provide two 135°F addressable heat detectors.
E. Provide one fire alarm horn/strobe.
F. Provide two fire alarm strobe lights.

1.13 WARRANTY

A. The Contractor shall be able to provide initial contact on warranty service and/or service contract requests from their principal location within eight (8) hours of notification. During the warranty period, the Contractor may choose to attempt troubleshooting of the system by telephone, with the facility maintenance staff. If the problem cannot be resolved within 24 hours, the Contractor shall travel to the facility on the next available flight to repair the system.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Edwards Systems Technology (EST), **NO SUBSTITUTIONS**.

2.02 INITIATING DEVICES

A. Manual Station: Semi-flush mounted, single action addressable manual station. Provide with high impact clear polycarbonate protective cover in gymnasium and multipurpose rooms.
B. Ceiling Mounted Smoke Detector: Addressable, NFPA 72, photoelectric type with adjustable sensitivity, plug-in base, and visual indication of detector actuation, suitable for mounting on 4-inch outlet box. Suitable for operation on existing control panel power supply and signaling line circuit.
C. Ceiling Mounted Multi-Sensor Detector: Addressable detector with multi-sensor technology to integrate ionization, photoelectric, and heat sensors into one detector. Detector shall have adjustable sensitivity, pre-alarm warning, automatic day/night sensitivity selection, plug-in base, and visual indication of detector actuation, suitable for mounting on 4-inch outlet box.
D. Duct Mounted Smoke Detector: Addressable, NFPA 72, photoelectric type with auxiliary SPDT relay contact, duct sampling tubes extending the width of duct, and visual indication of detector activation, in duct-mounted housing. Provide with remote visual indicator, test, and reset station. Suitable for operation on existing control panel power supply and signaling line circuit.
E. Heat Detector: Addressable combination rate-of-rise and fixed temperature, rated 135° F, and temperature rate of rise of 15° F. Provide fixed temperature devices rated 200° F where indicated.

2.03 INTELLIGENT MODULES

A. A control relay/transponder shall be installed where building services (i.e. fan shutdown, door holder or release, etc.) are to be automatically controlled by the fire alarm system during a fire emergency. The control relay shall be of a type that only consumes power momentarily while transferring from the deenergized to the energized state or back again. The command to change state shall come from the control panel in accordance with the system program. The control relay shall be condition (deenergized or energized) supervised, and its condition shall be confirmed and corrected, if necessary, during each polling cycle. The control relay/transponder shall be capable of operating on the same communication channel with initiating devices/transponders so that it can be located within 3 feet of the building service device it is controlling as required by NFPA 101-Life Safety Code while its integrity is being monitored from the control panel. The address code of the control relay transponder shall be field selectable and changeable in the same manner as for other transponders. The control relay/ transponder type code shall be factory preset and not be field changeable.

2.04 NOTIFICATION APPLIANCES

A. All appliances shall be U.L. Listed for Fire Protective Service.
B. All appliances shall be of the same manufacturer as the Fire Alarm Control Panel specified to assure absolute compatibility between the appliances and the control panels, and to assure that the application of the appliances is done in accordance with the single manufacturer's instructions.
C. Any appliances that do not meet the above requirements, and are submitted for use must show written proof of their compatibility for the purposes intended. Such proof shall be in the form of documentation from all manufacturers that clearly states that their equipment (as submitted) is 100% compatible with each other for the purposes intended.
D. Fire Alarm Strobe Lights: NFPA 72 compliant, flush [surface] wall [ceiling] mounted, self-synchronizing, xenon, fire alarm strobe lamp and flasher with flashrate of one flash per second, complying with the requirements of ICC/ANSI A117.1. Provide red lettered FIRE on clear lens. The strobe shall be field-selectable to provide 15, 30 75, or 110 candela synchronized flash outputs. The settings of all strobes shall be determined by the Contractor during the shop drawing process.
E. Fire Alarm Horn: ANSI S3.41 and NFPA 72 compliant, flush [surface] mounted fire alarm horn with adjustable sound output level. Sound Rating: 87 dBA (reverberant) at 10 feet on the "high" setting and 82 dBA (reverberant) at 10 feet on the "low" setting. Provide minimum sound pressure level of 15 dBA above the average ambient sound level in every occupied space within the building. Provide integral fire alarm strobe light as specified above where indicated on the drawings.

2.05 AUXILIARY DEVICES

A. Door Release: Magnetic hold open as specified in Division 08. Provide power supply to power all door holders. Provide power connection to 120 V primary source and overcurrent protection.
B. NAC Booster Power Supplies:
    1. Existing Power Supplies: New notification appliances may be connected to existing booster power supplies if the unit and batteries have sufficient capacity.
    2. Power supply quantity, rating and battery size shall be determined by the Contractor. All locations of new power supplies shall be approved by the Owner prior to shop drawing submittal. Provide one or more dedicated circuits for all new power supplies. Each circuit shall have a handle lock on the breaker.
    3. Smoke Detection: Provide a smoke detector to protect each NAC booster power supply in accordance with NFPA 72 requirements. Note that because the quantity and locations of NAC boosters are determined by the Contractor, these smoke detectors are <u>not</u> shown on the Contract Drawings but they shall be provided at no additional cost to the Owner.

2.06 FIRE ALARM WIRE AND CABLE

A. Fire Alarm System Power Branch Circuits: Building wire as specified in Section 26 0519.
B. Notification Appliance Circuits: Minimum #12 AWG copper building wire, as specified in Section 26 0519.
C. Initiating and Signaling Line Circuits: Twisted, shielded or unshielded fire alarm cable as recommended by the fire alarm system manufacturer. Minimum size #16 AWG.

2.07 FIRE ALARM SYSTEM MAP

A. On wall beside each fire alarm panel and text annunciator, provide a system map under clear 1/8" plexiglass with black metal frame permanently screwed to the wall with 4 screws around the perimeter of the map.
B. Map to denote locations of all panels, annunciator, and device address and room numbers that correlate with text display on panel to locate system event.
C. Orientate each map consistent with location the map is installed. Provide call denoting "YOU ARE HERE" at the installation point for each map.
D. The map shall be color-coded for clarity.
E. The final layout to be approved prior to final printing.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install the fire alarm system in accordance with the manufacturer's instructions.
B. Install manual station with operating handle not less than 42 inches and not more than 48 inches above finished floor. Install audible notification appliances with top of device not less than 90 inches above finished floor, and not less than 6 inches below finished ceiling. Install visual notification appliances such that the entire lens is not less than 80 inches and not greater than 96 inches above finished floor.
C. Install all smoke detectors a minimum of three feet from any air supply, return, or exhaust diffuser and a minimum of one foot from any light fixture.
D. Install all fire alarm system wiring in a dedicated [fire alarm MC cable or] conduit system separate from any other system wiring. Provide minimum 8 inch wire tails at each device box and 50 inch wire tails at the fire alarm control panel.
E. Make conduit and wiring connections to door release devices and other items as shown on the drawings or required by NFPA 72.
F. Mount outlet box for magnetic door holder to withstand 80 pounds pulling force.
G. The Contractor is responsible to field coordinate the final location of all initiating devices and notification appliances to comply with the requirements of NFPA 72. Any initiating devices or notification appliances that are not installed in accordance with NFPA 72 shall be relocated to comply with the requirements of NFPA 72 at no cost to the Owner.
H. Detectors shall not be installed until after the construction cleanup of all trades is complete and final. Protective dust covers shall be installed on all detectors prior to final clean-up. Detectors that have been installed without dust covers prior to final clean-up shall be replaced at no cost to the Owner.
I. Field locate remote visual indicators and test/reset stations for duct detectors in an accessible location.
J. Program the system to identify each device with the submitted and approved designation in the LCD annunciators on the control panel.

3.02 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 01.
B. Test in accordance with NFPA 72 and local fire department requirements. Provide a completed NFPA 72 Inspection and Testing Form for inclusion in the Operation and Maintenance manual at the completion of testing and commissioning the fire alarm system.
C. Provide all equipment, devices and manpower as necessary to test each and every device in the fire alarm system both for function and supervision. Demonstrate that all devices connected to the system function properly.
D. The facility will not be accepted as substantially complete until the fire alarm system has been tested and demonstrated to the Owner's authorized representative as 100 percent complete and fully functional, a completed NFPA 72 Inspection and Testing form is submitted.

3.03 MANUFACTURER'S FIELD SERVICES

A. Provide manufacturer's field services under provisions of Division 01.
B. Include services of a certified technician to supervise installation, adjustments, final connections, programming and system testing.

3.04 FIRE ALARM SYSTEM IDENTIFICATION

A. Wire and Cable: Provide fire alarm unit conductors with color coded insulation, or use color coded tape at each conductor termination and in each junction box as follows:
    1. Power Branch Circuit Conductors: Black, red, white.
    2. Initiating Device Circuit: Black, red.
    3. Detector Power Supply: Violet, brown.
    4. Notification Appliance Circuit: Blue (positive), white (negative).
    5. Door Release: Gray, gray.

B. Identify all circuit conductors at all terminal and junction boxes per NEC 760.30. Use the circuit designations (i.e. “NAC 1”, “SLC 1”, etc.), as indicated on the shop drawings.

C. Fire Alarm Device Labels:

1. Install machine-printed device address labels on all addressable devices, including smoke/heat detectors, control relays, monitor modules, etc. Unless otherwise noted, in public spaces where devices are mounted below +80” on walls, install label on inside cover of device. At all other locations, install label on exterior cover of device. Device labels shall show the unique device address corresponding to the text annunciator description. For smoke detectors, the label shall be affixed to the base and not to the detector itself.
2. Provide label on each remote test station indicating description and location of device being tested.

D. The circuit disconnecting means for the fire alarm control panel circuit, remote power booster supply, 120V door holders, or other control equipment circuits shall have a painted red handle and handle lock. The circuit(s) shall be labeled “Fire Alarm Circuit”. The circuit assignment and panel location shall be permanently identified on all fire alarm control equipment.

END OF SECTION

SECTION 31 2000

EARTH MOVING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Excavating, backfilling and preparing subgrades for structures and pavements.
2. Subbase course for concrete.
3. Subbase course and leveling course for asphalt paving.
4. Excavating and backfilling trenches for storm water utilities.

1.02 RELATED DOCUMENTS

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

B. Municipality of Anchorage Standard Specifications (M.A.S.S.), current edition.

C. When conflicts exist between M.A.S.S. and the Project Specifications, the Project Specifications shall govern.

D. Related Sections:

1. Divisions 22, 26, and 27 Sections for installing underground plumbing, electrical, and communications utilities and buried mechanical and electrical structures.
2. Division 32 Section "Exterior Civil Improvements" for civil sitework.

1.03 DEFINITIONS

A. Backfill: Material placed in an excavated area.

B. Bedding: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

C. Borrow: Material used as fill and/or backfill which is obtained from off-site for use as fill or backfill.

D. Compaction: Tamping by hand or machine to achieve required density in soils.

E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Engineer. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.

F. Fill: Soil materials used to raise existing grades.

G. Leveling Course: Leveling course is compacted material placed above the subbase and below the finishing surface of the improvement.

H. Non-Frost-Susceptible (NFS) Material: Non-organic soil containing less than 3 percent by weight of grains smaller than 0.02 mm obtained from minus three inches material.

I. 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.

J. Subbase: Aggregate layer placed between the subgrade and leveling course.

K. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage course, or topsoil materials.

L. Trench: Any excavation for a utility or drainage system.

M. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.04 SUBMITTALS

A Product Data: See Division 32 Section 32 1000, 1.05 “Submittals.”

B Material Test Reports: See Division 32 Section 32 1000, 1.05 “Submittals.”

C Independent Geotechnical Testing Agency Qualifications

1.05 QUALITY ASSURANCE

A Independent Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

1.06 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, parking areas, walks, and other adjacent occupied or used facilities during earth moving operations.

1. Do not close or obstruct streets, parking areas, walks, or other adjacent occupied or used facilities without permission from Owner.

2. Provide alternate routes around closed or obstructed traffic ways if required by Owner.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Engineer.

C. Utility Locator Service: Notify "Call Before You Dig" for area where Project is located before beginning earth moving operations.

D. Do not commence earth moving operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Fill and Backfill: Foundation material for backfill shall consist of Type II, II-A, III, V, or VI classified backfill as specified in the design drawings or by the Engineer. Fill and backfill shall meet the requirements of M.A.S.S. Section 20.21.

E. Leveling Course: Shall consist of crushed gravel, crushed stone, and crushed sand meeting the requirements of M.A.S.S. Section 20.22.

F. Bedding: Material for bedding shall consist of Class B, C, D, or E Bedding as specified in the design drawings or by the Engineer. Bedding shall meet the requirements of M.A.S.S. Section 20.16.

G. Geotextile Fabric: Fabric shall consist of Type A Separation geotextile fabric. Geotextile fabric shall meet the requirements of M.A.S.S. Section 20.25.

H. Filter Media: Filter Media shall be suitable for water percolation and shall consist of crushed or naturally occurring granular material, free of clay particles. Filter Media shall meet the requirements of Filter Material Type C of M.A.S.S. Section 20.17.

I. Sand Liner Material: Sand Liner material shall meet the following gradations.

85-100 percent passing a #10 sieve (less than 2.0 mm)

60-90 percent passing a #20 sieve (less than 0.850 mm)

25-50 percent passing a #40 sieve (less than 0.425 mm)

less than or equal to 15 percent passing a #60 sieve (less than 0.250 mm)

less than 5 percent passing a #200 sieve (less than 0.075 mm)

and the sand must not have more than 45 percent of the total passing any one sieve and retained on the next consecutive sieve, of those listed.

J. Insulation: Rigid board insulation shall be high density extruded or expanded polystyrene, with minimum compressive strength of 60 psi, and shall be equivalent to R-20 per four (4”) inch thick insulation. All exterior insulation shall meet the requirements of M.A.S.S. Section 20.26.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect structures, foundations, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.02 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.03 EXPLOSIVES

A. Do not use explosives.

3.04 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

B. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth. Do not excavate rock until it has been classified and cross sectioned by Engineer.

1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.

C. Excavation in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.

3. Cut and protect roots as directed by the Landscape Architect.

3.05 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Trim bottoms to required lines and grades to leave solid base to receive other work.

2. Excavation for Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

3.06 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.07 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit.

1. Clearance: 12 inches each side of pipe or conduit.

C. 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. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.

2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
4. Excavate trenches 6 inches deeper than elevation required in unyielding bearing material to allow for bedding course. Hand-excavate deeper for bells of pipe.

D. Excavation in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots as directed by the Landscape Architect.

3.08 SUBGRADE INSPECTION

A. Notify Geotechnical Testing Agency when excavations have reached required subgrade.

B. If Geotechnical Testing Agency determines that unsatisfactory soils including organics, are present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the structure slabs and pavements with a pneumatic-tired compactor weighing not less than 10 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Engineer, and replace with compacted backfill or fill as directed. After removal of unsatisfactory soil prepare subgrade and place Satisfactory Soils and compact to a minimum of 95 percent of maximum density.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

3.09 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Engineer.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Engineer.

3.10 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. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL, GENERAL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

A. 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.

B. Backfill voids with satisfactory soil while removing shoring and bracing.

C. Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

D. Place and compact final backfill of satisfactory soil to final subgrade elevation.

E. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.13 SOIL BACKFILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under structures and foundations, use classified fill material.
2. Under walks and pavements, use classified fill material.
3. Under grass and planted areas, use classified fill material.

3.14 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 9 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place and compact backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. Under structures, concrete slabs, foundations, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.

2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.

3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.

4. In bioretention basins and infiltration trenches, engineered soil shall be compacted to no more than 80 percent.

5. For utility trenches under pavement and structures, compact each layer of initial and final backfill soil material at 95 percent. For utility trenches under turf or unpaved areas compact each layer of initial and final backfill soil material at 85 percent

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.

C. Finish Grading: Grade subgrades to required elevations within the following tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch.

2. Walks: Plus or minus 1 inch.

3. Pavements: Plus or minus 1/2 inch.

4. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.17 SUBBASE AND LEVELING COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and leveling course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course and leveling course under pavements and walks as follows:

1. Place leveling course material over subbase course under hot-mix asphalt pavement.

2. Shape subbase course and leveling course to required crown elevations and cross-slope grades.

3. Place subbase course and leveling course 9 inches or less in compacted thickness in a single layer.

4. Place subbase course and leveling course that exceeds 9 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 9 inches thick or less than 2 inches thick.

5. Compact subbase course and leveling course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight

according to ASTM D 1557.

3.18 FIELD QUALITY CONTROL

A. Testing Agency: Contractor will engage a qualified geotechnical engineering testing agency to perform tests, inspections, and reporting.

B. Testing agency shall perform the following:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.

2. Determine that fill material and maximum lift thickness comply with requirements.

3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving 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 Engineer.

E. Testing agency will test compaction of soils in place according to ASTM D 1557, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

M.A.S.S. Section	Material	Testing Frequency
Section 20.13	Trench Bedding and Backfill	1 test per 50 LF
Section 20.21	Classified Fill and Backfill	1 test per lift or 1 test per 2,000 SF
Section 20.22	Leveling Course	1 test per 2,000 SF
Section 30.02	PCC Curb and Gutter	1 test per 250 LF
Section 30.03	PCC Sidewalks	1 test per 250 LF
Section 40.06	Asphalt and PCC Pavements	1 test per 2,000 SF

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; recompact and retest until specified compaction is obtained.

3.19 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 Engineer; reshape and recompact.

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.

3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION

SECTION 32 1000

EXTERIOR CIVIL IMPROVEMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Requirements for civil site work shown on the civil designated Drawings.

1.02 RELATED SECTIONS

A. General Conditions of the Construction Contract.

B. Section 31 2000 – Earth Moving.

1.03 REFERENCED SPECIFICATIONS

A. This contract is subject to and hereby incorporates by reference the following documents as though physically contained herein:

1. Sections of the Municipality of Anchorage Standard Specifications, 2015 Edition, as enumerated below, with modifications as contained herein. This document is herein referred to as M.A.S.S.

2. The Municipality of Anchorage, Anchorage Stormwater Manual, Volume 2, Construction Practices, Version 1.0, December 2017.

B. When conflicts exist between M.A.S.S. and the Project Specifications, the Project Specifications shall govern.

C. Where an item of Work not addressed by the Project Specifications, but addressed by M.A.S.S., then the item of Work shall be in accordance with M.A.S.S., regardless of whether or not the M.A.S.S. Section of relevance is specifically enumerated herein.

D. The incorporated reference documents are available free from the following sources.

1. M.A.S.S., Municipality of Anchorage Project Management and Engineering Department. www.muni.org/Departments/project_management/Pages/MASS.aspx

2. Anchorage Stormwater Manual, Volume 2, Construction Practices, Municipality of Anchorage Project Management and Engineering Department. http://anchoragestormwater.com/Documents/DCM/ASM_Volume2_Final_December2017.pdf

E. All references to “Municipality of Anchorage” shall mean “Owner.”

F. This Specification section applies only to the civil designated Drawings.

1.04 MUNICIPALITY OF ANCHORAGE STANDARD SPECIFICATIONS, 2015, herein referred to as “M.A.S.S.”.

A. Division 20.00 - Earthwork

Section 20.01: General

Section 20.02: Storm Water Pollution Prevention Plan

Section 20.07: Removal of Sidewalk and Concrete Apron

Section 20.08: Removal of Curb and Gutter

Section 20.09: Removal of Pavement

Section 20.12: Dewatering

Section 20.13: Trench Excavation and Backfill

Section 20.16: Furnish Bedding Material

Section 20.17: Furnish Filter Material

Section 20.18: Drain/Filter Rock

Section 20.21: Classified Fill and Backfill

Section 20.22: Leveling Course

Section 20.25: Geotextile Fabric

Section 20.26: Insulation

Section 20.27: Disposal of Unsuitable or Surplus Material

B. Division 30.00 - Portland Cement Concrete

Section 30.01: General

Section 30.02: Portland Cement Concrete, Curb and Gutter and Valley Gutter

Section 30.03: Portland Cement Concrete Sidewalks

Section 30.04: Portland Cement Concrete Curb Ramps

Section 30.05: Structures and Retaining Walls

Section 30.11: Sidewalk Joint Sealant

C. Division 40.00 - Asphalt Surfacing

Section 40.01: General

Section 40.04: Tack Coat

Section 40.06: Asphalt Concrete Pavement

D. Division 55.00 – Storm Drain Systems

Section 55.01: General

Section 55.02: Furnish and Install Pipe

Section 55.03: Subdrains

Section 55.04: Connections to Existing Manholes or Catch Basins

Section 55.05: Manholes and Catch Basins

Section 55.06: Watertight Manhole Frames and Cover

Section 55.08: Adjust Storm Drain Manhole Ring to Finish Grade

Section 55.09: Construct Catch Basin

Section 55.12: Adjust Catch Basin to Finish Grade

Section 55.13: Abandon Catch Basin Lead

Section 55.14: Construct Storm Cleanout

Section 55.22: Oil and Grit Separator

E. Division 65.00 – Construction Surveys

Section 65.01: General

Section 65.02: Construction Surveying

F. Division 70.00 - Miscellaneous

Section 70.01: General

Section 70.07: Remove Pipe

Section 70.10: Traffic Markings

Section 70.11: Standard Signs

Section 70.12: Traffic Maintenance

G. Standard Details as Listed Below:

20-9 PIPE INSULATION
20-10 CLASS “B” BEDDING
20-14 TYPE II CLASSIFIED FILL AND BACKFILL
20-15 TYPE II-A CLASSIFIED FILL AND BACKFILL
20-18 LEVELING COURSE
30-1 CURB AND GUTTER CROSS SECTIONS
30-8 PERPENDICULAR CURB RAMP
30-10 ACCESSIBLE (TYPE 1A/2A) CURB AND GUTTER SECTIONS
30-13 CURB TYPE RETAINING WALL 2’ TO 3’
30-14 SIDEWALK RETAINING WALL 6” TO 24”
30-15 SIDEWALK RETAINING WALL 2’ TO 5’
55-4 STORM DRAIN MANHOLE TYPE I PIPE ≤ 24”
55-5 STORM DRAIN MANHOLE TYPE II 24” to 36”
55-7 STORM DRAIN MANHOLE COVER
55-10 MANHOLE HEIGHTS
55-18 MANHOLE RING ADJUSTMENT
55-19 CATCH BASIN INLET FRAME AND HOOD FOR TYPE 1 CURB & GUTTER
55-20 CATCH BASIN INLET GRATES FOR TYPE 1 CURB AND GUTTER
70-13 CONCRETE FOUNDATION FOR SIGN POST

1.05 SUBMITTALS

A. Storm Water Pollution Prevention Plan

B. Type II Classified Fill, Type II-A Classified Fill, Bedding Material, Trench Backfill, Leveling Course, Sand Liner Material, and Filter Media.

1. Particle-size Analysis
2. Moisture/Density Relationship
3. In-Place Density Test Results

C. Storm Drain System Components including pipe, insulation and geotextile fabric

1. Certificates of Compliance
2. Manufacturer’s Catalog Data

D. Exterior Portland Cement Concrete for sidewalk, paving, curbs, ramps and walls.

1. Mix Design

2. Reinforcing Steel Shop Drawings
3. Reinforcement Certificates of Compliance
4. Certificate of Compliance for Curing Compound and Admixtures
5. Sample Material Test Results

E. Joint Filler and Joint Sealant
1. Certificates of Compliance
2. Manufacturer's Catalog Data

F. Asphalt
1. Mix Design
2. Certified Asphalt Analysis
3. Paving Plan
4. Sample Material Test Results

G. Sand Slurry for abandoning pipes in place
1. Particle-size Analysis
2. Mix Design

H. Board Insulation for Exterior Use
1. Certificates of Compliance
2. Manufacturer's Catalog Data

1.06 MODIFICATIONS AND/OR ADDITIONS TO M.A.S.S.

A. All Divisions, All Sections: Delete articles entitled "Measurement" and "Basis of Payment."

B. Replace all references to materials testing by the Engineer with an equivalent reference to materials testing by the Owner Engaged Special Inspector. The Contractor shall be responsible for all certifications and their own quality control.

C. All Divisions, All Sections: All references to "Municipality of Anchorage" shall mean "Owner."

D. All Divisions, All Sections: All references to construction with a public right-of-way shall also include the construction areas as indicated on the Drawings.

E. The Contractor shall submit for review copies of the complete Product Data for all Contractor Furnished Items to be provided under the Division including specific performance data, material description, grade, gradation, source, rating, capacity, working pressure, material gage or thickness, brand name, catalog number, and operating and maintenance data in accordance with the procedures of Division 10, Section 10.04, Article 4.3 "Submittal List".

F. Modify the MASS Sections and Articles as follows:

Division 10.00 - Standard General Provisions

Section 10.01: Definitions

Add the following definition:

Record Drawings - Detailed Drawings which accurately depict all changes in location (both horizontal and vertical), material, equipment, and other elements of Work accomplished by Contractor. The Drawings shall also depict the horizontal

and vertical locations of all other utilities and obstructions encountered during construction. Final elevations and locations shall be clearly marked with actual dimensions, or existing dimensions shall be noted with “ASB” if no changes occur.

Section 10.06: Legal Relations and Responsibilities

Article 6.6 Permits

Add the following:

Certain fire hydrants may be used by the Contractor for the purposes of construction. A “Hydrant Use Permit” shall be obtained by the Contractor prior to the use of any hydrant. “Hydrant Use Permits” are available through the Permit Counter of the AWWU Field Services Section, 3000 Arctic Boulevard, in Anchorage. The connection to and use of such fire hydrants shall be in accordance with those requirements specified within said permit. In all cases, the Contractor shall ensure the hydrants are protected from damage, including freezing, and all damage resulting directly from the Contractor’s use of the hydrant will be repaired by AWWU at the Contractor’s expense. The “Hydrant Use Permit” shall be provided at no cost to the Owner.

Division 20.00 – Standard Construction Specifications for Earthwork

Section 20.01: General

Article 1.3 Applicable Standards

Add the following reference:

ASTM D 1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort

Article 1.5 Compaction Standards

Substitute the following in the second paragraph:

Substitute the words “ASTM D 1557, Method D” for the words “AASHTO Standard Method T-180-D”.

PART 2 - PRODUCTS

2.01 SEE REFERENCED M.A.S.S. SECTIONS FOR MATERIALS.

PART 3 - EXECUTION

3.01 SEE REFERENCED M.A.S.S. SECTIONS FOR CONSTRUCTION.

END OF SECTION

SECTION 32 9000

LANDSCAPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

1.02 DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 1 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.

A. SUMMARY

1.03 THIS SECTION INCLUDES THE FOLLOWING:

A. Placement of Topsoil

1.04 PLANTING OF EXTERIOR PLANTS

A. Landscaping Accessories including Mulches

B. Seeding

C. Maintenance

1.05 RELATED SECTIONS INCLUDE THE FOLLOWING:

1.06 DIVISION 2 SECTION "SITE CLEARING" FOR PROTECTION OF EXISTING TREES AND PLANTING, TOPSOIL STRIPPING AND STOCKPILING, AND SITE CLEARING.

A. Division 2 Section "Earthwork" for excavation, filling, and rough grading and for subsurface aggregate drainage and drainage backfill materials.

B. Division 2 Section "Subdrainage" for below-grade drainage of landscaped areas, paved areas, and wall perimeters.

C. REFERENCE DOCUMENTS

1.07 ANSI Z 60.1-LATEST EDITION; AMERICAN STANDARD FOR NURSERY STOCK, (SPONSOR: AMERICAN ASSOCIATION OF NURSERYMEN, INC., 1250 I STREET, N.W., SUITE 500, WASHINGTON, D.C. 20005).

A. Plants of the Western Boreal Forest and Aspen Parkland, Johnson-Kershaw-MacKinnon-Pojar, Lone Pine Publishing, Edmonton, Vancouver, Redmond, 1995

B. Flora of Alaska and Neighboring Territories, Eric Hulteen, Stanford University Press, Stanford, California, 1968, reprinted 1990

C. DEFINITIONS

1.08 BALLED AND BURLAPPED STOCK: EXTERIOR PLANTS DUG WITH FIRM, NATURAL BALLS OF EARTH IN WHICH THEY ARE GROWN, WITH BALL SIZE NOT LESS THAN DIAMETER AND DEPTH RECOMMENDED BY ANSI Z60.1 FOR TYPE AND SIZE OF TREE OR SHRUB REQUIRED; WRAPPED, TIED, RIGIDLY SUPPORTED, AND DRUM-LACED AS RECOMMENDED BY ANSI Z60.1.

A. Balled and Potted Stock: Exterior plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of exterior plant required.

B. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for kind, type, and size of exterior plant required.

C. Finish Grade: Elevation of finished surface of topsoil.

D. Topsoil: Soil produced off-site by homogeneously blending available peat and mineral soils with soil amendments to produce topsoil for seeding and plantings.

E. Planting Medium: Soil composed of commercially available sand, compost and lightweight, porous mineral and glass composite for special rooftop applications.

F. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

G. SUBMITTALS

1.09 PRODUCT DATA: FOR EACH TYPE OF PRODUCT INCLUDED ON DRAWINGS.

A. Samples for Verification: For each of the following:

1.10 EDGING MATERIALS AND ACCESSORIES, OF MANUFACTURER'S STANDARD SIZE, TO VERIFY TYPE AND COLOR SELECTED IF SPECIFIC PRODUCT IS NOT INDICATED ON DRAWINGS.

A. 1 lb sample of organic mulch for each type specified in labeled plastic bags.

1.11 PRODUCT CERTIFICATES: FOR EACH TYPE OF MANUFACTURED PRODUCT INCLUDING SEED MIXES AND SOD, VERIFIED BY PRODUCT MANUFACTURER, AND COMPLYING WITH THE FOLLOWING:

1.12 MANUFACTURER'S CERTIFIED ANALYSIS FOR STANDARD PRODUCTS INCLUDING SEED AND SOD.

A. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

1.13 MATERIAL TEST REPORTS: FOR TOPSOIL AND SOIL AMENDMENTS IF REQUIRED.

A. Maintenance schedule: Submit a maintenance schedule for the maintenance and warranty period prior to planting and seeding operations.

B. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of exterior plants during a calendar year. Submit before expiration of required maintenance periods.

C. QUALITY ASSURANCE

1.14 INSTALLER QUALIFICATIONS: A QUALIFIED LANDSCAPE INSTALLER WHOSE WORK HAS RESULTED IN SUCCESSFUL ESTABLISHMENT OF EXTERIOR PLANTS.

1.15 INSTALLER'S FIELD SUPERVISION: REQUIRE INSTALLER TO MAINTAIN AN EXPERIENCED FULL-TIME SUPERVISOR ON PROJECT SITE WHEN LANDSCAPING IS IN PROGRESS.

1.16 SOIL-TESTING LABORATORY QUALIFICATIONS: AN INDEPENDENT LABORATORY, RECOGNIZED BY THE STATE OF ALASKA, WITH THE EXPERIENCE AND CAPABILITY TO CONDUCT THE TESTING INDICATED AND THAT SPECIALIZES IN TYPES OF TESTS TO BE PERFORMED.

A. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of topsoil. Provide standard annual soil analysis results obtained from topsoil manufacturer if topsoil is from a third party commercial source.

B. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock." Provide clear identification for each species by nursery tags or other methods approved by the Landscape Architect.

C. Tree and Shrub Measurements: Measure according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches above ground for trees up to 4 inch caliper size, and 12 inches above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

D. Substitution requests: Submit substitution requests in writing prior to April 30 each year. All substitutions shall be approved by the Landscape Architect.

E. Observation: Landscape Architect may observe trees and shrubs either at place of growth, nursery site or at project site before planting for compliance with requirements for genus, species, variety, size, and quality. Landscape Architect retains the right to observe trees and shrubs further for size and condition of balls and root systems, insects, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1.17 NOTIFY LANDSCAPE ARCHITECT OF SOURCES OF ALL PLANT MATERIALS, PROVIDE NURSERY TAGS UPON REQUEST

1.18 SEED CERTIFICATES: PROVIDE SEED CERTIFICATES FOR APPROVAL PRIOR TO COMMENCEMENT OF SEEDING OPERATIONS.

1.19 DELIVERY, STORAGE, AND HANDLING

1.20 DELIVER EXTERIOR PLANTS FRESHLY DUG OR REMOVED FROM TEMPORARY NURSERY SITE.

A. Do not prune trees and shrubs before delivery, except as approved by Landscape Architect. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery.

B. Handle planting stock to avoid damage to rootball and plant.

C. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than four hours after delivery, set exterior plants in shade, protect from weather and mechanical damage, and establish a temporary site where roots can be kept moist.

1.21 SET BALLED STOCK ON GROUND AND COVER BALL WITH TOPSOIL, PEAT MOSS, SAWDUST, OR OTHER ACCEPTABLE MATERIAL.

A. Do not remove container-grown stock from containers before time of planting.

B. Water root systems of exterior plants stored on-site avoiding damage to the rootballs. Water as often as necessary to maintain root systems in a moist condition.

C. COORDINATION

1.22 PLANTING RESTRICTIONS: PLANT DURING THE LOCAL GROWING SEASON OF MAY 15 THROUGH SEPTEMBER 30 UNLESS OTHERWISE APPROVED BY LANDSCAPE ARCHITECT IN WRITING. COORDINATE PLANTING PERIOD WITH MAINTENANCE PERIOD TO PROVIDE REQUIRED MAINTENANCE FROM DATE OF INSTALLATION.

A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit unless otherwise approved by the Landscape Architect.

B. Coordination with Lawns: Plant trees and shrubs after finish grades are established and before seeding lawns, unless otherwise acceptable to Landscape Architect.

1.23 WHEN PLANTING TREES AND SHRUBS AFTER LAWNS, PROTECT LAWN AREAS AND PROMPTLY REPAIR DAMAGE CAUSED BY PLANTING OPERATIONS.

A. WARRANTY

1.24 WARRANTY: WARRANT EXTERIOR PLANTS AND LAWN, FOR THE WARRANTY PERIOD INDICATED, AGAINST DEFECTS INCLUDING DEATH AND UNSATISFACTORY GROWTH, EXCEPT FOR DEFECTS RESULTING FROM NEGLECT, OR ABUSE BY OWNER, OR INCIDENTS THAT ARE BEYOND CONTRACTOR'S CONTROL.

1.25 WARRANTY PERIOD FOR TREES AND SHRUBS (WOODY PLANT MATERIAL): ONE YEAR FROM DATE OF INSTALLATION.

A. Warranty Period for Lawns and Sod: 60 days from date of installation.

B. Remove dead exterior plants immediately. Replace immediately unless required to plant in the succeeding planting season.

C. Replace exterior plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.

D. A limit of one replacement of each exterior plant will be required, except for losses or replacements due to failure to comply with the requirements of these Specifications.

E. MAINTENANCE

1.26 TREES AND SHRUBS: MAINTAIN FOR THE FOLLOWING MAINTENANCE PERIOD BY PRUNING, CULTIVATING, WATERING, WEEDING, FERTILIZING, RESTORING PLANTING SAUCERS, TIGHTENING AND REPAIRING STAKES AND GUY SUPPORTS, AND RESETTING TO PROPER GRADES OR VERTICAL POSITION, AS REQUIRED TO ESTABLISH HEALTHY, VIABLE PLANTINGS. SPRAY AS REQUIRED TO KEEP TREES AND SHRUBS FREE OF INSECTS AND DISEASE. RESTORE OR REPLACE DAMAGED TREE WRAPPINGS.

1.27 MAINTENANCE PERIOD: MAXIMUM 12 MONTHS FROM DATE OF INSTALLATION OR AS APPROVED BY OWNER.

1.28 LAWN AND SOD: MAINTAIN FOR THE FOLLOWING MAINTENANCE PERIOD BY WATERING, WEEDING, FERTILIZING, MOWING AND OTHER OPERATIONS AS REQUIRED TO ESTABLISH HEALTHY, VIABLE LAWN AND GRASS AREAS:

1.29 MAINTENANCE PERIOD: MAXIMUM 60 DAYS FROM DATE OF INSTALLATION OR AS APPROVED BY OWNER.

A. Mow lawn as soon as top growth is tall enough to cut, but not less than 6”. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings.

PART 2 - PRODUCTS

2.01 TREES AND SHRUBS

2.02 GENERAL: FURNISH NURSERY-GROWN TREES AND SHRUBS COMPLYING WITH ANSI Z60.1, WITH HEALTHY ROOT SYSTEMS DEVELOPED BY TRANSPLANTING OR ROOT PRUNING. PROVIDE WELL-SHAPED, FULLY BRANCHED, HEALTHY, VIGOROUS STOCK FREE OF DISEASE, INSECTS, EGGS, LARVAE, AND DEFECTS SUCH AS KNOTS, SUN SCALD, INJURIES, ABRASIONS, AND DISFIGUREMENT.

A. Grade: Provide trees and shrubs of sizes and grades complying with ANSI Z60.1 for type of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to Landscape Architect, with a proportionate increase in size of roots or balls.

B. Identify nursery trees and shrubs with securely attached waterproof tags bearing legible designation of botanical and common name. Separating shrubs into groups by species and size and labeling at least one for clear identification is allowed if approved by the Landscape Architect.

C. If formal arrangements or consecutive order of trees or shrubs is shown, select stock for uniform height and spread, and number label to assure symmetry in planting.

D. GRASS SEED

2.03 PROVIDE SEED FROM COMMERCIAL SOURCE CONFORMING TO THE SPECIES MIX, APPLICATION RATE, GERMINATION RATE AND PURITY SPECIFIED ON DRAWINGS

A. GRASS SEED MIX:

2.04 PROPORTION BY WEIGHT PURITY GERMINATION

A. "Nugget" Kentucky Bluegrass (Poa pratensis "Nugget") 25% 95% 80%

B. "Arctared" Red Fescue (Festuca rubra "Arctared") 20% 95% 80%

C. Merion" Kentucky Bluegrass (Poa Pratensis "Merion") 50% 95% 80%

D. Annual Ryegrass (Lolium spp.) 5% 95% 80%

E. TOPSOIL

2.05 TOPSOIL: TOPSOIL SHALL CONSIST OF A NATURAL FRIABLE SURFACE SOIL WITHOUT ADMIXTURES OF UNDESIRABLE SUBSOIL, REFUSE, OR FOREIGN MATERIALS. IT SHALL BE SHREDDED AND REASONABLY FREE FROM ROOTS, HARD CLAY, COARSE GRAVEL, STONES LARGER THAN ONE (1) INCH IN ANY DIAMETER, NOXIOUS WEEDS, GRASS, BRUSH, STICKS, STUBBLE, OR OTHER LITTER, AND SHALL HAVE INDICATED BY A HEALTHY GROWTH OF CROPS, GRASSES, TREES, OR OTHER VEGETATION THAT IT IS FREE-DRAINING AND NON-TOXIC.

2.06 TOPSOIL SOURCE: IMPORT MANUFACTURED TOPSOIL FROM OFF-SITE SOURCES. IDENTIFY SOURCE PRIOR TO INSTALLATION. LANDSCAPE ARCHITECT RETAINS THE RIGHT TO INSPECT THE TOPSOIL AT ITS SOURCE PRIOR TO INSTALLATION.

A. Topsoil shall confirm to the following texture requirements:

2.07 ORGANIC MATERIAL 5-15% BY WEIGHT

2.08 30-45% BY WEIGHT PASSING NO. 200 SIEVE

2.09 45-65% BY WEIGHT

2.10 GRAVEL LESS THAN 2%

2.11 TOPSOIL SHALL CONFIRM TO THE FOLLOWING CHEMICAL CONSTITUENT REQUIREMENTS:

A. Nitogen 50-75 PPM

2.12 PHOSPHORIC ACID 60-110 PPM

2.13 POTASSIUM 120-200 PPM

2.14 6 – 7

2.15 FERTILIZER

2.16 COMMERCIAL FERTILIZER: COMMERCIAL-GRADE COMPLETE FERTILIZER OF NEUTRAL CHARACTER, CONSISTING OF FAST- AND SLOW-RELEASE NITROGEN, 50 PERCENT DERIVED FROM NATURAL ORGANIC SOURCES OF UREA FORMALDEHYDE, PHOSPHOROUS, AND POTASSIUM IN THE FOLLOWING COMPOSITION:

2.17 COMPOSITION: NITROGEN, PHOSPHOROUS, AND POTASSIUM IN AMOUNTS RECOMMENDED IN SOIL REPORTS FROM A QUALIFIED SOIL-TESTING AGENCY.

2.18 SLOW-RELEASE FERTILIZER: GRANULAR OR PELLETED FERTILIZER CONSISTING OF 50 PERCENT WATER-INSOLUBLE NITROGEN, PHOSPHORUS, AND POTASSIUM IN THE FOLLOWING COMPOSITION:

2.19 COMPOSITION: NITROGEN, PHOSPHOROUS, AND POTASSIUM IN AMOUNTS RECOMMENDED IN SOIL REPORTS FROM A QUALIFIED SOIL-TESTING AGENCY.

A. MULCHES

2.20 SHREDDED BARK MULCH: FREE FROM DELETERIOUS MATERIALS AND SUITABLE AS A TOP DRESSING OF TREES AND SHRUBS. MULCH SHALL CONSIST OF SHREDDED BARK AND DECOMPOSING WOOD. MAXIMUM LENGTH OF ANY INDIVIDUAL COMPONENT SHALL BE 2 INCHES AND A MINIMUM OF 75% OF THE MULCH SHALL PASS THROUGH A 1 INCH SCREEN. MULCH SHALL BE FREE OF GROWTH OR GERMINATION-INHIBITING INGREDIENTS. THE BARK MULCH SHALL HAVE THE CHARACTERISTICS TO RETAIN MOISTURE, TO FORM A MAT NOT SUSCEPTIBLE TO SPREADING BY WIND OR RAIN, AND TO PROVIDE A GOOD GROWTH MEDIUM FOR PLANTS. SHREDDED BARK MAY CONTAIN UP TO 50% SHREDDED DECOMPOSING WOOD MATERIAL. WOOD CHIPS ARE NOT ACCEPTABLE. BARK MULCH CONTAINING SHREDDED WOOD SHALL BE AGED FOR ONE-YEAR MINIMUM PRIOR TO INSTALLATION.

A. STAKES AND GUYS

2.21 UPRIGHT AND GUY STAKES: ROUGH-SAWN, SOUND, FREE OF DEFECTS, 2 BY 2 INCHES BY LENGTH INDICATED, POINTED AT ONE END.

A. Guy and Tie Wire: ASTM A 641/A 641M, Class 1, galvanized-steel wire, 2-strand, twisted, 0.106 inch in diameter.

B. Guy Cable: 5-strand, 3/16-inch- diameter, galvanized-steel cable, with zinc-coated turnbuckles, a minimum of 3 inches long, with two 3/8-inch galvanized eyebolts.

C. Hose Chafing Guard: Reinforced rubber or plastic hose at least 1/2 inch in diameter, black, cut to lengths required to protect tree trunks from damage.

D. Flags: Standard surveyor's plastic flagging tape, white, 6 inches long.

E. MISCELLANEOUS PRODUCTS

2.22 ANTIDESICCANT: WATER-INSOLUBLE EMULSION, PERMEABLE MOISTURE RETARDER, FILM FORMING, FOR TREES AND SHRUBS. DELIVER IN ORIGINAL, SEALED, AND FULLY LABELED CONTAINERS AND MIX ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS.

A. Trunk-Wrap Tape: Two layers of crinkled paper cemented together with bituminous material, 4-inch- wide minimum, with stretch factor of 33 percent.

PART 3 - EXECUTION

3.01 EXAMINATION

3.02 EXAMINE AREAS TO BE LANDSCAPED FOR DEFECTS THAT WILL ADVERSELY AFFECT THE WORK AND FOR DEVIATIONS BEYOND ALLOWABLE TOLERANCES. PROCEED WITH INSTALLATION ONLY AFTER UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.

A. PREPARATION

3.03 PROTECT STRUCTURES, UTILITIES, SIDEWALKS, PAVEMENTS, AND OTHER FACILITIES, AND LAWNS AND EXISTING EXTERIOR PLANTS FROM DAMAGE CAUSED BY PLANTING OPERATIONS.

A. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

B. Lay out individual tree and shrub locations and areas for multiple exterior plantings. Coordinate with Landscape Architect about on-site adjustments and general planting concepts prior to planting. Make minor adjustments as required and lay out exterior plants at locations shown on Drawings or as directed by Landscape Architect. Landscape Architect retains the right to have the Contractor delineate planting areas and stake plant locations prior to planting.

C. Apply antidesiccant to trees and shrubs if necessary to minimize plant dehydration as requested and approved by the Landscape Architect.

3.04 ESTABLISHMENT OF PLANTING AND SEEDING AREAS

3.05 REMOVE STONES LARGER THAN 1 INCH IN ANY DIMENSION FOR SEEDING AREAS AND LARGER THAN 4" FOR PLANTING AREAS. REMOVE STICKS, ROOTS, RUBBISH, AND OTHER EXTRANEOUS MATTER AND LEGALLY DISPOSE OF THEM OFF OWNER'S PROPERTY.

3.06 SPREAD TOPSOIL TO A DEPTH INDICATED ON THE DRAWINGS, BUT TO A MINIMUM OF 12 INCHES OF SETTLED DEPTH TO MEET FINISH GRADE AFTER NATURAL SETTLEMENT IN PLANTING AREAS. DO NOT SPREAD IF PLANTING SOIL OR SUBGRADE IS FROZEN, MUDDY, OR EXCESSIVELY WET UNLESS APPROVED BY LANDSCAPE ARCHITECT.

A. Spread topsoil to a minimum 4 inches of settled depth to meet finish grade after natural settlement in seeding areas. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet unless approved by Landscape Architect.

3.07 FINISH GRADING: GRADE TOPSOIL AREAS TO A SMOOTH, UNIFORM SURFACE PLANE WITH LOOSE, UNIFORMLY FINE TEXTURE. ROLL AND RAKE, REMOVE RIDGES, AND FILL DEPRESSIONS TO MEET FINISH GRADES.

A. Restore topsoil areas if eroded or otherwise disturbed after finish grading and before planting or seeding.

3.08 TREE AND SHRUB PIT EXCAVATION

3.09 PITS AND TRENCHES: EXCAVATE CIRCULAR PITS WITH SIDES SLOPED INWARD. DO NOT FURTHER DISTURB BASE. SCARIFY SIDES OF PLANT PIT SMEARED OR SMOOTHED DURING EXCAVATION.

3.10 EXCAVATE PITS APPROXIMATELY THREE TIMES AS WIDE AS ROOTBALL DIAMETER FOR NURSERY STOCK AND AT LEAST 2' LARGER IN DIAMETER FOR TRANSPLANTED STOCK.

A. Where rootballs overlap excavate the entire planting area to a consistent depth and place each tree in its location prior to backfilling with tosoil.

3.11 SUBSOIL REMOVED FROM EXCAVATIONS MAY BE USED AS BACKFILL, BY TRANSITION MIXING WITH TOPSOIL DURING BACKFILLING.

A. Obstructions: Make minor adjustments in plant location if unexpected obstructions detrimental to exterior plants are encountered in excavations. Coordinate with Landscape Architect if the obstruction requires relocation of exterior plants or other modification of design intent.

B. Drainage: Notify General Contractor and Landscape Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub pits.

C. TREE AND SHRUB PLANTING

3.12 SET BALLED AND BURLAPPED STOCK PLUMB AND IN CENTER OF PIT OR TRENCH WITH TOP OF ROOT BALL FLUSH WITH ADJACENT FINISH GRADES.

3.13 REMOVE BURLAP AND WIRE BASKETS FROM TOPS OF ROOT BALLS AND PARTIALLY FROM SIDES, BUT DO NOT REMOVE FROM UNDER ROOT BALLS. REMOVE PALLETS, IF ANY, BEFORE SETTING. DO NOT USE PLANTING STOCK IF ROOT BALL IS CRACKED OR BROKEN BEFORE OR DURING PLANTING OPERATION.

A. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. Water planting immediately after installation. Water again after placing and tamping final layer of planting soil mix.

3.14 ORGANIC MULCHING: APPLY ORGANIC MULCH AT THE THICKNESS SHOWN ON DRAWINGS EXTENDING 12 INCHES BEYOND EDGE OF PLANTING PIT OR TRENCH. DO NOT PLACE MULCH WITHIN 3 INCHES OF TRUNKS OR STEMS.

3.15 TREE AND SHRUB TRANSPLANTING

3.16 THE PROJECT CONTAINS APPROX.. 25 BIRCH TREES IN THE EXPANSION FOOTPRINT THAT ARE INTENDED TO PRODUCE AT LEAST 18 TRANSPLANTED TREES TO THE GENERATOR AREA. IN ADDITION THE NATIVE SHRUBS AND HERBACEOUS PLANTS FROM THE NATIVE PLANTS GARDEN AREA WILL BE RELOCATED INTO THE PLANTERS/PLANTING AREAS INDICATED ON THE DRAWINGS.

A. Each tree shall be root-pruned during dormant season to prepare for transplanting.

B. Lift out each tree without tearing roots and causing unnecessary damage to the trunk and branches. The rootballs shall be matching the crown of the tree, but shall be at least a min. 5’ in diameter unless approved otherwise by the Landscape Architect of Record.

C. Transplant each tree into prepared planting pits or beds in the generator area immediately, but no later than 5 days. Trees shall be heeled in on site if not immediately transplanted and watered without allowing the rootball to dry out.

D. Transplanted trees and shrubs shall be laid out in an informal, naturalistic composition with plant associations that may resemble native plant communities.

E. Support trees with staking and guying after transplanting to ensure their establishment while staying upright.

F. TREE AND SHRUB PRUNING

3.17 PRUNE, THIN, AND SHAPE TREES AND SHRUBS AS REQUIRED AND APPROVED BY THE LANDSCAPE ARCHITECT.

A. Prune, thin, and shape trees and shrubs according to standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured or dead branches from flowering trees. Prune shrubs to retain natural character. Shrub sizes indicated are sizes after pruning.

B. GUYING AND STAKING

3.18 UPRIGHT STAKING AND TYING: STAKE TREES AS SHOWN ON THE DRAWINGS. USE STAKES OF LENGTH REQUIRED TO PENETRATE AT LEAST 18 INCHES BELOW BOTTOM OF BACKFILLED EXCAVATION AND TO EXTEND AT LEAST 72 INCHES ABOVE GRADE. SET VERTICAL STAKES AND SPACE TO AVOID PENETRATING ROOT BALLS OR ROOT MASSES. SUPPORT TREES WITH TWO STRANDS OF TIE WIRE ENCASED IN HOSE SECTIONS AT CONTACT POINTS WITH TREE TRUNK. ALLOW ENOUGH SLACK TO AVOID RIGID RESTRAINT OF TREE.

A. Guying and Staking: Guy and stake evergreen trees more than 6' in height. Securely attach guys to stakes as shown on Drawings.

3.19 ATTACH FLAGS TO EACH GUY WIRE, 30 INCHES ABOVE FINISH GRADE.

A. Paint turnbuckles with luminescent white paint.

B. PLANTING BED MULCHING

3.20 MULCH BACKFILLED SURFACES OF PLANTING BEDS AND OTHER AREAS INDICATED.

3.21 ORGANIC MULCH: APPLY ORGANIC MULCH AT A MINIMUM THICKNESS SHOWN ON DRAWINGS, AND FINISH LEVEL WITH ADJACENT FINISH GRADES. DO NOT PLACE MULCH AGAINST PLANT STEMS.

A. DRY SEEDING

3.22 BROADCAST DRY SEED EVENLY BY A METHOD APPROVED BY LANDSCAPE ARCHITECT USING THE SEED MIX AND APPLICATION RATE SPECIFIED ON THE DRAWINGS.

A. Rake seed lightly into top 1/8 inch of topsoil, roll lightly and water with fine spray.

B. Protect seed from desiccation, birds, or displacement by water by applying peat mulch straw or other approved method as needed.

C. HYDROSEEDING

3.23 BROADCAST HYDROSEEDING MULCH EVENLY OVER SEEDED AREAS USING THE SEED MIX AND APPLICATION RATE SPECIFIED ON THE DRAWINGS.

A. Hydroseeding shall use industry standard slurry of seed, mulch, fertilizer and carrying agent if necessary. No paper mulch is allowed.

B. Protect buildings, outdoor structures and furniture, utility installations and all flatwork from overspray. Immediately remove hydroseeding slurry if overspray occurs.

C. SATISFACTORY LAWNS

3.24 SATISFACTORY SEEDED LAWN: AT END OF MAINTENANCE PERIOD, A HEALTHY, UNIFORM, CLOSE STAND OF GRASS HAS BEEN ESTABLISHED, FREE OF WEEDS AND SURFACE IRREGULARITIES, WITH COVERAGE EXCEEDING 90 PERCENT OVER ANY 10 SQ. FT. (0.92 SQ. M) AND BARE SPOTS NOT EXCEEDING 5 BY 5 INCHES. REESTABLISH LAWNS THAT DO NOT COMPLY WITH REQUIREMENTS AND CONTINUE MAINTENANCE UNTIL LAWNS ARE SATISFACTORY.

A. CLEANUP AND PROTECTION

3.25 DURING EXTERIOR PLANTING, KEEP ADJACENT PAVINGS AND CONSTRUCTION CLEAN AND WORK AREA IN AN ORDERLY CONDITION.

A. Protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged exterior planting.

B. DISPOSAL

3.26 DISPOSAL: REMOVE SURPLUS SOIL AND WASTE MATERIAL, INCLUDING EXCESS SUBSOIL, UNSUITABLE SOIL, TRASH, AND DEBRIS, AND LEGALLY DISPOSE OF THEM OFF OWNER'S PROPERTY.

END OF SECTION

SECTION 41 2123
PIECE MATERIAL CONVEYOR

PART 1 GENERAL

1.01 SECTION INCLUDES

1.02 MOTORIZED MATERIAL BELT CONVEYOR.

1.03 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems.

C. Section 26 0533 - Raceway and Boxes for Electrical Systems.

D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.04 PRICE AND PAYMENT PROCEDURES

A. Alternates: See Section 01 2300 - Alternates, for product alternates affecting this section.
   1. This section describes a base bid product.

1.05 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. System components.
   2. Accessories.
   3. Substrate preparation instructions and recommendations.
   4. Storage and handling requirements and recommendations.
   5. Installation methods.
   6. Specimen warranty.

C. Shop Drawings: Indicate location, type, and layout of motorized conveyor system, including lengths, heights, layout, and relationship to adjacent construction.
   1. Indicate location and configuration of rails and supports.
   2. Indicate method of installation and configuration.
   3. Provide location and details of anchorage devices to be embedded in or fastened to the structure.
   4. Motorized Systems: Include plan views indicating locations of system components and proposed size, type, and routing of conduits and/or cables. Include system interconnection schematic diagrams.

D. Selection Samples: For each finish product specified, provide color chips representing manufacturer's full range of available colors and finishes.

E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of documented experience.

C. Motorized Systems: Listed by an organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Inspect for dents, scratches, or other damage. Replace damaged components.

B. Store in manufacturer's unopened packaging until ready for installation.

C. Store under cover and elevated above grade.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide one year manufacturer warranty covering defects of manufacturing and workmanship and rust and corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Modular Plastic Conveyor Systems:
   1. QC Conveyor: https://qcconveyors.com/
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MOTORIZED MOBILE STORAGE SHELVING SYSTEMS

A. Basis of Design: QC Conveyor – Flextrac Series. Motorized floor supported materials conveyor with plastic chain.
   1. Substitutions: See Section 01 6000 - Product Requirements.
   2. Components:
      a. Plastic Chain: Plain Chain
      b. Color: To be selected from standard line of available colors
      c. Width: 8” nominal.
      d. Bends: Horizontal wheel bend
   3. Motors:
      a. Type: One left had end drive and one left hand combination drive, serpentine formation
      b. Voltage: 230 VAC 3 Phase gearmotors (40 FPM)
      c. Controls: two manual stops
      d. Provide photosensors for detection and control.
   4. Accessories:
      a. Guide Rail: Fixed G4 rails
      b. Support: Type B1 stands for 36” top of conveyor

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that substrate is in proper condition to install rails and flooring system per manufacturer's requirements.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

A. General: Install system components and accessories in accordance with manufacturer's printed instructions.

B. Motorized Systems:
   1. Perform work in accordance with NECA 1 and in compliance with NFPA 70 requirements.

2. Conduit: Comply with Section 26 0533.13.
3. Provide grounding and bonding in accordance with Section 26 0526.
4. Identify system wiring and components in accordance with Section 26 0553.
5. Position system components level and plumb within manufacturer's specified tolerances.
6. Anchor floor system to structure as indicated on drawings.
7. Extend rails under stationary shelving units.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Motorized Systems:
1. Provide services of a manufacturer's authorized representative to observe installation and assist in inspection and testing. Include manufacturer's field reports with submittals.
2. Test to verify wiring is free of shorts and grounds.
3. Prepare and start system in accordance with manufacturer's instructions.
4. Test system for proper operation.
5. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.
6. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.04 ADJUSTING

A. Adjust components and accessories to provide for smooth operation of system.

3.05 CLEANING

A. Clean shelving and surrounding area after installation.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. See Section 01 7900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

D. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of two hours of training.
3. Instructor: Manufacturer's authorized representative.
4. Location: At project site.

3.07 PROTECTION

A. Protect installed system from subsequent construction operations.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION