Takotna, Alaska

HEALTH CLINIC

Specifications

95 % Submittal
June 22, 2020
SECTION 00 0110
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SUMMARY

PART 1  GENERAL

1.01  PROJECT

A. Project Name: Takotna Health Clinic
B. Southcentral Foundation's Name: Southcentral Foundation.
C. Architect's Name: LCG Lantech.
D. Additional Project contact information is specified in Section 00 0103 - Project Directory.
E. Work Consists of: Furnish all labor, materials, equipment, and freight for the construction of the Takotna Health Clinic.
F. Related requirements specified elsewhere:
   1. Other Sections in Divisions 1-48.
   2. Related information on Contract Drawings.
G. Contractor's Duties:
   1. Have a Foreman or Superintendent present on site any time work is being performed. Each Contractor or Sub-Contractor shall have at least one English speaking representative on site while work is being performed.
   2. Except as specifically noted, provide and pay for:
      a. Labor, materials, equipment, and all transportation.
      b. Tools, construction equipment and machinery.
      c. Other facilities and services necessary for proper execution and completion of work.
   3. Pay legally required sales, consumer, and use taxes.
   4. Secure and pay for, as necessary for proper execution and completion of work, and as applicable at time of receipt of bids:
      a. Government fees.
      b. Licenses.
   5. Maintain the original or a copy of all necessary permits and licenses at the project site.
   6. Give required notices
   7. Comply with codes, ordinances, rules, regulations, orders and other legal requirements of public authorities which bear on performance of work.
   8. Promptly submit written notice to Contracting Officer of observed variance of Contract Documents from legal requirements. It is not the Contractor's responsibility to make certain that Drawings and Specifications comply with codes and regulations.
      a. Appropriate Modifications to Contract Documents will adjust necessary changes.
      b. Assume responsibility for work known to be contrary to such requirements that is completed without notice.
9. Enforce strict discipline and good order among employees. Do not employ on work:
   a. Unfit persons.
   b. Persons not skilled in assigned task.

1.02 CONTRACTOR USE OF SITE AND PREMISES

A. Confine operations at site to areas permitted by:
   1. Law
   2. Ordinances
   3. Permits
   4. Contract Documents
   5. Owners

B. Assume full responsibility for protection and safekeeping of products stored on premises.

C. Obtain and pay for use of additional storage or work areas needed for operations.

1.03 ADDITIONAL CONTRACTOR FURNISHED

A. Water supply for construction, fire protection, and dust control

B. Domestic water and wastewater supply and disposal for any field offices.

C. Sanitation facilities adequate for all workers that complies with all codes and regulations.

D. All gates, barricades, fences, handrails, guardrails, and security required by the contract or by laws and regulations.

E. Shelter, protection, and drying facilities for workers.

F. Guards, marks, shields, protective clothing, raingear, and other equipment required by law, ordinance, labor contracts, OSHA and/or other regulations for the maintenance of health and safety.

G. First aid kits, firefighting, and safety equipment required by law and regulations.

H. The Contractor shall furnish himself with such documents incorporated into the Contract by reference including but not limited to:
   1. Local codes, ordinances, regulations and laws.
   2. Standards, referenced such as America Society of Testing and Materials (ASTM), American Water Works Association (AWWA) and so forth.

1.04 TYPE AND EXTENT OF WORK

A. All work incidental and necessary to the completion of the work described herein and shown on the plans shall be completed under the appropriate bid items listed on the bid form and no other compensation will be allowed.

B. The Contractor acknowledges that he has satisfied himself as to the nature and location of the work, the local conditions, particularly those bearing upon transportation, handling and storage of materials, availability of labor, water, electrical power, roads, and uncertainties of weather, ground water table or similar physical conditions at the site, the condition of the ground surface, the character, quality and quantity of surface materials to be encountered, the character of equipment and facilities needed prior to and during the work, or the cost thereof under this contract. Any failure by the Contractor to acquaint
himself with all of the available information concerning these conditions will not relieve the Contractor from responsibility for properly estimating the difficulty or cost of successfully completing the work.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONSTRUCT WORK IN STAGES

A. Construct work as required in specifications and agreed to with Owners.

B. Portions of the work requiring shop drawings or sample submissions shall not begin until the shop drawing or submission has been approved by the Architect- of-Record. A copy of each approved sample shall be kept in good order by the Contractor at the site and shall be available to the Architect in accordance with Section 01 30 00 Administrative Requirements.

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. 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. Document 00 7200 - General Conditions and Document 00 7300 - Supplementary Conditions: Additional requirements for progress payments, final payment, changes in the Work.

1.03  SCHEDULE OF VALUES
   A. Submit to Owner's Representative a Schedule of Values, at least fifteen (15) days prior to submitting first Application for Payment.
   B. Form to be used: HUD required forms.
   C. Forms filled out by hand will not be accepted, electronic (PDF) submission required.
   D. Submit quantities of stored or other designated materials. Listed and tallied separate from completed work.
   E. Upon request by Owner's Representative, support values given with data that will substantiate their correctness.
   F. List quantities of materials specified under unit price allowances.
   G. Payment for materials stored will be limited to those materials supported by invoice per 1.04 below.
   H. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
   I. Use Schedule of Values only as basis for Contractor's Application for Payment.
   J. Revise schedule to list approved Change Orders, with each Application For Payment.
   K. Include progress photos with each application for payment.

1.04  FORM OF SUBMITTAL
   A. Use Table of Contents of this Specification as basis for format for listing costs of work for SECTIONS under Divisions 2 through 50
   B. Identify each line item with number and title as listed in Table of Contents of this Specification.

1.05  PREPARING SCHEDULE OF VALUES
   A. Itemize separate line item cost for each of following general cost items:
      1. Performance and Payment Bonds.
      2. Field Supervision and Layout.
      3. Temporary Facilities and Controls.
4. Site mobilization and demobilization.
5. Insurance.
6. Training
7. Close-out process
B. Itemize separate line item cost for work required by each section of this Specification.
C. Round off figures to nearest dollar.
D. Make sum of total costs of all items listed in Schedule equal to total Contract Sum.
E. Include in each line item a directly proportional amount of Contractor's overhead and profit.

1.06 PREPARING SCHEDULE OF STORED MATERIALS
A. Submit separate recap for all stored materials which are included in the schedule.
B. The Contractor shall request approval from the Owner's Representative of any location for stored materials other than the construction site, prior to submittal of Application for Payment.
C. All stored materials listed on recap shall be substantiated by invoices for the material and copies of the invoices shall be attached to the recap. If any stored materials are being claimed which are not stored on the construction site, itemized listing shall show location where materials are stored and such location must be available for inspection of the materials.
D. Contractor must show proof of adequate insurance for materials stored off-site.
E. Stored material prices shall include cost of material, related freight costs and applicable taxes. All of which must be substantiated by invoice.

1.07 APPLICATIONS FOR PROGRESS PAYMENTS
A. Payment Period: Submit at intervals stipulated in the Agreement.
B. Form to be used: AIA G702 and G703 or computer generated form containing similar style.
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, electronic (PDF) submission is required.
E. Execute certification by signature of authorized officer.
F. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
G. 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 3216.
   3. Current construction photographs specified in Section 01 3000.
   4. Partial release of liens from major subcontractors and vendors.
   5. Affidavits attesting to off-site stored products.
H. 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.

1.08 MODIFICATION PROCEDURES

A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or subcontractors of changes to Contract Documents.

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

C. For other required changes, Architect will issue a document signed by Southcentral Foundation 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.

D. 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 with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 7 days.

E. 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.

F. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.

G. Substantiation of Costs: Provide full information required for evaluation as determined by LCG LANTECH.
   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.

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

I. 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. Submit revised Schedule of Values within 10 days.

J. 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, within 10 days.

K. Promptly enter changes in Project Record Documents.

1.09 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.

B. Application for Final Payment will not be considered until the following have been accomplished:

1. All closeout procedures specified in Section 01 7000.
SECTION 01 2200
UNIT PRICES

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. List of unit prices, for use in preparing Bids.
   B. Measurement and payment criteria applicable to Work performed under a unit price payment method.
   C. Defect assessment and non-payment for rejected work.

1.02 COSTS INCLUDED
   A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.03 UNIT QUANTITIES SPECIFIED
   A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.04 MEASUREMENT OF QUANTITIES
   A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.
   B. Take all measurements and compute quantities. Measurements and quantities will be verified by Architect.
   C. Assist by providing necessary equipment, workers, and survey personnel as required.
   D. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.
   E. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.
   F. Measurement by Area: Measured by square dimension using mean length and width or radius.
   G. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.
   H. Stipulated Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.
   I. Perform surveys required to determine quantities, including control surveys to establish measurement reference lines. Notify Architect prior to starting work.
   J. Contractor's Engineer Responsibilities: Sign surveyor's field notes or keep duplicate field notes, calculate and certify quantities for payment purposes.
1.05 PAYMENT
   A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.
   B. Payment will not be made for any of the following:
      1. Products wasted or disposed of in a manner that is not acceptable.
      2. Products determined as unacceptable before or after placement.
      3. Products not completely unloaded from the transporting vehicle.
      4. Products placed beyond the lines and levels of the required Work.
      5. Products remaining on hand after completion of the Work.

1.06 DEFECT ASSESSMENT
   A. Replace Work, or portions of the Work, not complying with specified requirements.
   B. If, in the opinion of Architect or Owner, it is not practical to remove and replace the Work, Architect will direct one of the following remedies:
      1. The defective Work may remain, but the unit price will be adjusted to a new unit price at the discretion of Architect.
      2. The defective Work will be partially repaired to the instructions of the Architect, and the unit price will be adjusted to a new unit price at the discretion of Architect.
   C. The individual specification sections may modify these options or may identify a specific formula or percentage price reduction.
   D. The authority of Architect to assess the defect and identify payment adjustment is final.

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, equipment, and methods of construction.
      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.
         a.  Substitution requests offering advantages solely to the Contractor will not be considered.

1.04  REFERENCE STANDARDS
   A.  CSI/CSC Form 13.1A - Substitution Request (After the Bidding/Negotiating Phase); Current Edition.

PART 2  PRODUCTS - NOT USED

PART 3  EXECUTION
3.01  GENERAL REQUIREMENTS
   A.  A Substitution Request for products, assemblies, materials, equipment, and methods of construction 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 Southcentral Foundation.
      5.  Waives claims for additional costs or time extension that may subsequently become apparent.
6. Agrees to reimburse Southcentral Foundation 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 any additional required identifiers established in Contract Documents.
   b. Substitution Request Information:
   c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
   d. Impact of Substitution:

D. Limit each request to a single proposed substitution item.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Section 00 2113 - Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period, and the documents required.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Architect will consider requests for substitutions only within 15 days after date of Agreement.

B. 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.

C. 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 Southcentral Foundation 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. Southcentral Foundation's compensation to the Architect for any required redesign, time spent processing and evaluating the request.

D. 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. When acceptance will require revisions to Contract Documents.

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.

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.

END OF SECTION
SECTION 01 2973
SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Submit to Contracting Officer a Schedule of Values, at least fifteen (15) days prior to submitting first Application for Payment.

B. Upon request by Contracting Officer, support values given with data that will substantiate their correctness.

C. Submit quantities of stored or other designated materials.

D. List quantities of materials specified under unit price allowances.

E. Payment for materials stored will be limited to those materials supported by invoice per 1.04 below.

F. Use Schedule of Values only as basis for Contractor's Application for Payment.

1.02 FORM OF SUBMITTAL

A. Submit typewritten Schedule of Values on a form provided by Contracting Officer.

B. Use Table of Contents of this Specification as basis for format for listing costs of work for SECTIONS under Divisions 2 through 50.

C. Identify each line item with number and title as listed in Table of Contents of this Specification.

1.03 PREPARING SCHEDULE OF VALUES

A. Itemize separate line item cost for each of following general cost items:
   1. Performance and Payment Bonds.
   2. Field Supervision and Layout.
   3. Temporary Facilities and Controls.
   4. Insurance.

B. Itemize separate line item cost for work required by each section of this Specification.

C. Round off figures to nearest dollar.

D. Make sum of total costs of all items listed in Schedule equal to total Contract Sum.

E. Include in each line item a directly proportional amount of Contractor's overhead and profit.

F. Revise schedule to list Change Orders for each application for payment.

1.04 PREPARING SCHEDULE OF STORED MATERIALS

A. Submit separate recap for all stored materials which are included in the schedule.

B. The Contractor shall request approval from the Contracting Officer of any location for stored materials other than the construction site, prior to submittal of Application for Payment.

C. All stored materials listed on recap shall be substantiated by invoices for the material and copies of the invoices shall be attached to the recap. If any stored materials are being claimed which are not stored on the construction site, itemized listing shall show location.
where materials are stored and such location must be available for inspection of the materials.

D. Contractor must show proof of adequate insurance for materials stored off-site.

E. Stored material prices shall include cost of material, related freight costs and applicable taxes. All of which must be substantiated by invoice.

END OF SECTION
SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Electronic document submittal service.
B. Preconstruction meeting.
C. Site mobilization meeting.
D. Progress meetings.
E. Progress photographs.
F. Submittals for review, information, and project closeout.
G. Number of copies of submittals.
H. Submittal procedures.

1.02 RELATED REQUIREMENTS
A. Section 00 7200 - General Conditions: Dates for applications for payment.
B. Section 01 3216 - Construction Progress Schedule: Form, content, and administration of schedules.
C. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.
D. Section 01 7800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 REFERENCE STANDARDS

1.04 PROJECT COORDINATOR
A. Project Coordinator: Owner.
B. If requirements specified herein conflict with Contract Conditions, then Contract Conditions shall govern.
C. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for site access, traffic, and parking facilities.
D. During construction, coordinate use of site and facilities through the Project Coordinator.
E. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
F. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 01 1000 - Summary.
G. Coordinate the work of all subcontractors and make certain that, where the work of one trade is dependent upon the work of another trade, the work first installed is properly placed, installed, aligned, and finished as specified or required to properly receive subsequent materials applied or attached thereto.
H. Direct subcontractors to correct defects in substrates they install when subcontractors of subsequent materials have a reasonable and justifiable objection to such surfaces.

I. Do not force subcontractor to apply or install product to improperly placed or improperly finished substrate that would result in an unsatisfactory or unacceptable finished product.

J. Coordinate field engineering and layout work under instructions of the Project Coordinator.

K. Make the following types of submittals to Architect through the Project Coordinator:

**PART 2  PRODUCTS - NOT USED**

**PART 3  EXECUTION**

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. Digital online system managed by LCG Lantech will be used for document communication.

3.02 PRECONSTRUCTION MEETING

A. Schedule meeting after Notice of Award.

B. Attendance Required:
   1. Southcentral Foundation.
   3. Contractor.

C. Agenda:
   1. Execution of Southcentral Foundation-Contractor Agreement.
   2. Submission of executed bonds and insurance certificates.
   4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
   5. Designation of personnel representing the parties to Contract and Architect.
   6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   7. Scheduling.

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

3.03 SITE MOBILIZATION MEETING

A. Schedule meeting at the Project site prior to Contractor occupancy.

B. Project Coordinator will schedule meeting at the Project site prior to Contractor occupancy.

C. Attendance Required:
   1. Contractor.
   2. Southcentral Foundation.
   3. Architect.
4. Contractor's superintendent.
5. Major subcontractors.

D. Agenda:
1. Use of premises by Southcentral Foundation and Contractor.
2. Southcentral Foundation's requirements.
3. Construction facilities and controls provided by Southcentral Foundation.
4. Temporary utilities provided by Southcentral Foundation.
5. Survey and building layout.
7. Schedules.
8. Application for payment procedures.
9. Procedures for testing.
11. Requirements for start-up of equipment.
12. Inspection and acceptance of equipment put into service during construction period.

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

3.04 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at maximum bi-monthly intervals.

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

C. Project Coordinator will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

D. Attendance Required:
1. Contractor.
2. Southcentral Foundation.
3. Architect.
4. Special consultants.
5. Contractor's superintendent.

E. 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 off-site fabrication and delivery schedules.
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.

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

G. Update the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

H. Report no later than 3 days after each progress meeting date, distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

I. Update the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

3.05 CONSTRUCTION PROGRESS SCHEDULE - SEE SECTION 01 3216

3.06 PROGRESS PHOTOGRAPHS

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

B. Submit new photographs at least once a month, within 3 days after being taken.

C. Photography Type: Digital; electronic files.

D. In addition to periodic, recurring views, take photographs of each of the following events:
   1. Completion of site clearing.
   2. Excavations in progress.
   3. Foundations in progress and upon completion.
   4. Structural framing in progress and upon completion.
   5. Enclosure of building, upon completion.
   6. Final completion, minimum of ten (10) photos.

E. Views:
   1. Consult with Architect for instructions on views required.
   2. Provide factual presentation.
3. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
4. Point of View Sketch: Provide sketch identifying point of view of each photograph.

F. Digital Photographs: 24 bit color, minimum resolution of 1600 by 1200 (“2 megapixel”), in JPG format; provide files unaltered by photo editing software.
   2. File Naming: Include project identification, date and time of view, and view identification.
   3. Point of View Sketch: Include digital copy of point of view sketch with each electronic submittal; include point of view identification in each photo file name.

3.07 SUBMITTALS FOR REVIEW
A. When the following are specified in individual sections or in section 01 4000 Quality Requirements, submit them for review, prior to ordering:
   1. Materials
   2. Product data.
   3. Shop drawings.
   4. Samples for selection.
   5. 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 or in section 01 4000 Quality Requirements, submit them for information, prior to ordering:
   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 Southcentral Foundation.

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.
   6. Other types as indicated.
D. Submit for Southcentral Foundation'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. Documents for Review:
   1. Sheet sizes must be one of the following sizes:
      a. 8-1/2 x 11 inches
      b. 11 x 17 inches
      c. 22 x 34 inches
C. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
   1. After review, produce duplicates, as required.
   2. Retained samples will not be returned to Contractor unless specifically so stated, or as decided by LCG Lantech.

3.11 SUBMITTAL PROCEDURES
A. General Requirements:
B. Shop Drawing Procedures:
   1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related Work.
   2. Do not reproduce the Contract Documents to create shop drawings.
   3. Generic, non-project specific information submitted as shop drawings do not meet the requirements for shop drawings.
C. Transmit each submittal with a copy of approved submittal form.
D. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
E. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
F. 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.
G. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.

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

I. Provide space for Contractor and Architect review stamps.

J. When revised for resubmission, identify all changes made since previous submission.

K. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

L. Submittals not requested will not be recognized or processed.

END OF SECTION
SECTION 01 3216
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Preliminary schedule.
   B. Construction progress schedule, bar chart type.

1.02 RELATED SECTIONS
   A. Section 01 1000 - Summary: Work sequence.
   B. Section 01 2000 - Price and Payment Procedures
   C. Section 01 3000 - Administrative Requirements

1.03 REFERENCE STANDARDS
   B. M-H (CPM) - CPM in Construction Management - Project Management with CPM; O'Brien; 2006.

1.04 SUBMITTALS
   A. Within 10 days after date of Agreement, submit preliminary schedule.
   B. If preliminary schedule requires revision after review, submit revised schedule within 7 days. After date of Notice of Revision.
   C. Within 14 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
      1. Include written certification that major Subcontractors have reviewed and accepted proposed schedule.
   D. Within 7 days after date of joint review, submit complete schedule.
   E. Submit updated schedule with each Application for Payment.
   F. Submit electronically per requirements in 01 3000 - Administrative Requirements.
   G. Submit under transmittal letter form specified in Section 01 3000 - Administrative Requirements.

1.05 QUALITY ASSURANCE
   A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with one year minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.
   B. Contractor's Administrative Personnel: 1 year minimum experience in using and monitoring CPM schedules on comparable projects.

1.06 SCHEDULE FORMAT
   A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.
   B. Diagram Sheet Size: Maximum 22 x 17 inches.
   C. Sheet Size: Multiples of 8-1/2 x 11 inches.
D. Scale and Spacing: To allow for notations and revisions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE
   A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT
   A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
   B. Identify each item by specification section number.
   C. Identify work of separate stages and other logically grouped activities.
   D. Provide sub-schedules for each stage of Work identified in Section 01 1000 - Summary.
   E. Provide sub-schedules to define critical portions of the entire schedule.
   F. Include conferences and meetings in schedule.
   G. Include site inspections in schedule.
   H. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
   I. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, products identified under Allowances, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.
   J. Indicate delivery dates for owner-furnished products.
   K. Coordinate content with schedule of values specified in Section 01 2000 - Price and Payment Procedures.
   L. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS
   A. Include a separate bar for each major portion of Work or operation.
   B. Identify the first work day of each week.

3.04 NETWORK ANALYSIS
   A. Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method.
   B. Illustrate order and interdependence of activities and sequence of work; how start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.
   C. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:
      1. Preceding and following event numbers.
      2. Activity description.
      3. Estimated duration of activity, in maximum 7 day intervals.
4. Earliest start date.
5. Earliest finish date.
6. Actual start date.
7. Actual finish date.
8. Latest start date.
9. Latest finish date.
10. Total and free float; float time shall accrue to Southcentral Foundation and to Southcentral Foundation's benefit.
11. Monetary value of activity, keyed to Schedule of Values.
12. Percentage of activity completed.

D. Analysis Program: Capable of compiling monetary value of completed and partially completed activities, accepting revised completion dates, and recomputation of all dates and float.

E. Required Reports: List activities in sorts or groups:
   1. By preceding work item or event number from lowest to highest.
   2. By amount of float, then in order of early start.
   3. By responsibility in order of earliest possible start date.
   4. In order of latest allowable start dates.
   5. In order of latest allowable finish dates.
   6. Contractor's periodic payment request sorted by Schedule of Values listings.
   7. Listing of basic input data that generates the report.
   8. Listing of activities on the critical path.

3.05 REVIEW AND EVALUATION OF SCHEDULE
   A. Participate in joint review and evaluation of schedule with Architect at each submittal.
   B. Evaluate project status to determine work behind schedule and work ahead of schedule.
   C. After review, revise as necessary as result of review, and resubmit within 7 days.

3.06 UPDATING SCHEDULE
   A. Maintain schedules to record actual start and finish dates of completed activities.
   B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
   C. Annotate diagrams to graphically depict current status of Work.
   D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
   E. Indicate changes required to maintain Date of Substantial Completion.
   F. Submit reports required to support recommended changes.
G. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect.

3.07 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Contractor’s project site file, to Subcontractors, suppliers, Architect, Southcentral Foundation, and Construction Administrator.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION
SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Submittals.
B. Testing and inspection agencies and services.
C. Manufacturers' field services.
D. Defect Assessment.

1.02 RELATED REQUIREMENTS
A. Section 01 3000 - Administrative Requirements: Submittal procedures.
B. Section 01 4000 - Quality Requirements
C. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. 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 Southcentral Foundation's information.
C. Test Reports: After each test/inspection, promptly submit one copy 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.
2. Test report submittals are 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 Southcentral Foundation's information.

D. 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.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

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

F. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Southcentral Foundation.
   1. Submit report in duplicate within 30 days of observation to Architect for information.
   2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

G. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Southcentral Foundation.
   1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
   2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Southcentral Foundation.

1.05 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.
1.06 TESTING AND INSPECTION AGENCIES AND SERVICES
   A. 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.

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 TOLERANCES
   A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
   B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
   C. Adjust products to appropriate dimensions; position before securing products in place.

3.03 TESTING AND INSPECTION
   A. See individual specification sections for testing required.
   B. Testing Agency Duties:
      1. Test samples of mixes submitted by Contractor.
      3. Perform specified sampling and testing of products in accordance with specified standards.
      4. Ascertian compliance of materials and mixes with requirements of Contract Documents.
      5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
6. Perform additional tests and inspections required by Architect.
7. Submit reports of all tests/inspections specified.

C. 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.

D. 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 Southcentral Foundation's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

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

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

3.04 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 of equipment 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.

3.05 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
PART 1  GENERAL

1.01  SUMMARY OF REFERENCE STANDARDS

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


E. State of Alaska amendments to some or all of the following.

F. ICC (IFC) - International Fire Code; 2009


H. ICC (IBC) - International Building Code; 2009

I. IAPMO (UPC) - Uniform Plumbing Code; 2009

J. IAPMO (UPC) - Uniform Plumbing Code; 2012.

K. Private Sewage Disposal Code: STATE OF ALASKA, DEC, 18AAC72.

L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.02  RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements.

1.03  QUALITY ASSURANCE

A. Contractor’s Designer Qualifications: Refer to Section - 01 4000 - Quality Requirements.

PART 2  PRODUCTS - NOT USED

PART 3  EXECUTION - NOT USED

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.

1.02  RELATED REQUIREMENTS
A.  Section 01 5100 - Temporary Utilities.
B.  Section 01 5213 - Field Offices and Sheds.

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

1.04  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.

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

1.06  FENCING
A.  Construction: Contractor's option. Must satisfy requirements of Authority Having Jurisdiction.

1.07  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.
1.08 SECURITY
   A. Provide security and facilities to protect Work from unauthorized entry, vandalism, or theft.

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

1.10 WASTE REMOVAL
   A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.
   B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
   C. Provide containers with lids. Remove trash from site at a minimum, weekly.
   D. 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.
   E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.11 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 5100
TEMPORARY UTILITIES

PART 1  GENERAL

1.01  SECTION INCLUDES
   A. Temporary Utilities: Provision of electricity, lighting, heat, ventilation, and water.

1.02  RELATED REQUIREMENTS
   A. Section 01 5000 - Temporary Facilities and Controls:
      1. Temporary telecommunications services for administrative purposes.
      2. Temporary sanitary facilities required by law.

1.03  TEMPORARY ELECTRICITY
   A. Cost: By Contractor.
   B. Provide power service required from utility source.
   C. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.
   D. Provide main service disconnect and over-current protection at convenient location and meter.
   E. Permanent convenience receptacles may be utilized during construction.
   F. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.
      1. Provide 20 ampere duplex outlets, single phase circuits for power tools adequately spaced throughout the work area.
      2. Provide 20 ampere, single phase branch circuits for lighting.

1.04  TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES
   A. Provide and maintain lighting for construction operations to achieve a minimum lighting level of 4 watt/sq ft or to achieve 5-10 foot candles per OSHA standard.
   B. Provide and maintain 1 watt/sq ft lighting to exterior staging and storage areas after dark for security purposes.
   C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
   D. Maintain lighting and provide routine repairs.
   E. Permanent building lighting may be utilized during construction.

1.05  TEMPORARY HEATING
   A. Cost of Energy: By Contractor.
   B. Provide heating devices and heat as needed to maintain specified conditions for construction operations.
   C. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.
   D. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place.
Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.06 TEMPORARY COOLING
   A. Cost of Energy: By Contractor.
   B. Provide cooling devices and cooling as needed to maintain specified conditions for construction operations.
   C. Maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.
   D. Prior to operation of permanent equipment for temporary cooling purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.07 TEMPORARY VENTILATION AND MOISTURE CONTROL
   A. Provide and maintain suitable ventilation for construction operations.
   B. Provide and maintain humidification and/or dehumidification as required by manufacturers or specification sections for products and system installation procedures.
      1. Ensure stored materials are kept in appropriate moisture controlled environments for an adequate period of time prior to installation.
      2. If outdoor ambient relative humidity makes adequate moisture control impracticable, inform LCG Lantech prior to installation of impacted materials, products and systems.

1.08 TEMPORARY WATER SERVICE
   A. Cost of Water Used: By Contractor.
   B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.

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

END OF SECTION
PART 1  GENERAL

1.01  SECTION INCLUDES
   A.  Temporary field offices for use of Contractor.
   B.  Maintenance and removal.

1.02  RELATED REQUIREMENTS
   A.  Section 01 1000 - Summary: use of premises.
   B.  Section 01 5100 - Temporary Utilities

1.03  USE OF PERMANENT FACILITIES
   A.  Permanent facilities shall not be used for field offices.

PART 2  PRODUCTS

2.01  MATERIALS, EQUIPMENT, FURNISHINGS
   A.  Materials, Equipment, Furnishings: Serviceable, new or used, adequate for required
       purpose.

2.02  CONSTRUCTION
   A.  Portable or mobile buildings, or buildings constructed with floors raised above ground,
       securely fixed to foundations, with steps and landings at entrance doors.
   B.  Construction: Structurally sound, secure, weather tight enclosures for office. Maintain
       during progress of Work; remove when no longer needed.
   C.  Temperature Transmission Resistance of Floors, Walls, and Ceilings: Compatible with
       occupancy requirements.
   D.  Exterior Materials: Weather resistant, finished in one color.
   E.  Interior Materials in Offices: Sheet type materials for walls and ceilings, prefinished or
       painted; resilient floors and bases.
   F.  Lighting for Offices: 50 fc at desk top height, exterior lighting at entrance doors.
   G.  Fire Extinguishers: Appropriate type fire extinguisher at each office.

2.03  ENVIRONMENTAL CONTROL
   A.  Heating, Cooling, and Ventilating: Automatic equipment to maintain comfort conditions.

2.04  CONTRACTOR OFFICE AND FACILITIES
   A.  Size: For Contractor's needs and to provide space for project meetings.
   B.  Equipment: Six adjustable band protective helmets for visitors, one 10 inch outdoor
       weather thermometer.

PART 3  EXECUTION

3.01  PREPARATION
   A.  Fill and grade sites for temporary structures to provide drainage away from buildings.
3.02 INSTALLATION
   A. Install office spaces ready for occupancy 15 days after date fixed in agreement with Owner.
   B. Employee Residential Occupancy: Not allowed on Southcentral Foundation's property.

3.03 MAINTENANCE AND CLEANING
   A. Weekly janitorial services for offices; periodic cleaning and maintenance for offices.
   B. Maintain approach walks free of mud, water, and snow.

3.04 REMOVAL
   A. At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

END OF SECTION
SECTION 01 5713
TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES
A. This work includes planning, providing and maintaining control of soil erosion and water pollution during construction.

1.02 RELATED SECTIONS
A. Section 32 9219: Landscaping and Seeding

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONSTRUCTION REQUIREMENTS:
A. Follow all Federal, State and local statutes and regulations regarding storm water runoff, including application for NPDES Storm water Discharge Permit or Storm Water Pollution Prevention Plan if required.
B. Follow State of Alaska – Alaska Certified Erosion and Sedimentation Control Lead (AK-CESCL) Guidelines for Storm Water Control
C. Follow the more restrictive requirements when conflicts occur between erosion control specification and federal, state, or local agency laws, rules or regulations.
D. All required permit applications; notifications and inspections shall be accomplished under the direction of a Professional Engineer registered in the State of Alaska. All plans, reports, modifications, and amendments required shall be prepared under the direction of and sealed by a Professional Engineer registered in the State of Alaska.
E. Contain, clean up, and dispose of all construction-related discharges of petroleum fuels, oil, and/or other substances hazardous to the land and water shall comply with 18 AAC 75 and Title 46 of the Alaska Statutes.

END OF SECTION
SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1  GENERAL

1.01 SECTION INCLUDES

A. General product requirements.
B. Transportation, handling, storage and protection.
C. Product option requirements.
D. Substitution limitations.
E. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Document 00 6325 - Substitution Request Form - During Construction.
B. Section 01 2500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
C. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
D. Section 01 7419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.03 REFERENCE STANDARDS

C. C2C (DIR) - C2C Certified Products Registry; Cradle to Cradle Products Innovation Institute; Current Edition.

1.04 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 prior to ordering any materials 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.

1.05 QUALITY ASSURANCE

A. Bio-Based Content: Of vegetable or animal origin, not including products made by killing the animal.
   1. Determine percentage of bio-based content in accordance with ASTM D6866.
   2. Bio-based content must be sourced from a Sustainable Agriculture Network certified farm.

B. Cradle-to-Cradle Certified: End use product certified Cradle-to-Cradle v2 Basic or Cradle-to-Cradle v3 Bronze, minimum, as evidenced by C2C (DIR).

C. Recycled Content: Determine percentage of post-consumer and pre-consumer (post-industrial) content separately, using the guidelines contained in 16 CFR 260.13.
   1. Previously used, reused, refurbished, and salvaged products are not considered recycled.
   2. Wood fabricated from timber abandoned in transit to original mill is considered reused, not recycled.
   3. Determine percentage of recycled content of any item by dividing the weight of recycled content in the item by the total weight of materials in the item.
   4. Determine value of recycled content of each item separately, by multiplying the content percentage by the value of the item.
   5. Acceptable Evidence:
      a. For percentage of recycled content, information from manufacturer.
      b. For cost, Contractor's cost data.

D. Reused Products: Materials and equipment previously used in this or other construction, salvaged and refurbished as specified.
   1. Wood fabricated from timber abandoned in transit after harvesting is considered reused, not recycled.
   2. Acceptable Evidence: Information about the origin or source, from Contractor or supplier.

E. Source Location: Location of harvest, extraction, recovery, or manufacture; where information about source location is required to be submitted, give the postal address:
   1. In every case, indicate the location of final assembly.
   2. For harvested products, indicate location of harvest.
   3. For extracted (i.e. mined) products, indicate location of extraction.
   4. For recovered products, indicate location of recovery.
   5. For products involving multiple manufacturing steps, provide a description of the process at each step, with location.
   6. Acceptable Evidence:
      a. Manufacturer's certification.
b. Life cycle analysis (LCA) performed by third-party.

F. Sustainably Harvested Wood: Solid wood, wood chips, and wood fiber certified or labeled by an organization accredited by one of the following:

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 Southcentral Foundation; notify Southcentral Foundation promptly upon discovery; protect, remove, handle, and store as directed by Southcentral Foundation.

C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Southcentral Foundation, or otherwise indicated as to remain the property of the Southcentral Foundation, 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. Use of products having any of the following characteristics is not permitted:
   1. Made using or containing CFC's or HCFC's.
   2. Made of wood from newly cut old growth timber.
   3. Containing lead, cadmium, or asbestos.

C. Where other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 01 6116.
   2. If wet-applied, have lower VOC content, as defined in Section 01 6116.
   3. Have longer documented life span under normal use.
   4. Result in less construction waste. See Section 01 7419
   5. Are made of vegetable materials that are rapidly renewable.
   6. If made of wood, are made of sustainably harvested wood, wood chips, or wood fiber.
   7. If bio-based, other than wood, are or are made of Sustainable Agriculture Network certified products.
   8. Are Cradle-to-Cradle Certified.

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.
      1. Where not specified, for all finish materials provide 5% of total installed quantity.
      2. Provide new, factory packaged material. Off-cuts, leftovers or similar do not count toward the maintenance material quantities.
      3. Remnants can be used for maintenance materials with the approval of LCG Lantech.
   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.
   B. Architect will consider requests for substitutions only within 15 days after date of Agreement.
   C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
   D. A request for substitution 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.
      2. Agrees to provide the same warranty for the substitution as for the specified product.
      3. 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 Southcentral Foundation.
      4. Waives claims for additional costs or time extension that may subsequently become apparent.
      5. Agrees to reimburse Southcentral Foundation and Architect for review or redesign services associated with re-approval by authorities.
   E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
   F. Substitution Submittal Procedure (after contract award):
      1. Submit substitution requests by completing the form in Section 00 6325; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.
      2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
      3. Architect will notify Contractor in writing of decision to accept or reject request.

3.02 TRANSPORTATION AND HANDLING
   A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
PRODUCT REQUIREMENTS

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.

3.03 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. Do not store products directly on the ground.

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

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

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

L. 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. Pre-installation meetings.
C. Cutting and patching.
D. Surveying for laying out the work.
E. Cleaning and protection.
F. Starting of systems and equipment.
G. Demonstration and instruction of Southcentral Foundation personnel.
H. Closeout procedures, including Contractor’s Correction Punch List, except payment procedures.
I. General requirements for maintenance service.

1.02 REFERENCE STANDARDS


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 the Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   5. Work of Southcentral Foundation or separate Contractor.
   6. Include in request:
      a. Identification of Project.
      b. Location and description of affected work.
      c. Necessity for cutting or alteration.
      d. Description of proposed work and products to be used.
e. Effect on work of Southcentral Foundation or separate Contractor.
f. Written permission of affected separate Contractor.
g. Date and time work will be executed.

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 of Alaska 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,

B. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State of Alaska. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.

C. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State of Alaska.

1.05 PROJECT CONDITIONS

A. Use of explosives is not permitted.

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

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

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

E. 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 barriers between construction areas and areas continuing to be occupied by Southcentral Foundation.

F. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
   1. Outdoors: Limit conduct of especially noisy exterior work to as agreed to by Owner.
   2. Indoors: Limit conduct of especially noisy interior work to as agreed to by Owner.

G. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

H. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
I. 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 Southcentral Foundation occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Southcentral Foundation'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 seven 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 PDF copies to Architect, Southcentral Foundation, 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. Contractor shall locate and protect survey control and reference points.
   D. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
   E. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
   F. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
   G. Utilize recognized engineering survey practices.
   H. 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.
I. Periodically verify layouts by same means.
J. Maintain a complete and accurate log of control and survey work as it progresses.
K. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

3.05 GENERAL INSTALLATION REQUIREMENTS
A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.
B. 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.
C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
F. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 CUTTING AND PATCHING
A. Whenever possible, execute the work by methods that avoid cutting or patching.
B. 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.
C. 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.
D. Employ original installer to perform cutting for structural systems, weather exposed and moisture resistant elements, and sight exposed surfaces.
E. Inform LCG Lantech two days prior to cutting existing elements or elements previously installed.
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.

3.07 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 minimum weekly and dispose off-site; do not burn or bury.

3.08 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.

3.09 SYSTEM STARTUP
   A. Coordinate schedule for start-up of various equipment and systems.
   B. Notify Architect and Owner seven days prior to start-up of each item.
   C. 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.
   D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
E. Verify that wiring and support components for equipment are complete and tested.
F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION
A. Demonstrate operation and maintenance of products to Southcentral Foundation's personnel two weeks prior to date of Substantial Completion.
B. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at equipment location.
C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
D. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.
E. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Southcentral Foundation's personnel in detail to explain all aspects of operation and maintenance.
F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

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

3.12 FINAL CLEANING
A. Execute final cleaning prior to final project assessment.
   1. Clean areas to be occupied by Southcentral Foundation prior to final completion before Southcentral Foundation occupancy.
B. Use cleaning materials that are nonhazardous.
C. Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned.
D. 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.
E. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
F. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
G. Clean filters of operating equipment.
H. Clean debris from roofs, overflow drains, area drains, and drainage systems.
I. Clean site; sweep paved areas, remove petrochemical spills, stains and other foreign matter, rake clean landscaped surfaces.
J. Remove snow and ice to provide safe access to building.
K. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 CLOSEOUT PROCEDURES
A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Architect and Southcentral Foundation.
B. Accompany Project Coordinator 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, at a minimum seven days prior to requested 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 Southcentral Foundation-occupied areas.
G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection, at a minimum seven days prior to requested inspection.
H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.14 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 Southcentral Foundation.

END OF SECTION
SECTION 01 7419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Southcentral Foundation 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. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
   1. Aluminum and plastic beverage containers.
   2. Wood pallets.
   3. Clean dimensional wood.
   4. Land clearing debris, including brush, branches, logs, and stumps; see Section 31 1000 - Clearing and Grubbing for use options.
   5. Concrete: May be crushed and used as riprap, aggregate, sub-base material, or fill.
   6. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
   7. Glass.
   9. Carpet, carpet cushion, carpet tile, and carpet remnants, both new and removed: DuPont (http://flooring.dupont.com) and Interface (www.interfaceinc.com) conduct reclamation programs.
   12. Rigid foam insulation.
   13. Vinyl siding.
   14. Windows, doors, and door hardware.
   15. Plumbing fixtures.
   16. Mechanical and electrical equipment.
   17. Fluorescent lamps (light bulbs).

E. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.

F. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.
G. 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.
   5. Incineration, either on- or off-site.

H. 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. Refer to State of Alaska Division of Environmental Health for landfills approved for construction waste on this project.

1.02 SUBMITTALS

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

B. Waste Management Plan: Include the following information:
   1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
   2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
   3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
   4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
   5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
   6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Southcentral Foundation, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Preconstruction meeting.
   2. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. As a minimum, provide:
      a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.
      b. Separate dumpsters for each category of recyclable.
      c. Recycling bins at worker lunch area.

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

G. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

H. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

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 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
   B. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.
   C. Individual Product Sections: Specific requirements for operation and maintenance data.
   D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS
   A. Project Record Documents: Submit documents to Architect in PDF format prior to final application for payment.
   B. Operation and Maintenance Data:
      1. Submit a PDF copy 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 Southcentral Foundation, submit completed documents within ten days after acceptance.
      3. Submit one copy 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 printed format to Owner within 10 days after final inspection.
   C. Warranties and Bonds:
      1. For equipment or component parts of equipment put into service during construction with Southcentral Foundation'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 Southcentral Foundation.

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. 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:
1. Product data, with catalog number, size, composition, and color and texture designations.
2. Information for re-ordering custom manufactured products.

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.


D. Additional information as specified in individual product specification sections.
E. 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. Include color coded wiring diagrams as installed.

E. 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.

F. 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.

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

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

I. Include sequence of operation by controls manufacturer.

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

K. Provide control diagrams by controls manufacturer as installed.

L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.

M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

O. Include test and balancing reports.

P. 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 Southcentral Foundation'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 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.
   4. Design Data: To allow for addition of design data furnished by Architect or others, provide a tab labeled "Design Data" and provide a binder large enough to allow for insertion of at least 20 pages of printed text.
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 Southcentral Foundation'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. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION
SECTION 05 4000
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Formed steel stud exterior wall and interior wall framing.
   B. Exterior wall sheathing.

1.02 RELATED REQUIREMENTS
   A. Section 06 1000 - Rough Carpentry.
   B. Section 07 2100 - Thermal Insulation.
   C. Section 07 2500 - Weather Barriers.

1.03 REFERENCE STANDARDS
   A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2012.
   F. PS 1 - Structural Plywood; 2009.

1.04 ADMINISTRATIVE REQUIREMENTS
   A. Coordinate with work of other sections that is to be installed in or adjacent to the metal framing system, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

1.05 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements for submittal procedures.
   B. Product Data: Provide manufacturer's data on factory-made framing connectors, showing compliance with requirements.
   C. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention.
   D. Designer's Qualification Statement.
   E. Manufacturer's Qualification Statement.

1.06 QUALITY ASSURANCE
   A. Designer Qualifications: Design framing system under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Alaska.
   B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.
PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing:
   1. ClarkDietrich.
   2. SCAFCO Corporation.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Framing Connectors and Accessories:
   1. Simpson Strong Tie.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FRAMING SYSTEM

A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

B. Design Requirements: Provide completed framing system having the following characteristics:
   1. Design: Calculate structural characteristics of cold-formed steel framing members according to AISI S100-12.
   2. Structural Performance: Design, engineer, fabricate, and erect to withstand specified design loads for project conditions within required limits.
   3. Design Loads: As indicated on the drawings.
   4. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
   5. Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

C. Shop fabricate framing system to the greatest extent possible.

D. Deliver to project site in largest practical sections.

2.03 FASTENERS

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.
   1. Products:
      a. ITW Commercial Construction North America; ITW CCNA-Buildex Teks Select Series.
      b. Substitutions: See Section 01 6000 - Product Requirements.

B. Anchorage Devices: Powder actuated.

C. Welding: Comply with AWS D1.1/D1.1M.

2.04 WALL SHEATHING

A. Plywood; PS 1, Grade C-D, Exposure I.
2.05 ACCESSORIES
   A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.
   B. Plates, Gussets, Clips: Formed Sheet Steel, thickness determined for conditions encountered; finish to match framing components.
   C. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

PART 3  EXECUTION

3.01 EXAMINATION
   A. Verify that substrate surfaces are ready to receive work.
   B. Verify field measurements and adjust installation as required.

3.02 INSTALLATION OF STUDS
   A. Install components in accordance with manufacturers' instructions and ASTM C1007 requirements.
   B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches on center.
   C. Place studs at 16 inches on center; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using clip and tie or fastner method.
   D. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.
   E. Install load-bearing studs full length in one piece. Splicing of studs is not permitted.
   F. Install load-bearing studs, brace, and reinforce to develop full strength and achieve design requirements.
   G. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.
   H. Install intermediate studs above and below openings to align with wall stud spacing.
   I. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.
   J. Attach cross studs to studs for attachment of fixtures anchored to walls.
   K. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

3.03 INSTALLATION OF WALL SHEATHING
   A. Install wall sheathing with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using self-tapping screws.
      1. Provide plywood wall sheathing at least 32 inches wide at building corners, measured horizontally.
      2. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges, and ends.

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
   B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, 
      Zinc-Coated, Welded and Seamless; 2018.
      and Steel Products; 2017.
   D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel 
      Hardware; 2016a.
   E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength 
      Carbon Steel Plates; 2018.
   F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 
      000 PSI Tensile Strength; 2014, with Editorial Revision (2017).
   G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or 
      Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.
   H. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
   I. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).
      2004).
   K. SSPC-SP 2 - Hand Tool Cleaning; 2018.

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

PART 2  PRODUCTS
2.01  MATERIALS - STEEL
   A. Steel Sections:  ASTM A36/A36M.
   B. Plates:  ASTM A283/A283M.
   C. Mechanical Fasteners: Same material as or compatible with materials being fastened; type 
      consistent with design and specified quality level.
   E. Shop and Touch-Up Primer:  SSPC-Paint 15, complying with VOC limitations of authorities 
      having jurisdiction.
   F. Touch-Up Primer for Galvanized Surfaces:  SSPC-Paint 20, Type I - Inorganic, 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. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

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. Stair Tread Plank: Grip Strut Plank, 14 Gauge, 4-Diamond (10-1/2" Width), Galvanized.
C. Plank Grating: Grip Strut Plank Grating, 14 Ga, Galvanized.
D. Corner Guards: Stainless Steel, 2"x2", 14 Ga, Satin finish.

2.04 FINISHES - STEEL
A. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

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.

END OF SECTION
SECTION 05 5213
PIPE AND TUBE RAILINGS

PART 1  GENERAL

1.01  SECTION INCLUDES
A.  Stair railings and guardrails.

1.02  REFERENCE STANDARDS
C.  ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2018.
D.  ASTM A554 - Standard Specification for Welded Stainless Steel Mechanical Tubing

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

1.04  QUALITY ASSURANCE
A.  Structural Designer Qualifications:  Professional Structural Engineer experienced in design of this work and licensed in the State of Alaska, or personnel under direct supervision of such an engineer.

PART 2  PRODUCTS

2.01  MANUFACTURERS
A.  Handrails and Railings:
   1.  C.R. Laurence Company, Inc.
   2.  Kee Safety, Inc.
   3.  The Wagner Companies
   4.  Substitutions:  See Section 01 6000 - Product Requirements.
B.  Non-Weld Pipe Fittings:
C.  Accessibility-Compliant Handrail Brackets:
   1.  Manufacturer’s Standard.
   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.  Allow for expansion and contraction of members and building movement without damage to connections or members.
C.  Dimensions:  See drawings for configurations and heights.

D. 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.

E. 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.

2.03 STEEL RAILING SYSTEM
A. Non-Weld Mechanical Fittings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.

B. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.

C. Straight Splice Connectors: Steel concealed spigots.

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.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION
A. Ensure area to receive railings are ready for application prior to install.

3.03 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. Install railings in compliance with ADA Standards for accessible design at applicable locations.

D. Anchor railings securely to structure.

3.04 TOLERANCES
A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.


END OF SECTION
SECTION 05 5305
METAL GRATINGS AND FLOOR PLATES

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Formed metal floor and stair tread gratings.
B. Flat surface floor and stair tread plating.

1.02 RELATED REQUIREMENTS
A. Section 05 5000 - Metal Fabrications.

1.03 REFERENCE STANDARDS
G. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
J. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).
L. SSPC-SP 2 - Hand Tool Cleaning; 2018.

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate details of component supports, openings, perimeter construction details, and tolerances.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
C. Manufacturer’s Installation Instructions: Indicate special requirements for opening and perimeter framing.

1.05 QUALITY ASSURANCE
A. Designer Qualifications: Design gratings and plates under direct supervision of a Professional Structural Engineer experienced in design of this type of work and licensed in the State of Alaska.
PART 2 PRODUCTS

2.01 MANUFACTURERS
   A. Pacific Stair Corp.
   B. McNichols Co.
   C. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS
   A. Comply with applicable code for loading requirements.

2.03 MATERIALS
   A. Steel Floor Plate: ASTM A786/A786M.
   B. Steel Framing: ASTM A36/A36M shapes, galvanized per ASTM A123/A123M.
   C. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
   D. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.04 ACCESSORIES
   A. Fasteners and Flange Blocks: Galvanized steel:
      1. Type and Style: as selected from Manufacturer's standard line of clips.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that field measurements are as indicated on drawings.
   B. Verify that opening sizes and dimensional tolerances are acceptable.
   C. Verify that supports are correctly positioned.

3.02 INSTALLATION
   A. Install components in accordance with manufacturer's instructions.
   B. Place frames in correct position, plumb and level.
   C. Mechanically cut galvanized finish surfaces. Do not flame cut.
   D. Anchor by bolting through flange blocks.
   E. Secure to prevent movement.
SECTION 06 1000
ROUGH CARPENTRY

PART 1  GENERAL

1.01  SECTION INCLUDES

A. Structural dimension lumber framing.
B. Non-structural dimension lumber framing.
C. Rough opening framing for doors, windows, and roof openings.
D. Sheathing.
E. Subflooring.
F. Underlayment.
G. Preservative treated wood materials.
H. Miscellaneous framing and sheathing.
I. Communications and electrical room mounting boards.
J. Concealed wood blocking, nailers, and supports.

1.02  RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.
B. Section 06 1733 - Wood I-Joists.
C. Section 06 1753 - Shop-Fabricated Wood Trusses.
D. Section 06 1800 - Glued-Laminated Construction.
E. Section 07 2500 - Weather Barriers.
F. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.
G. Section 07 6200 - Sheet Metal Flashing and Trim.

1.03  REFERENCE STANDARDS

H. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing; 2018a.
L. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
N. PS 1 - Structural Plywood; 2009.
O. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.
Q. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; 2015.

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.
C. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.
D. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of all contractor accreditation and installer certification on site during and after installation. Present on-site documentation upon request.

1.05 QUALITY ASSURANCE
A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP):
   1. Installer Qualification: Use accredited contractor, certified installers, evaluated materials, and third-party field quality control audit.
   2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING
A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

1.07 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 GENERAL REQUIREMENTS
A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
1. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.

2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (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. Stud Framing (2 by 2 through 2 by 6):
   1. Grade: No. 2.

D. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16):

E. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.03 EXPOSED BOARDS

A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.

B. Moisture Content: Kiln-dry (15 percent maximum).

C. Surfacing: S4S.

D. Species: Douglas Fir.

E. Grade: No. 2, 2 Common, or Construction.

2.04 CONSTRUCTION PANELS

A. Subflooring: Any PS 2 type, rated Sheathing.
   3. Performance Category: 3/4 PERF CAT.

B. Underlayment: APA Underlayment; plywood, Exposure 2, 1/2 inch thick. Fully sanded faces at resilient flooring.

C. Roof Sheathing: Oriented strand board wood structural panel; PS 2.
   1. Grade: Structural 1 Sheathing.
   2. Bond Classification: Exposure 1.
   3. Performance Category: 5/8 PERF CAT.
   5. Edges: Square.
   6. Exposure Time: Sheathing will not delaminate or require sanding due to moisture absorption from exposure to weather for up to 500 days.
D. Wall Sheathing: Any PS 2 type.
   2. Grade: Structural I Sheathing.
   3. Edge Profile: Square edge.
E. 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.

2.05 ACCESSORIES
A. Fasteners and Anchors:
   2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.
B. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
C. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.
D. Subfloor Adhesives: Waterproof, air cure type, cartridge dispensed; adhesives designed for subfloor applications and complying with either ASTM C557 or ASTM D3498.
   1. Manufacturers:
      a. Franklin International, Inc.
      b. Huber Engineered Woods, LLC.
      c. Liquid Nails, a brand of PPG Architectural Coatings.
      d. Substitutions: See Section 01 6000 - Product Requirements.
E. Water-Resistive Barrier: As specified in Section 07 2500.

2.06 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.
   1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.
B. Preservative Treatment:
   1. Manufacturers:
      a. Lonza Group.
      b. Koppers Performance Chemicals, Inc.
      c. Viance, LLC.
      d. Substitutions: See Section 01 6000 - Product Requirements.
a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
b. Treat lumber exposed to weather.
c. Treat lumber in contact with roofing, flashing, or waterproofing.
d. Treat lumber in contact with masonry or concrete.
e. Treat lumber less than 18 inches above grade.
f. Treat lumber in other locations as indicated.

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.
   B. Coordinate installation of rough carpentry members specified in other sections.

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 FRAMING INSTALLATION
   A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength.
   B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
   C. Install structural members full length without splices unless otherwise specifically detailed.
   D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AWC (WFCM) Wood Frame Construction Manual.
   E. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.
   F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
   G. Provide bridging at joists in excess of 8 feet span as detailed. Fit solid blocking at ends of members.
   H. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 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 code authorities 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 non-structural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Grab bars.
   4. Towel and bath accessories.
   5. Wall-mounted door stops.
   6. Wall paneling and trim.
   7. Joints of rigid wall coverings that occur between studs.

3.05 INSTALLATION OF CONSTRUCTION PANELS

A. Subflooring/Underlayment Combination: Glue and nail to framing; staples are not permitted.

B. Subflooring: Glue and nail to framing; staples are not permitted.

C. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
   1. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.

D. 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 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.

B. Allow preservative to dry prior to erecting members.
3.07 TOLERANCES
   A. Framing Members: 1/4 inch from true position, maximum.
   B. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.
   C. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.08 CLEANING
   A. Waste Disposal: Comply with the requirements of Section 01 7419 - Construction Waste Management and Disposal.
      1. Comply with applicable regulations.
      2. Do not burn scrap on project site.
      3. Do not burn scraps that have been pressure treated.
   B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
   C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION
PART 1  GENERAL
SECTION INCLUDES
A. Wood I-joists for floor framing.
B. Bridging, bracing, and anchorage.
C. Framing for openings.

RELATED REQUIREMENTS
A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
B. Section 06 1000 - Rough Carpentry.

REFERENCE STANDARDS
C. PS 1 - Structural Plywood; 2009.
D. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.

DESIGN REQUIREMENTS
A. As indicated on Structural drawings.

SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Manufacturer's literature describing materials, dimensions, allowable spans and spacings, bearing and anchor details, bridging and bracing requirements, and installation instructions; identify independent inspection agency.
C. Shop Drawings: Indicate sizes and spacing of joists, bracing and bridging, bearing stiffeners, holes to be cut (if any), and framed openings between joists.
D. Certificate: Certification by joist manufacturer that products delivered are of the same design and construction as those evaluated by the independent inspection agency.

DELIVERY, STORAGE, AND HANDLING
A. Deliver products to site in manufacturer's original packaging with manufacturer's name and product identification intact and legible.
B. Protect products from damage due to weather and breakage.
C. Protect joists from warping or other distortion by stacking in upright position, braced to resist movement, with air circulation under coverings and around stacks.
D. Handle individual joists in the upright position.

PART 2  PRODUCTS
MANUFACTURERS
A. Wood I-joists:
1. Boise Cascade Company
2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS
A. Wood I-Joists: Laminated veneer lumber top and bottom flanges and oriented strand board (OSB) webs bonded together with structural adhesive, with published span rating to meet project requirements.
   1. Span Rating: Established and monitored in accordance with ASTM D5055 by independent inspection agency.
   2. Oriented Strand Board: Comply with PS 2.
   3. Adhesive: Tested for wet/exterior service in accordance with ASTM D2559.
   4. Depth: As indicated on drawings.
   5. Fabrication Tolerances:
      b. Flange Thickness: Minus 1/16 inch.
      c. Joist Depth: Plus 0, minus 1/8 inch.
   6. Marking: Mark each piece with depth, joist spacing, and allowable span for joist spacing.
   7. Provide bearing stiffeners if required by span rating or joist hanger manufacturer.
B. Wood-Based Components:
   1. Wood fabricated from old growth timber is not permitted.
C. Joist Bridging: Type, size and spacing recommended by joist manufacturer.
D. Wood Blocking, Plates, and Miscellaneous Framing: Softwood lumber, any species, construction grade, maximum moisture content of 19 percent.
E. Fasteners: Electro galvanized steel, type to suit application.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify that supports and openings are ready to receive joists.
B. Verify that field measurements are as indicated on shop drawings.

3.02 PREPARATION
A. Coordinate placement of bearing items.

3.03 ERECTION
A. Install joists in accordance with manufacturer's instructions.
B. Set structural members level and plumb, in correct position.
C. Make provisions for erection loads and for sufficient temporary bracing to maintain structure plumb and in true alignment until completion of erection and installation of permanent bracing.
D. Do not field cut or alter structural members without approval of Structural Engineer.
E. Install permanent bridging and bracing.
F. Install headers and supports to frame openings required.
G. Coordinate installation of sheathing/decking with work of this section.

3.04 TOLERANCES
A. Framing Members: 1/4 inch maximum, from true position.

END OF SECTION
SECTION 06 1753
SHOP-FABRICATED WOOD TRUSSES

PART 1  GENERAL
1.01  SECTION INCLUDES
   A. Shop fabricated wood trusses for roof framing.
   B. Bridging, bracing, and anchorage.

1.02  REFERENCE STANDARDS
   A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or
      Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.
   B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building
      Materials; 2018b.
   C. TPI 1 - National Design Standard for Metal-Plate-Connected Wood Truss Construction;
      2014.
   D. TPI BCSI 1 - Building Component Safety Information Booklet: The Guide to Good Practice
      for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses; 2015.
   E. TPI DSB-89 - Recommended Design Specification for Temporary Bracing of Metal Plate
      Connected Wood Trusses; 1989.

1.03  SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Manufacturer’s data sheets on plate connectors, bearing plates, and metal
      bracing components.
   C. Shop Drawings: Show truss configurations, sizes, spacing, size and type of plate
      connectors, cambers, framed openings, bearing and anchor details, and bridging and
      bracing.
      1. Include identification of engineering software used for design.
      2. Provide shop drawings stamped or sealed by design engineer.
   D. Fabricator’s Qualification Statement.

1.04  DELIVERY, STORAGE, AND HANDLING
   A. Handle and erect trusses in accordance with TPI BCSI 1.
   B. Store trusses in vertical position resting on bearing ends.

PART 2  PRODUCTS
2.01  TRUSSES
   A. Wood Trusses: Designed and fabricated in accordance with TPI 1 and TPI DSB-89 to
      achieve structural requirements indicated on drawings.
      1. Connectors: Steel plate.

2.02  MATERIALS
   A. Lumber:
      1. Moisture Content: Between 7 and 9 percent.
2. Lumber fabricated from old growth timber is not permitted.

B. Steel Connectors: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) Grade 33/230, with G90/Z275 coating; die stamped with integral teeth; thickness as required.

C. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

2.03 ACCESSORIES

A. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: Softwood lumber, any species, construction grade, 19 percent maximum and 7 percent minimum moisture content.

B. Fasteners: Electrogalvanized steel, type to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that supports and openings are ready to receive trusses.

3.02 PREPARATION

A. Coordinate placement of bearing items.

3.03 ERECTION

A. Install trusses in accordance with manufacturer's instructions and TPI DSB-89 and TPI BCSI 1; maintain a copy of each TPI document on site until installation is complete.

B. Set members level and plumb, in correct position.

C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb, and in true alignment until completion of erection and installation of permanent bracing.

D. Do not field cut or alter structural members without approval of Engineer

E. Install permanent bridging and bracing.

F. Frame openings between trusses with lumber in accordance with Section 06 1000.

G. Coordinate placement of decking with work of this section.

3.04 TOLERANCES

A. Framing Members: 1/2 inch maximum, from true position.

END OF SECTION
SECTION 06 1800
GLUED-LAMINATED CONSTRUCTION

PART 1  GENERAL

1.01  SECTION INCLUDES
A. Glue laminated wood beams.
B. Steel hardware and attachment brackets.

1.02  RELATED REQUIREMENTS

1.03  REFERENCE STANDARDS
L. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; 2015.
M. WWPA G-5 - Western Lumber Grading Rules; 2017.

1.04  SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide technical data on wood preservative materials, application technique and resultant performance information.
C. Manufacturer's Qualification Statement.
1.05 QUALITY ASSURANCE
   A. Designer Qualifications: Design structural members under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Alaska.

1.06 DELIVERY, STORAGE, AND HANDLING
   A. Protect members to AITC requirements for load wrapped.
   B. Leave individual wrapping in place until finishing occurs.

PART 2 PRODUCTS
2.01 MANUFACTURERS
   A. Glued-Laminated Structural Units:
      1. Sentinel Structures, Inc.
      2. Western Wood Structures, Inc.
      3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 GLUED-LAMINATED UNITS
   A. Glued-Laminated Units: Fabricate in accordance with AITC 117 Industrial grade.
      1. Verify dimensions and site conditions prior to fabrication.
      2. Cut and fit members accurately to length to achieve tight joint fit.
      3. Fabricate member with camber built in.
      4. Do not splice or join members in locations other than those indicated without permission.
      5. After end trimming, seal with penetrating sealer in accordance with AITC requirements.

2.03 MATERIALS
   A. Lumber: Softwood lumber complying with WCLIB (GR) grading rules with 12 percent maximum moisture content before fabrication. Design for the following values:
      1. See structural sheets for design values.
      2. Lumber fabricated from old growth timber is not permitted.
   B. Steel Connections and Brackets: ASTM A36/A36M weldable quality, galvanize per ASTM A123/A123M.
   C. Anchor Bolts: ASTM F3125/F3125M, Type 1 heavy hex high strength bolts and ASTM A563 (ASTM A563M) nuts; hot-dip galvanized to meet requirements of ASTM A153/A153M, matching washers.
   D. Laminating Adhesive: Tested for wet/exterior service in accordance with ASTM D2559.

2.04 WOOD TREATMENT
   A. Shop treat wood materials in accordance with manufacturer's instructions.

2.05 FABRICATION
   A. Fabricate glue laminated structural members in accordance with AITC Industrial grade.
   B. Cut and fit members accurately to length to achieve tight joint fit.
C. Fabricate member with camber built in.
D. Do not splice or join members in locations other than those indicated without permission.
E. Fabricate steel hardware and connections with joints neatly fitted, welded, and ground smooth.
F. After end trimming, seal with penetrating sealer in accordance with AITC requirements.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify that supports are ready to receive units.
B. Verify sufficient end bearing area.

3.02 ERECTION
A. Lift members using protective straps to prevent visible damage.
B. Set structural members level and plumb, in correct positions or sloped where indicated.
C. Provide temporary bracing and anchorage to hold members in place until permanently secured.

3.03 TOLERANCES
A. Framing Members: 1/2 inch maximum from true position.

END OF SECTION
SECTION 06 2000
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Finish carpentry items.
   B. Wood door frames, glazed frames.
   C. Wood casings and moldings.
   D. Hardware and attachment accessories.

1.02 RELATED REQUIREMENTS
   A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.
   B. Section 08 1416 - Flush Wood Doors.

1.03 REFERENCE STANDARDS
   B. ANSI A135.4 - American National Standard for Basic Hardboard; 2012.
   I. BHMA A156.9 - American National Standard for Cabinet Hardware; 2015.
   K. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
   L. PS 1 - Structural Plywood; 2009.

1.04 ADMINISTRATIVE REQUIREMENTS
   A. Coordinate the work with plumbing rough-in, electrical rough-in, installation of associated and adjacent components, and miscellaneous medical and dental rough-in requirements.
   B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements for submittal procedures.
   B. Product Data:
      1. Provide manufacturer's product data, storage and handling instructions for factory-fabricated units.
2. Provide instructions for attachment hardware and finish hardware.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
   2. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
   3. Include certification program label.

D. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five 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. Quality Certification:
   1. Provide labels or certificates indicating that the 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 certification program.
   3. Provide designated labels on installed products as required by certification program.
   4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-fabricated units to project site in original packages, containers or bundles bearing brand name and identification.

B. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.

C. Protect from moisture damage.

D. Handle materials and products to prevent damage to edges, ends, or surfaces.

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. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

C. Exterior Woodwork Items:
   1. Top Rail at Handrails: Composite Wood; factory finish.

D. Interior Woodwork Items:
   1. Moldings, Bases, Casings, and Miscellaneous Trim: Hemlock; prepare for paint finish.
   2. Door, Glazed Light, and Pocket Door Frames: Hemlock; prepare for paint finish.
3. Window Sills: Hemlock; prepare for paint finish.

2.02 LUMBER MATERIALS
   A. Softwood Lumber: Hemlock species, Plain sawn, maximum moisture content of 6 percent; with vertical grain.

2.03 SHEET MATERIALS
   A. Softwood Plywood, Not Exposed to View: Any face species, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.
   B. Softwood Plywood, Exposed to View: Face species as indicated, plain sawn, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.

2.04 FASTENINGS
   A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.
   B. Adhesive for factory-fabricated units: Manufacturer’s recommended adhesive for application.
   C. Fasteners: Of size and type to suit application; stainless finish in concealed locations and stainless finish in exposed locations.

2.05 ACCESSORIES
   A. Adhesive: Type recommended by fabricator to suit application.
   B. Wood Filler: Solvent base, tinted to match surface finish color.

2.06 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.

PART 3 EXECUTION

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

3.02 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.
   D. Install hardware in accordance with manufacturer’s written instructions.

3.03 PREPARATION FOR SITE FINISHING
   A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
3.04 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 8316
FIBERGLASS REINFORCED PANELING

PART 1 GENERAL
1.01 SECTION INCLUDES
   A. Fiberglass reinforced plastic panels.
   B. Trim.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

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.

1.05 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. Crane Composites, Inc
      2. Marlite, Inc
      3. Nudo Products, Inc
      4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PANEL SYSTEMS
   A. Wall Panels at Corridor:
      1. Panel Size: 4 by 8 feet.
      2. Panel Thickness: 0.10 inch.
      3. Surface Burning Characteristics: Maximum flame spread index of 25-75, Class B; and smoke developed index of 450.
      4. Backing: Plywood; Thickness: 1/2".
      5. Surface Design: Embossed.
      7. Attachment Method: Mechanical fasteners concealed by trim, with sealant in joints.
   B. Wall Panels at all other locations:
1. Panel Size: 4 by 8 feet.
2. Panel Thickness: 0.10 inch.
3. Surface Burning Characteristics: Effective flame spread index of 76-200; Class C, and smoke developed index of 450.
4. Backing: Plywood; Thickness: 1/2”
5. Surface Design: Embossed.
7. Attachment Method: Mechanical fasteners concealed by trim, with sealant in joints.

2.03 MATERIALS
A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
   1. Surface Burning Characteristics at Corridor: Maximum flame spread index of 25-75 and smoke developed index of 450.
   2. Surface Burning Characteristics at
   3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
B. Trim: Vinyl; color coordinating with panel.
C. Fasteners: Nylon rivets.
D. Adhesive: Type recommended by panel manufacturer.
E. 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. Pre-drill fastener holes in panels, 1/8 inch greater in diameter than fastener, spaced as indicated by panel manufacturer.
D. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.
E. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.
F. Install panels with manufacturer’s recommended gap for panel field and corner joints.
G. Drive fasteners to provide snug fit, and do not over-tighten.
H. Place trim on panel before fastening edges, as required.
I. Fill channels in trim with sealant before attaching to panel.
J. Install trim with adhesive and screws or nails, as required.
K. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.

L. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION
SECTION 07 2100
THERMAL INSULATION

PART 1  GENERAL
1.01  SECTION INCLUDES
   A. Board insulation at underside of floor slabs and Stair and Ramp footings, between floor framing, and as indicated on Civil drawings.
   B. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.
   C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02  RELATED REQUIREMENTS
   A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
   B. Section 07 2500 - Weather Barriers: Separate air barrier and vapor retarder materials.

1.03  REFERENCE STANDARDS

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.
      1. Rigid board insulation: Demonstrate compliance with specified physical properties.

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 Exterior Stair Foundation, and as indicated on Civil Drawings: Extruded polystyrene (XPS) board.

2.02  FOAM BOARD INSULATION MATERIALS
   A. Extruded Polystyrene (XPS) Board Insulation: Complies with ASTM C578 with either natural skin or cut cell surfaces.
1. Type and Compressive Resistance: Type VI, 40 psi (276 kPa), minimum.
2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
4. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88) per 1 inch thickness at 75 degrees F mean temperature.
6. Type and Water Absorption: Type IV, 0.3 percent by volume, maximum, by total immersion.
7. Manufacturers:
   a. Dow Chemical Company
   b. Kingspan Insulation LLC
   c. Owens Corning Corporation

2.03 BATT INSULATION MATERIALS
A. Where batt insulation is indicated, either glass fiber or mineral fiber batt insulation may be used, at Contractor's option.
B. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
   3. Formaldehyde Content: Zero.
   5. Facing: Unfaced.
C. Mineral Fiber Batt Insulation: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
   1. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.

2.04 ACCESSORIES
A. Sheet Vapor Retarder: Specified in Section 07 2500.
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.

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.
B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.
3.02 BOARD INSTALLATION UNDER DECK AND RAMP FOUNDATION
   A. Place insulation under deck and ramp framing, on grade after base has been compacted.
   B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
   C. Prevent insulation from being displaced or damaged while placing footer.

3.03 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.

3.04 FIELD QUALITY CONTROL
   A. See Section 01 4000 - Quality Requirements, for additional requirements.

3.05 PROTECTION
   A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ceiling and Attic and floor: Blown insulation pneumatically placed into attic and between floor joists as indicated on drawings.

1.02 REFERENCE STANDARDS

A. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Blown Insulation:
   1. CertainTeed Corporation.
   2. GreenFiber.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Applications: Provide blown insulation in attic and floor as indicated on drawings.
B. Thermal Transmittance [U-value]: Provided maximum values in accordance with applicable edition of ASHRAE Std 90.1 I-P for envelope requirements of building location and climate zone.
C. Blown Insulation: ASTM C739, cellulosic fiber type, nodulated for pour and bulk for pneumatic placement.
   1. Thermal Transmittance (U-value): 0.27 BTU/hr sq ft deg F, maximum.

2.03 ACCESSORIES

A. Roof Ventilation Baffles: Prefabricated ventilation channels for placement under roof sheathing with baffles to prevent wind-washing.
   1. Material: Polyvinyl chloride (PVC).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate and adjacent materials are dry and ready to receive insulation.
B. Verify that light fixtures have thermal cut-out device to restrict over-heating in soffit or ceiling spaces.
C. Verify spaces are unobstructed to allow for proper placement of insulation.
3.02 INSTALLATION
   A. Install insulation and ventilation baffle in accordance with ASTM C1015 and manufacturer's instructions.
   B. Drill 2 inch diameter insulation access ports in fascia boards to permit equipment access.
   C. Place insulation pneumatically to completely fill floor joist spaces.
   D. Pour insulation to completely fill joist and rafter spaces.
   E. Place insulation against baffles, and do not impede natural attic ventilation to soffit.
   F. Completely fill intended spaces leaving no gaps or voids.
   G. Repair and reseal insulation access ports, and refinish to match adjacent work.

3.03 CLEANING
   A. Remove loose insulation residue.

END OF SECTION
SECTION 07 2500
WEATHER BARRIERS

PART 1  GENERAL
1.01  SECTION INCLUDES
   A.  Water-Resistive Barrier:  Under exterior wall cladding, over sheathing or other substrate;  not air tight or vapor retardant.
   B.  Air Barriers:  Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

1.02  RELATED REQUIREMENTS
   A.  Section 06 1000 - Rough Carpentry:  Water-resistive barrier under exterior cladding.
   B.  Section 07 2100 - Thermal Insulation:  Vapor retarder installed in conjunction with batt insulation.

1.03  REFERENCE STANDARDS

1.04  SUBMITTALS
   A.  See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B.  Product Data:  Provide data on material characteristics.
   C.  ABAA Field Quality Control Submittals:  Submit third-party reports of testing and inspection required by ABAA QAP.
   D.  Manufacturer's Installation Instructions:  Indicate preparation.
   E.  ABAA Manufacturer Qualification:  Submit documentation of current evaluation of proposed manufacturer and materials.
   F.  ABAA Installer Qualification:  Submit documentation of current contractor accreditation and current installer certification; keep copies of each contractor accreditation and installer certification on site during and after installation, and present on-site documentation upon request.

1.05  QUALITY ASSURANCE
   A.  Air Barrier Association of America (ABAA) Quality Assurance Program (QAP):
       1.  Manufacturer Qualification:  Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.
1.06 FIELD CONDITIONS
   A. Maintain temperature and humidity recommended by the materials manufacturers
      before, during and after installation.

PART 2 PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES
   A. Air Barrier:
      1. On outside surface of sheathing of exterior walls use air barrier sheet, mechanically
         fastened type.

2.02 WATER-RESISTIVE BARRIER MATERIALS (NEITHER AIR BARRIER OR VAPOR RETARDER)
   A. Weather-Resistive Barrier, Composite: Tear-resistant polyester sheet with UV-resistant
      acrylic coating.
      1. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM
         E2178.
      2. Water Vapor Permeance: 200 perms, minimum, when tested in accordance with
         ASTM E96/E96M Procedure A (Desiccant Method) at 73.4 degrees F.
      3. Ultraviolet and Weathering Resistance: Approved in writing by manufacturer for up
         to 210 days of weather exposure.
      4. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed
         index of 450 or less (Class A), when tested in accordance with ASTM E84.
      5. Seam and Perimeter Tape: As recommended by sheet manufacturer.

2.03 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)
   A. Air Barrier Sheet, Mechanically Fastened:
      1. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM
         E2178.
      2. Water Vapor Permeance: 5 perms, minimum, when tested in accordance with ASTM
         E96/E96M Procedure A (Desiccant Method) at 73.4 degrees F.
      3. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for
         up to 180 days of weather exposure.
      4. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke
         developed index of 50 or less, when tested in accordance with ASTM E84.
      5. Seam and Perimeter Tape: Polyethylene self adhering type, mesh reinforced, 2
         inches wide, compatible with sheet material; unless otherwise specified.
   B. Air Barrier Sheet, Self-Adhered:
      1. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM
         E2178.
      2. Water Vapor Permeance: 10 perms, minimum, when tested in accordance with ASTM
         E96/E96M Procedure A (Desiccant Method) at 73.4 degrees F.
      3. Water Penetration Resistance Around Nails: Pass, when tested in accordance with
4. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 90 days of weather exposure.

5. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less (Class A), when tested in accordance with ASTM E84.


7. Seam and Perimeter Tape: As recommended by sheet manufacturer.

8. Manufacturers:
   a. Dorken Systems Inc.
   b. Henry Company.
   c. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ACCESSORIES
   A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION
   A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
   B. Clean and prime substrate surfaces to receive adhesives in accordance with manufacturer's instructions.

3.03 INSTALLATION
   A. Install materials in accordance with manufacturer's instructions.
   B. Water-Resistive Barriers: Install continuous barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.
   C. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
   D. Vapor Retarders: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
   E. Apply sealants and adhesives within recommended application temperature ranges. Consult manufacturer if temperature is out of this range.
   F. Mechanically Fastened Sheets - On Exterior:
      1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
      2. Overlap seams as recommended by manufacturer but at least 6 inches.
      3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches.
4. For applications specified to be air tight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners recommended by the manufacturer.

5. Install water-resistant barrier over jamb flashings.

6. Install air barrier and vapor retarder underneath the jamb flashings.

7. Install head flashings under weather barrier.

8. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.

G. Mechanically Fastened Sheets - Vapor Retarder On Interior:
   1. When insulation is to be installed in assembly, install vapor retarder over insulation.
   2. Anchor to wood framing using large-headed nails or staples at 12 to 18 inches on center along each framing member covered; cover fasteners with seam tape.
   4. Locate laps at a framing member; at laps fasten one sheet to framing member then tape overlapping sheet to first sheet.
   5. Seal entire perimeter to structure, window and door frames, and other penetrations.
   6. Where conduit, pipes, wires, ducts, outlet boxes, and other items are installed in insulation cavity, pass vapor retarder sheet behind item but over insulation and maintain air tight seal.

H. Openings and Penetrations in Exterior Weather Barriers:
   1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
   2. At openings to be 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 to be filled with non-flanged frames, seal weather barrier to each side of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
   4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
   5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
   6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 FIELD QUALITY CONTROL
   A. See Section 01 4000 - Quality Requirements, for additional requirements.
   B. Do not cover installed weather barriers until required inspections have been completed.
   C. Take digital photographs of each portion of the installation prior to covering up.
3.05 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION
SECTION 07 4113
METAL ROOF PANELS

PART 1  GENERAL

1.01  SECTION INCLUDES
A.  Architectural roofing system of preformed steel panels.

1.02  RELATED REQUIREMENTS
A.  Section 06 1000 - Rough Carpentry.

1.03  REFERENCE STANDARDS

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, including:
   1.  Storage and handling requirements and recommendations.
   2.  Installation methods.
   3.  Specimen warranty.
C.  Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
1. Show work to be field-fabricated or field-assembled.

D. Selection Samples: For each roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.

E. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Southcentral Foundation's name and are registered with manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Provide strippable plastic protection on prefinished roofing panels for removal after installation.

B. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Finish Warranty: Provide manufacturer's special warranty covering failure of factory-applied exterior finish on metal roof panels and agreeing to repair or replace panels that show evidence of finish degradation, including significant fading, chalking, cracking, or peeling within specified warranty period of five years from Date of Substantial Completion.

C. Waterproofing Warranty: Provide manufacturer's warranty for weathertightness of roofing system, including agreement to repair or replace roofing that fails to keep out water within specified warranty period of five years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Roof Panels:
   1. ATAS International, Inc.
   2. Metl-Span, a Division of NCI Group, Inc.
   3. Metal Sales Manufacturing Corp.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ARCHITECTURAL METAL ROOF PANELS

A. Architectural Metal Roofing: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.

B. Metal Panels: Factory-formed panels with factory-applied finish.

   1. Steel Panels:
      a. Aluminum-zinc alloy-coated steel complying with ASTM A792/A792M; minimum AZ55 coating.
      b. Steel Thickness: Minimum 24 gage (0.024 inch).

   2. Profile: Clip-loc, with minimum 1.5 inch seam height; concealed fastener system manufacturers standard.

   3. Texture: Smooth.
4. Length: Maximum possible length to minimize lapped joints. Where lapped joints are unavoidable, space laps so that each sheet spans over three or more supports.

5. Width: Maximum panel coverage of 24 inches.

2.03 ATTACHMENT SYSTEM

A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

2.04 FABRICATION

A. Panels: Provide factory fabricated panels with applied finish and accessory items, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.

B. Joints: Provide captive gaskets, sealants, or separator strips at panel joints to ensure weathertight seals, eliminate metal-to-metal contact, and minimize noise from panel movements.

2.05 FINISHES

A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated aluminum surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss as selected by Architect from manufacturer's standard line.

1. Manufacturers:
   a. PPG Metal Coatings.
   b. Valspar.
   c. Substitutions: See Section 01 6000 - Product Requirements.

2.06 ACCESSORIES

A. Miscellaneous Sheet Metal Items: Provide flashings, trim, moldings, closure strips, preformed crickets, caps, and similar sheet metal items of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.

B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of combination steel and closed-cell foam.

C. Sealants:
   1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
   2. Concealed Sealant: Non-curing butyl sealant or tape sealant.

2. Sheet Thickness: 40 mil, 0.040 inch minimum total thickness.
5. Water Vapor Permeance: 0.1 perm, maximum, when tested in accordance with ASTM E96/E96M Procedure A (desiccant method).
6. Manufacturers:
   a. Henry Company; Blueskin RF200.
   b. Polyglass USA, Inc; Polystick MTS Self-Adhered High Temperature Roof Underlayment.
   c. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Do not begin installation of preformed metal roof panels 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. Broom clean wood sheathing prior to installation of roofing system.
   B. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to assure that the completed roof will be free of leaks.
   C. Coordinate installation of waterproof membrane over roof sheathing with 06 1000.
   D. Remove protective film from surface of roof panels immediately prior to installation. Strip film carefully, to avoid damage to prefinished surfaces.
   E. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by roof panel manufacturer.
   F. Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.03 INSTALLATION
   A. Overall: Install roofing system in accordance with approved shop drawings and panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement.
      1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
      2. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches for field cutting is absolutely prohibited.
B. Accessories: Install all components required for a complete roofing assembly, including flashings, trim, moldings, closure strips, preformed crickets, caps, rib closures, ridge closures, and similar roof accessory items.

C. Roof Panels: Install panels in strict accordance with manufacturer’s instructions, minimizing transverse joints except at junction with penetrations.

3.04 CLEANING

A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.05 PROTECTION

A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.

B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

END OF SECTION
SECTION 07 4215
INSULATED METAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Factory-assembled metal panel system for walls, with trim, related flashings and accessory components.
B. Secondary sub-girt framing system, attached to building structural frame.

1.02 RELATED REQUIREMENTS
A. Section 05 4000 - Cold-Formed Metal Framing: Stud wall framing system.
B. Section 07 6200 - Sheet Metal Flashing and Trim.

1.03 REFERENCE STANDARDS
E. FM 4880 - Approval Standard for Class 1 Fire Rating of Building Panels or Interior Finish Materials; 2015.

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide manufacturer documentation on tested thermal and fire resistance capabilities of assembled panel.

1.05 QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum three years experience.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
B. Store pre-finished material off ground with weather protection to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
C. Prevent contact with materials that could cause discoloration or staining.

1.07 WARRANTY
A. Correct defective work within a five year period after Date of Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.
B. Correct defective work within a five year period after Date of Substantial Completion, including defects in water tightness and integrity of seals for insulated metal wall panels.
PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Insulated Metal Wall Panels:
   1. ATAS International, Inc.
   2. Kingspan Insulated Panels.
   3. Metl-Span, a Division of NCI Group, Inc; ____.
   4. 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.

B. Performance Requirements:
   1. Thermal Performance: Provide thermal resistance through entire system; R-8 per inch.
   2. Fire Resistance: Class I fire rated, without height limitation, when tested in accordance with FM 4880.
   3. Movement: Accommodate the movement caused by the following without damage to system, components, or deterioration of seals:
      a. Normal movement between system components.
      b. Seasonal temperature cycling.
      c. Deflection of structural support framing.

2.03 PANELS AND TRIM

A. Wall Panels: Exterior and interior metal sheet skin, factory-assembled, with foamed in place insulation; exterior and interior sheet interlocking at edges, fitted with continuous gaskets.
   2. Profile: As indicated; vertical panels.
   4. Exterior Sheet: Pre-finished aluminum, 18 gage, 0.0403 inch minimum thickness; stucco embossed.
   5. Interior Sheet: Aluminum, 20 gage, 0.032 inch minimum thickness.
   6. Panel Edge Profile: Tongue and groove, for flush seam.
   7. Fabricate panels in longest practicable lengths.
B. Internal and External Corners: Same material, thickness, and finish as exterior sheets; factory-fabricated mitered to required angles in one continuous piece with minimum 18 inch returns.

C. Trim, Closure Pieces, Expansion Joints, Caps, Flashings, Fascias, and Infills: Same material, thickness and finish as exterior sheets; factory-fabricated to required profiles; fabricated in longest practicable lengths.
   1. Exposed Fasteners: Not permitted.
   2. Profiles: To suit system.

2.04 PANEL MATERIALS
A. Precoated Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792/A792M, Commercial Steel (CS) or Forming Steel (FS), with AZ55/AZM165 coating; continuous coil coated with acrylic primer coat, polyvinylidene fluoride (PVDF) top coat, and polyester washcoat for panel back.

B. Foamed-in-Place Insulation: Urethane type.

C. Gaskets: Manufacturer's standard type suitable for use with panel system, permanently resilient; ultraviolet and ozone resistant; color as selected by Architect.

D. Panel Sealants: Manufacturer's standard type suitable for use with installation of panel system; non-staining, skinning, non-shrinking, non-sagging, ultra-violet and ozone resistant; color as selected by Architect.

2.05 ACCESSORIES
A. Concealed Sealants: Non-curing butyl sealant or tape sealant.

B. Exposed Sealants: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.

C. Subgirts: As required for system design.

D. Anchors: Galvanized steel.

E. Field Touch-up Paint: As recommended by panel manufacturer.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify that structural substrate is ready to receive panel system.

3.02 INSTALLATION
A. Install panel system on walls in accordance with manufacturer's instructions.

B. Permanently fasten panel system to structural supports; aligned, level, and plumb, within specified tolerances.

C. Locate panel joints over supports.

D. Use concealed fasteners unless otherwise approved by Architect.

E. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.
3.03 TOLERANCES
   A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.
   B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch.

3.04 CLEANING
   A. Remove site cuttings from finish surfaces.
   B. Upon completion of installation, thoroughly clean prefinished aluminum surfaces in accordance with AAMA 609 & 610.

END OF SECTION
SECTION 07 4619
STEEL SOFFIT PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Steel panels for under building soffit.
   B. Trim, flashings, accessories, and fasteners for steel soffit.

1.02 RELATED REQUIREMENTS
   A. Section 07 2500 - Weather Barriers.
   B. Section 07 6200 - Sheet Metal Flashing and Trim.
   C. Section 07 9200 - Joint Sealants.

1.03 REFERENCE STANDARDS
   A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or
      Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 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, including:
      1. Preparation instructions and recommendations.
      2. Soffit materials, underlayment, flashings, fasteners and accessories.
      3. Dimensions, physical properties, and typical details.
      4. Storage and handling requirements and recommendations.
      5. Installation methods.
   C. Warranty: Submit manufacturer warranty and ensure forms have been completed in
      Southcentral Foundation’s name and registered with manufacturer.

1.05 QUALITY ASSURANCE
   A. Manufacturer Qualifications: Company specializing in manufacturing products specified in
      this section, with not less than five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING
   A. Deliver and store products in manufacturer's unopened packaging bearing brand name
      and manufacturer's identification until ready for installation.
   B. Verify quantities and condition immediately upon receipt; remove damaged materials
      from site, and coordinate with manufacturer to replace with new materials meeting
      specified requirements.
   C. Store products off the ground, within manufacturer's temperature and environmental
      limits, away from moisture, protected from traffic and construction activities, and minimize
      on-site storage prior to installation.

1.07 WARRANTY
   A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
   B. Correct defective work within a two year period after Date of Substantial Completion.
C. Manufacturer’s Warranty: Provide manufacturer’s standard lifetime, non-prorated, transferable warranty, including 50 year hail protection warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 STEEL SIDING

A. Steel Siding Accessories:

   1. Fasteners: Hot dipped galvanized; non-staining, of size and strength to securely and rigidly retain the work; prefinished to match siding finish.

   2. Flashing: Siding manufacturer’s standard, factory-finished flashing accessories.

   3. Provide coordinating accessories made of same material as required for complete and proper installation whether or not specifically shown on drawings.

      a. Starter strip.

      b. J-Channels.

4. Steel Fascia:

   a. Material: Precoated steel sheet, 26 gage, 0.0179 inch minimum base metal thickness.

5. Steel Under Building Soffit:

   a. Material: Precoated steel sheet, 26 gage, 0.0179 inch minimum base metal thickness.

   b. Profile: Solid, flush; style as indicated on drawings.

   c. Soffit Accessories: Provide coordinating accessories made of matching material as required for complete and proper installation.

      1) F-Channel trim.
      2) J-Channel trim.

6. Finish: Shop pre-coated with manufacturer’s standard SMP (silicone-modified polyester) coating system.

   a. Color: Match adjacent siding or soffit panels.

   b. Texture: Smooth.

2.03 MATERIALS

A. Precoated Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, Structural Steel (SS) or Forming Steel (FS), with G90/Z275 coating; continuous coil-coated on exposed surfaces with specified finish coating, and manufacturer’s standard panel back coating.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrate conditions before beginning installation.

B. Verify dimensions and acceptable substrate condition.

C. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory conditions before proceeding.
D. Do not proceed with installation until unacceptable conditions have been corrected.

3.02 PREPARATION
   A. Surface Preparation: Prepare surfaces as recommended by manufacturer.

3.03 INSTALLATION
   A. Provide concealed fasteners except where approved on shop drawings.
   B. Exterior Soffit Vents: Install according to manufacturer's written instructions; provide vent area specified.
   C. Where dissimilar materials are in contact, prevent galvanic action as recommended by manufacturer.

3.04 CLEANING
   A. Remove grease and oil films, excess joint sealer, handling marks, and other installation debris from steel siding, leaving siding clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to material finishes.
   B. Upon completion of installation, thoroughly clean prefinished steel surfaces.
   C. Remove excess materials and debris from project site.

3.05 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 7200
ROOF ACCESSORIES

PART 1  GENERAL
1.01  SECTION INCLUDES
   A. Snow guards.

1.02  RELATED REQUIREMENTS
   A. Section 07 4113 - Metal Roof Panels.

1.03  REFERENCE STANDARDS

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. Warranty Documentation:
      1. Submit manufacturer warranty.
      2. Ensure that forms have been completed in Southcentral Foundation's name and registered with manufacturer.

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.

PART 2  PRODUCTS
2.01  SNOW GUARDS/VENT GUARDS
   A. Unit Snow Guards: Individual projecting metal shapes, attached per manufacturer's standard detail, and mechanically fastened to roof deck.
      1. Projecting Metal Shapes: Zinc plated steel, triangular spike design.
      2. Manufacturers:
         a. Snowterminator
         b. Substitutions: See Section 01 6000 - Product Requirements.
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. 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 7230
RIDGE, SOFFIT AND SIDING VENTS

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Ridge vents.
   B. Hip vents.
   C. Siding vents.

1.02 RELATED SECTIONS
   A. Section 06 1000 - Rough Carpentry.
   B. Section 07 1300 - Shingles.

1.03 SUBMITTALS
   A. Submit under provisions of Section 01 3000.
   B. Product Data: Manufacturer's catalog data, standard details, and installation instructions.
   C. Samples: 2 inch (50 mm) long samples of each profile required.

1.04 DELIVERY, STORAGE, AND HANDLING
   A. Store products indoors and protect from construction traffic and damage.

PART 2 PRODUCTS

2.01 MANUFACTURER
   A. Manufacturer: Cor-A-Vent, Inc.; www.core-a-vent.com
   B. Substitutions will not be acceptable.

2.02 MATERIALS
      1. Net free area: 20 sq in per lin ft (42336 sq mm/m).
      2. Color: Black.
      3. Dimensions: 11 inches (279 mm) wide by 48 inches (1220 mm) long by 1 inch (25 mm) high.
   B. Soffit Vents: Cor-A-Vent S-400 Strip Vent.
      1. Net free area: 10 sq in per lin ft (21168 sq mm/m).
      2. Dimensions: 1 inch (25 mm) wide by 48 inches (1220 mm) long by 1 1/2 inch (38 mm) high.
   C. Soffit Vents: Cor-A-Vent PS-400 Strip Vent.
      1. Net free area: 10 sq in per lin ft (21168 sq mm/m).
      2. Dimensions: 1 inch (25 mm) wide by 48 inches (1220 mm) long by 3/4 inch (19 mm) high.
D. Siding Vents: SV-3.
   1. Net free area: 5 sq in per lin ft (10585 sq mm/m).
   2. Dimensions: 7/16 inches (10.5mm) wide by 48 inches (1220 mm) long by 3 inch (75 mm) high.

E. Siding Vents: SS-112 Sturdi Strips.
   1. Dimensions: 3/8 inches (9.65mm) depth by 1-1/2 inches (38 mm) wide by 48 inches (1220) long.
   2. Color: Black.

   1. Dimensions: 5/16 inches (7.87mm) wide by 1 1/4 inches (31.75 mm) tall by 48 inches (1220) long.
   2. Color: Black.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that framing, sheathing, and shingles are secured and ready to receive vents.
   B. Verify that there is a 1 inch (25 mm) wide clear air space between sheathing and each side of ridge board or, if trusses are used, a 1-1/2 inches (40 mm) wide continuous clear air space centered on ridge.

3.02 INSTALLATION
   A. General:
      1. Install ridge vents along entire length of roof ridges.
   B. Ridge Vents:
      1. Fit end cap onto one end of the first and last piece of ridge vent.
      2. Lay a bead of calking on the underside of the end cap, press the piece and cap into position, and nail through the end cap, the ridge vent, and into the roof sheathing.
      3. Use roofing nails that are long enough to penetrate ridge vent and through roof sheathing.
      4. Drive the nails down flush so that the vent and end cap are held down firmly.
      5. Do not indent by over driving.
      6. Butt each successive piece up snugly, checking for straight alignment.
      7. Use 2 nails in each end and 1 at each side at center, pulling up slightly when nailing second side to ensure that the vent is nailed at the same pitch as the roof.
      8. If roof shingles are the heavy dimensional type, a bead of sealant must be applied on top of the shingles to provide weather seal between the shingles and vent.
   C. Cap Shingles:
1. Place the first cap shingle with approximately 1/2-inch (40 mm) overhang over the end cap and at each side of the ridge vent.
2. Nail down through the shingle, the ridge vent, and through the roof sheathing.
3. Nails must be long enough to penetrate the roof sheathing. In high wind areas, washer-head nails may be used to provide additional holding for the shingle caps.
4. Do not fasten ridge vents with staples.
5. Preform shingle caps in cold weather to avoid cracking or humping up over the ridge.
6. Apply cap shingles with 1 nail each side, up approximately 2-1/2 inches (60 mm) from the overhanging edge.
7. Drive nails flush; do not indent.

D. Hips: Install ridge vent as needed on hips to provide proper ventilation. If vent must be run down entire length of hip, do not cut slot within 3 feet (1 m) of the building line.
   1. Rafters at 24 inches (610 mm) on centers: Install 8 inches (200 mm) long 2x4 (50 x 100 mm) wood blocking nailed or screwed into hip rafter between each rafter to support roof sheathing. Nail sheathing to blocking.
   2. Apply a continuous bead of sealant to roof shingles immediately prior to placing hip vent to form a seal between roof shingles and bottom of hip vent.
   3. Vents may be continued down hip without slot to maintain uniform appearance.

E. Flashings: Install specified flashings where indicated on the drawings.

3.03 SIDING VENTS
   A. Nail SV-3 or SV-5 in a continuous band along the wall at the level where the siding will start. A continuous band of SV-3 or SV-5 may also be nailed at the top of the wall where the siding ends if full ventilation behind the siding is desired. SV-3 and SV-5 may also be used above and below windows and above doors to provide drainage/ventilation in these areas as well.
   B. If SS-112 Sturdi Strips are being used with the SV-3 they should be nailed to the wall either at 16 inches (406 mm) OC or 24 inches (610 mm) OC, depending on the stud layout of the wall and alongside all windows and doors. Note the SS-112 are a spacer and are not designed to hold the weight of the siding, the siding must be fastened through the SS-112 Sturdi Strips into structural material behind them. Typically when the SV-5 is being used a 3/4 inch (19 mm) thick furring strip is used instead of the SS-112 Sturdi Strips, but they can be doubled up and used if desired. The fastener for the siding must be long enough to go through both layers and attach to structural material behind them.
   C. The ST-30 Sturdi Starter is used instead of ripping a piece of siding to place behind the bottom of the first row. The ST-30 will provide the same angle as the ripped siding to the first row of siding.

3.04 ADJUST AND CLEAN
   A. Remove any scrap from the site, and leave in a neat and clean condition.

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 1300 - Sheet Waterproofing.
B. Section 07 2500 - Weather Barriers.

1.03  REFERENCE STANDARDS
B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2012 (Reapproved 2017).

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.

1.05  QUALITY ASSURANCE
A. Maintain one copy of each referenced document covering installation requirements on site.
B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

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 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. Wall expansion and control joints.
   b. Joints between door, window, and other frames and adjacent construction.
   c. Joints between different exposed materials.
   d. Openings below ledge angles in masonry.
   e. 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 indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
   b. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
   c. Joints where installation of sealant is specified in another section.
   d. 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. In Sound-Rated Assemblies: Acrylic emulsion latex sealant.

D. Interior Wet Areas: Bathrooms, restrooms, kitchens, and janitor closets; fixtures in wet areas include plumbing fixtures, countertops, cabinets, and other similar items.

E. Sound-Rated Assemblies: Walls and ceilings identified as "STC-rated", "sound-rated", or "acoustical".

2.02 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

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.
2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.

3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.


5. Service Temperature Range: Minus 20 to 180 degrees F.

6. Manufacturers:
   a. Pecora Corporation.
   b. Sika Corporation.
   c. Tremco Commercial Sealants & Waterproofing.
   d. Substitutions: See Section 01 6000 - Product Requirements.

B. 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 35 percent, minimum.

2. Color: Match adjacent finished surfaces.

3. Service Temperature Range: Minus 40 to 180 degrees F.

4. Manufacturers:
   a. Sika Corporation.
   b. Tremco Commercial Sealants & Waterproofing.
   c. W. R. Meadows, Inc.
   d. Substitutions: See Section 01 6000 - Product Requirements.

C. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.

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.

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.

C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

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.

3.04 FIELD QUALITY CONTROL
   A. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
   B. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

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 frames.
D. Thermally insulated hollow metal doors with frames.
E. Accessories, including glazing and low expanding foam sealant, & kickplates.

1.02  RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware.

1.03  REFERENCE STANDARDS

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.
F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.
M. ITS (DIR) - Directory of Listed Products; current edition.
N. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
O. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.
R. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2016.
T. UL (DIR) - Online Certifications Directory; Current Edition.

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.
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.
E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.
F. Manufacturer's Qualification Statement.

1.05 QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
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.
   2. Republic Doors, an Allegion brand.
   3. Steelcraft, an Allegion brand.
   4. 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.


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. 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 gage, 0.042 inch, minimum.

2. Door Core Material: Polyisocyanurate, 2 lbs/cu ft minimum density.

   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 Thermal Resistance: R-Value of 9.9, minimum, for installed thickness of polyisocyanurate.
5. Door Finish: Factory primed and field finished.

B. 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 gage, 0.042 inch, minimum.

C. 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: 18 gage, 0.042 inch, minimum.
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: 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.

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: Full profile/continuously welded type.
1. Frame Metal Thickness: 16 gage, 0.053 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: 16 gage, 0.053 inch, minimum.

E. Door Frames, Fire-Rated: Full profile/continuously welded type.
   1. Fire Rating: Same as door, labeled.
   2. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.

F. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.

2.05 FINISHES
A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
   1. Color: As selected by Architect from manufacturer's standard range.

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 gage, 0.0478 inch, galvanized steel.
   4. Glazing: 1/4 inch thick, tempered glass, in compliance with requirements of authorities having jurisdiction.

B. Perimeter sealant: Provide low expanding foam sealant, entire frame perimeter. Ensure proper operation after installation of foam. Correct any door operating issues to ensure proper operation.

C. 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.

D. 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 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. Touch up damaged factory finishes.

3.03 TOLERANCES
   A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.04 ADJUSTING
   A. Adjust for smooth and balanced door movement.

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; non-rated.

1.02 RELATED REQUIREMENTS
   A.  Section 06 2000 - Finish Carpentry
   B.  Section 08 1113 - Hollow Metal Doors and Frames.
   C.  Section 08 7100 - Door Hardware.

1.03 REFERENCE STANDARDS
   D.  AWI (QCP) - Quality Certification Program; Current Edition.
   F.  ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
   G.  NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

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.
   D.  Manufacturer’s Installation Instructions: Indicate special installation instructions.
   E.  Manufacturer’s Qualification Statement.

1.05 QUALITY ASSURANCE
   A.  Maintain one copy of the specified door quality standard on site for review during installation and finishing.
   B.  Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.

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. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS
2.01 DOORS AND PANELS
A. Doors: See drawings for locations and additional requirements.

2.02 DOOR AND PANEL CORES

2.03 DOOR FACINGS

2.04 DOOR CONSTRUCTION
A. Fabricate doors in accordance with door quality standard specified.
B. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
C. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
D. Provide edge clearances in accordance with the quality standard specified.

2.05 FINISHES - WOOD VENEER DOORS

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.
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.

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.

   END OF SECTION
SECTION 08 5313
VINYL WINDOWS

PART 1  GENERAL

1.01  SECTION INCLUDES
A.  Vinyl-framed, factory-glazed windows.
B.  Operating hardware.
C.  Insect screens.

1.02  RELATED REQUIREMENTS

1.03  REFERENCE STANDARDS

1.04  SUBMITTALS
A.  See Section 01 3000 - Administrative Requirements, for submittal procedures.
B.  Product Data:  Provide component dimensions, anchors, fasteners, glass, and internal drainage.
C.  Shop Drawings:  Indicate opening dimensions, framed opening tolerances, affected related work, and installation requirements.
D.  Manufacturer's Certificate:  Certify that products of this section meet or exceed specified requirements.
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. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Southcentral Foundation's name and registered with manufacturer.

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.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Protect finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.
B. Jig, brace, and box the window frame assemblies for transport to minimize flexing of members or joints.

1.07 FIELD CONDITIONS
A. Do not install sealants when ambient temperature is less than 40 degrees F.

1.08 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. Provide five year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same. Include coverage for degradation of color finish.

PART 2 PRODUCTS
2.01 MANUFACTURERS
A. Vinyl Windows:
   1. Alside, Inc.
   2. Pella Corporation.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DESCRIPTION
A. Vinyl Windows: Factory fabricated frame and sash members of extruded, hollow, ultra-violet-resistant, polyvinyl chloride (PVC) with integral color; with factory-installed glazing, hardware, related flashings, anchorage and attachment devices.
   1. Configuration: As indicated on drawings.
   3. Size to fit openings with minimum clearance around perimeter of assembly providing necessary space for perimeter seals.
   4. Framing Members: Fusion welded corners and joints, with internal reinforcement where required for structural rigidity; concealed fasteners.
   5. System Internal Drainage: Drain to exterior side by means of weep drainage network any water entering joints, condensation within glazing channel, or other migrating moisture within system.
7. Mounting Flange: Integral to frame assembly, providing weather stop at entire perimeter of frame.

8. Insect Screens: Tight fitting for operating sash location.

2.03 PERFORMANCE REQUIREMENTS
A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:
   1. Performance Class (PC): R.
B. Design Pressure: In accordance with applicable codes.
C. Condensation Resistance Factor: CRF of 50, minimum, the lower value of the glass and frame window components and determined in accordance with AAMA 1503.
D. Overall Thermal Transmittance (U-value): 0.35, maximum, including glazing, measured on window sizes required for this project.

2.04 COMPONENTS
A. Glazing: Insulated triple pane, annealed glass, clear, low-E coated, argon filled, with glass thicknesses as recommended by manufacturer for specified wind conditions.
B. Frame Depth: Manufacturer's standard.
C. Insect Screens: Aluminum, extruded or roll-formed frame with mitered and reinforced corners; apply screen mesh taut to frame; secure to window with hardware to allow easy removal.
   1. Hardware: Manufacturer's standard; quantity as required per screen.
   2. Screen Mesh: Vinyl-coated fiberglass, window manufacturer's 18 x 16 mesh.
   3. Frame Finish: Manufacturer's standard, color to match window frame and sash color.
   4. Polycarbonate Glazing Protection: Shall consist of polycarbonate sheet attached to vinyl windows with aluminum frame as detailed on Contract Drawings. Installation shall provide for ventilation and moisture release between window glazing and polycarbonate sheet. Screws in mounting frame shall be oversized to allow for thermal movement. See drawings for location where polycarbonate to be installed, both at exterior and interior windows.
D. Fasteners: Galvanized steel.
E. Accessories: Provide related flashings, anchorage and attachment devices as necessary for full assembly.
F. Sealants for Setting Window Sill Pan Flashing: Provide butyl tape, non-hardening butyl, polyurethane, or silicone sealant; in compliance with ASTM E2112 installation practices.

2.05 HARDWARE
A. Sash lock: Lever handle and keeper with cam lock, provide at least one for each operating sash.
B. Casement/Awning Sash: Steel rotary arm sash operating mechanism with fold-down handle and two bar adjustable hinges and keepers fitted to projecting sash arms with limit stops.
C. Projecting Sash Arms: Cadmium plated steel, friction pivot joints with nylon bearings, removable pivot clips for cleaning.
D. Projecting Sash Lock: Single lever, multi-point, locking mechanism.
E. Finish of Exposed Hardware: Baked enamel, match interior sash and frame color.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify wall openings and adjoining air and vapor seal materials are ready to receive this work.

3.02 INSTALLATION
A. Install window unit assemblies in accordance with manufacturers instructions and applicable building codes.
B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities as necessary.
C. Align window plumb and level, free of warp or twist, and maintain dimensional tolerances and alignment with adjacent work.
D. 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: 0.06 inches every 3 ft non-cumulative or 0.5 inches per 100 ft, whichever is less.

3.04 ADJUSTING
A. Adjust hardware for smooth operation and secure weathertight closure.

3.05 CLEANING
A. Remove protective material from pre-finished 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 manufacturer and appropriate for application indicated.

END OF SECTION
SECTION 08 5659
SERVICE AND TELLER WINDOW UNITS

PART 1  GENERAL

1.01  SECTION INCLUDES
   A. Service and teller window units.

1.02  ADMINISTRATIVE REQUIREMENTS
   A. Coordinate work with adjacent materials specified in other sections and as indicated on
drawings and approved shop drawings.

1.03  SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Submit manufacturer's product data for specified products indicating
   materials, operation, glazing, finishes, and installation instructions.
   C. Shop Drawings: Indicate configuration, sizes, rough-in, mounting, anchors and fasteners,
   and installation clearances.
   D. Samples for Selection of Finishes:
      1. Applied Finishes: Color charts for factory finishes.
   E. Manufacturer Qualification Statement.
   F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in
Southcentral Foundation's name and registered with manufacturer.

1.04  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.

1.05  DELIVERY, STORAGE, AND HANDLING
   A. Deliver units in manufacturer's original packaging and unopened containers with
identification labels intact.
   B. Store units in area protected from exposure to weather and vandalism.

1.06  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. Ready Access, Inc.
      2. C.R. Laurance.
      3. Substitutions: See Section 01 6000 - Product Requirements.
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: Sliding, single horizontal.
      3. Window Size: As indicated on drawings.
      5. Header: Manufacturer's standard type.
      6. Sill: As indicated on drawings.
   D. Glazing: Single (monolithic), 1/4 inch thick, clear.
      1. Tempered safety glazing.

2.03 ASSEMBLY COMPONENTS
   A. Windows: Factory-fabricated, finished, and glazed, with vinyl 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. Apply factory finish to exposed surfaces.

2.04 MATERIALS
   A. Frame: Vinyl

2.05 FINISHES
   A. Color: To be selected by Architect from manufacturer's standard range.

2.06 ACCESSORIES
   A. Hardware and Security Devices for Sliding Windows:
      1. Handles: Manufacturer's standard profile and finish.

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 7100
DOOR HARDWARE

PART 1  GENERAL

1.01  SECTION INCLUDES
   A.  Hardware for wood and hollow metal doors.
   B.  Hardware for fire-rated doors.
   C.  Thresholds.
   D.  Weatherstripping and gasketing.

1.02  RELATED REQUIREMENTS
   A.  Section 08 1113 - Hollow Metal Doors and Frames.

1.03  REFERENCE STANDARDS
   B.  BHMA (CPD) - Certified Products Directory; 2017.
   E.  BHMA A156.3 - American National Standard for Exit Devices; 2014.
   F.  BHMA A156.4 - American National Standard for Door Controls - Closers; 2013.
   G.  BHMA A156.5 - American National Standard for Cylinders and Input Devices for Locks; 2014.
   H.  BHMA A156.6 - American National Standard for Architectural Door Trim; 2015.
   I.  BHMA A156.8 - American National Standard for Door Controls - Overhead Stops and Holders; 2015.
   J.  BHMA A156.16 - American National Standard for Auxiliary Hardware; 2013.
   O.  ITS (DIR) - Directory of Listed Products; current edition.
   Q.  NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2016.
   S.  UL (DIR) - Online Certifications Directory; Current Edition.
1.04 ADMINISTRATIVE REQUIREMENTS
   A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

1.05 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. 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.
   C. 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.
   D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
   E. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
   F. Maintenance Materials and Tools: Furnish the following for Southcentral Foundation's use in maintenance of project.
      1. See Section 01 6000 - Product Requirements, for additional provisions.
      2. Lock Cylinders: Ten for each master keyed group.
      3. Tools: One set of each special wrench or tool applicable for each different or special hardware component, whether supplied by hardware component manufacturer or not.

1.06 QUALITY ASSURANCE
   A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.

1.07 DELIVERY, STORAGE, AND HANDLING
   A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.08 WARRANTY
   A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
   B. Warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion.
      1. Closers: Five years, minimum.
      2. Exit Devices: Five years, minimum.
      3. Locksets and Cylinders: Three years, minimum.
      4. 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.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Provide door hardware products that comply with the following requirements:
   1. Applicable provisions of federal, state, and local codes.
   2. 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.
   3. Hardware on Fire-Rated Doors: Listed and classified by UL (DIR) or ITS (DIR) as suitable for application indicated.
   4. Auxiliary Hardware: BHMA A156.16.

D. Fasteners:
   1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
      a. Aluminum fasteners are not permitted.
      b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
   2. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
      a. Self-drilling (Tek) type screws are not permitted.
   3. Fire-Rated Applications: Comply with NFPA 80.
      a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
      b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.

2.02 HINGES

A. Manufacturers:
   1. McKinney; an Assa Abloy Group company
   2. C. R. Laurence Co., Inc
   3. Stanley, dormakaba Group

B. Hinges: Comply with BHMA A156.1, Grade 1.
   1. Provide hinges on every swinging door.
   2. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
   3. Provide non-removable pins on exterior outswinging doors.
   4. Provide following quantity of butt hinges for each door:
      a. Doors From 60 inches High up to 90 inches High: Three hinges.
2.03 FLUSH BOLTS
   A. Flush Bolts: Comply with BHMA A156.16, Grade 1.

2.04 EXIT DEVICES
   A. Manufacturers:
      1. C. R. Laurence Company, Inc
      2. Hager Companies
      3. Stanley, dormakaba Group
      4. Substitutions: See Section 01 6000 - Product Requirements.
   B. 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.

2.05 LOCK CYLINDERS
   A. Manufacturers:
      1. Best, dormakaba Group
      2. Substitutions: See Section 01 6000 - Product Requirements.
   B. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
      1. Provide cylinders from same manufacturer as locking device.
      2. Provide cams and/or tailpieces as required for locking devices.

2.06 CYLINDRICAL LOCKS
   A. Manufacturers:
      1. Best, dormakaba Group
      2. Hager Companies
      3. Stanley, dormakaba Group
   B. 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.
      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.
      5. Provide a lock for each door, unless otherwise indicated that lock is not required.
6. Provide an office lockset for swinging door where hardware set is not indicated.
7. Trim: Provide lever handle or pull trim on outside of each lock, unless otherwise indicated.

2.07 DOOR PULLS AND PUSH PLATES

A. Manufacturers:
   1. Hager Companies
   2. Pamex, Inc
   3. Trimco
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Door Pulls and Push Plates: Comply with BHMA A156.6.
   1. Pull Type: Straight, unless otherwise indicated.
   2. Push Plate Type: Flat, with square corners, unless otherwise indicated.
      a. Edges: Beveled, unless otherwise indicated.
   3. Material: Aluminum, unless otherwise indicated.

2.08 DOOR PULLS AND PUSH BARS

A. Manufacturers:
   1. Rockwood; an Assa Abloy Group company
   2. Hager Companies
   3. Trimco

B. Door Pulls and Push Bars: Comply with BHMA A156.6.
   1. Bar Type: Bar set, unless otherwise indicated.
   2. Material: Aluminum, unless otherwise indicated.

2.09 CLOSERS

A. Manufacturers; Surface Mounted:
   1. C. R. Laurence Company, Inc
   2. Hager Companies
   3. Stanley, dormakaba Group

B. Closers: Comply with BHMA A156.4, Grade 1.
   1. Type: Surface mounted to door.
   2. Provide door closer on each exterior door.
   3. Provide door closer on each fire-rated and smoke-rated door.
      a. Spring hinges are not an acceptable self-closing device, unless otherwise indicated.
   4. At corridor entry doors, mount closer on room side of door.
   5. At outswinging exterior doors, mount closer on interior side of door.
2.10 OVERHEAD STOPS AND HOLDERS
   A. Overhead Stops and Holders (Door Checks): Comply with BHMA A156.8, Grade 1.
      1. Provide stop for every swinging door, unless otherwise indicated.
      2. Stop is not required if positive stop feature is specified for door closer; positive stop feature of door closer is not an acceptable substitute for a stop, unless otherwise indicated.

2.11 PROTECTION PLATES
   A. Manufacturers:
      1. Hager Companies.
      2. Substitutions: See Section 01 6000 - Product Requirements.
   B. Protection Plates: Comply with BHMA A156.6.
   C. Metal Properties: Stainless steel.
      1. Metal, Standard Duty: Thickness 0.05 inch, minimum.
   D. Edges: Beveled, on four sides unless otherwise indicated.
   E. Fasteners: Countersunk screw fasteners.
   F. Provide clear anti-microbial coating that is silver ion-based.

2.12 KICK PLATES
   A. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
      1. Size: 8 inch high by 2 inch less door width (LDW) on push side of door.

2.13 STRETCHER PLATES
   A. Manufacturers:
      1. Ives, an Allegion brand.
      2. Trimco.
      3. Substitutions: See Section 01 6000 - Product Requirements.
   B. Stretcher Plates: Provide along middle of push side and pull side of doors to provide protection from stretcher hitting door and damaging door surface.
      1. Size: 6 inch high by 1-1/2 inch less door width (LDW) on pull side and 2 inch LDW on push side of door.

2.14 DOOR HOLDERS
   A. Door Holders: Comply with BHMA A156.16, Grade 1.
      1. Type: Lever, or kick down stop, with rubber bumper at bottom end.

2.15 FLOOR STOPS
   A. Floor Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
      1. Type: Manual hold-open, with dome floor stop.

2.16 WALL STOPS
A. Manufacturers:
1. Hager Companies
2. Hiawatha, Inc, division of Activar Construction Products Group, Inc.
3. Trimco.
B. Wall Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
1. Type: Bumper, convex, wall stop.

2.17 THRESHOLDS
A. Thresholds: Comply with BHMA A156.21.
1. Provide threshold at each exterior door, unless otherwise indicated.
2. Type: Adjustable.
4. Threshold Surface: Thermally broken.
5. Field cut threshold to profile of frame and width of door sill for tight fit.
6. Provide non-corroding fasteners at exterior locations.

2.18 WEATHERSTRIPPING AND GASKETING
A. Manufacturers:
1. Pemko; an Assa Abloy Group company
2. Hager Companies.
3. National Guard Products, Inc.
4. Substitutions: See Section 01 6000 - Product Requirements.
B. Weatherstripping and Gasketing: Comply with BHMA A156.22.
1. Head and Jamb Type: Interlocking.
2. Door Sweep Type: Encased in retainer.
3. Material: Aluminum, with brush weatherstripping.
4. Provide gasketing for smoke and draft control doors (Indicated as "S" on Drawings) that complies with local codes, requirements of assemblies tested in accordance with UL 1784.
5. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated.
6. Provide door bottom sweep on each exterior door, unless otherwise indicated.

2.19 COAT HOOKS
A. Coat Hooks: Provide on room side of door, screw fastened.
B. Material: Stainless steel.
2.20 SILENCERS
   A. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
      1. Single Door: Provide three on strike jamb of frame.

2.21 FIRE DEPARTMENT LOCK BOX
   A. Fire Department Lock Box:
      2. Finish: Manufacturer's standard dark bronze.

2.22 FINISHES
   A. Finishes: As indicated drawings.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

3.02 INSTALLATION
   A. Install hardware in accordance with manufacturer's instructions and applicable codes.
   B. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.
   C. Install hardware for smoke and draft control doors in accordance with NFPA 105.
   D. Use templates provided by hardware item manufacturer.
   E. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item.
      1. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.
   F. 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.

3.03 FIELD QUALITY CONTROL
   A. Perform field inspection and testing under provisions of Section 01 4000 - Quality Requirements.

3.04 ADJUSTING
   A. Adjust work under provisions of Section 01 7000 - Execution and Closeout Requirements.
   B. Adjust hardware for smooth operation.
   C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.05 CLEANING
   A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.
   B. Clean adjacent surfaces soiled by hardware installation.
C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.06 PROTECTION

A. Protect finished Work under provisions of Section 01 7000 - Execution and Closeout Requirements.

B. Do not permit adjacent work to damage hardware or finish.

END OF SECTION
SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Metal stud wall framing.
B. Acoustic insulation.
C. Gypsum sheathing.
D. Gypsum wallboard.
E. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS
A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
B. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.
C. Section 07 2100 - Thermal Insulation: Acoustic insulation.

1.03 REFERENCE STANDARDS
F. 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; 2016.
L. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
M. 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.

1.05 QUALITY ASSURANCE
A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum three years of experience.

PART 2 PRODUCTS

2.01 METAL FRAMING MATERIALS
A. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. ClarkDietrich
   2. SCAFCO Corporation
   3. Steel Construction Systems
   4. Substitutions: See Section 01 6000 - Product Requirements.
B. 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. Runners: U shaped, sized to match studs.

2.02 BOARD MATERIALS
A. Manufacturers - Gypsum-Based Board:
   1. American Gypsum Company
   2. CertainTeed Corporation
   3. Georgia-Pacific Gypsum
   4. 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. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. Mold Resistant Paper Faced Products:
      a. American Gypsum Company
      b. CertainTeed Corporation
      c. Georgia-Pacific Gypsum
      d. Substitutions: See Section 01 6000 - Product Requirements.

2.03 GYPSUM WALLBOARD ACCESSORIES
A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3 inch.
B. 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.
b. Liquid Nails, a brand of PPG Architectural Coatings; AS-825 Acoustical Sound Sealant.
c. Substitutions: See Section 01 6000 - Product Requirements.

C. 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, except as otherwise indicated.
   2. Products:
      a. Continental Building Products
      b. US Gypsum.
      c. Substitutions: See Section 01 6000 - Product Requirements.

D. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION
A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.
B. 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 top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
D. Acoustic Furring: Install resilient channels at maximum 24 inches on center. Locate joints over framing members.
E. Blocking: Install wood blocking for support of:
   1. Framed openings.
   2. Wall-mounted cabinets.
   3. Plumbing fixtures.
   4. Toilet accessories.
3.03 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. Acoustic Sealant: Install in accordance with manufacturer's instructions.
      1. Place one bead continuously on substrate before installation of perimeter framing members.

3.04 BOARD INSTALLATION
   A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

3.05 INSTALLATION OF TRIM AND ACCESSORIES
   A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
   B. Corner Beads: Install at external corners, using longest practical lengths.

3.06 JOINT TREATMENT
   A. 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 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.
   B. 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.
   C. 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.

3.07 TOLERANCES
   A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION
PART 1  GENERAL

1.01  SECTION INCLUDES

   A. Metal partition and ceiling framing.
   B. Framing accessories.

1.02  RELATED REQUIREMENTS

   A. Section 06 1000 - Rough Carpentry.
   B. Section 07 2100 - Thermal Insulation: Acoustic insulation.
   C. Section 07 9200 - Joint Sealants.
   D. Section 08 1113 - Hollow Metal Doors and Frames
   E. Section 08 1416 - Flush Wood Doors
   F. Section 09 2116 - Gypsum Board Assemblies.

1.03  REFERENCE STANDARDS

   E. 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; 2016.
   G. ASTM E413 - Classification for Rating Sound Insulation; 2016.

1.04  SUBMITTALS

   A. See Section 01 3000 - Administrative Requirements for submittal procedures.
   B. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.
   C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
   D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.05  QUALITY ASSURANCE

PART 2  PRODUCTS

2.01  MANUFACTURERS

   A. Metal Framing, Connectors, and Accessories:
1. ClarkDietrich.
2. R-stud, LLC.
3. SCAFCO Corporation.
4. Substitutions: See Section 01 6000 - Product Requirements.

### 2.02 FRAMING MATERIALS

A. Fire 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. Runners: U shaped, sized to match studs.
3. Resilient Sound Isolation Clips: Steel resilient clips with molded rubber isolators, attaches to framing; improves noise isolation for areas between gypsum board assemblies and adjacent sources of noise.
   a. Products: 
      1) Pliteq, Inc.
      2) Substitutions: See Section 01 6000 - Product Requirements.

C. 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 braced with continuous bridging on both sides.

D. Deflection and Firestop Track: Intumescent strip factory-applied to track flanges expands when exposed to heat or flames to provide a perimeter joint seal.

1. Products: 
   a. ClarkDietrich.
   b. Substitutions: See Section 01 6000 - Product Requirements.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that rough-in utilities are in proper location.

#### 3.02 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. Place one bead of acoustic sealant between studs and adjacent vertical surfaces.
F. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
G. Align stud web openings horizontally.
H. Secure studs to tracks using crimping method. Do not weld.
I. Stud splicing is permissible; splice studs with 8 inch nested lap, secure each stud flange with flush head screw.
J. Fabricate corners using a minimum of three studs.
K. Install double studs at wall openings, door and window jambs, not more than 2 inches from each side of openings.
L. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.
M. Sound Isolation Clips: Mechanically attach to framing or structure with fasteners recommended by clip manufacturer. Install at spacing indicated on drawings.

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 6500
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Resilient sheet flooring.
   B. Resilient base.
   C. Installation accessories.

1.02 REFERENCE STANDARDS

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.
   C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.
   D. Verification Samples: Submit two samples, 6 by 6 inch in size illustrating color and pattern for each resilient flooring product specified.
   E. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.

1.04 QUALITY ASSURANCE
   A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

1.05 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 per manufacturer's recommendation.
   E. Do not double stack pallets.

1.06 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. Vinyl Sheet Flooring: Homogeneous without backing, with color and pattern throughout full thickness.
   1. Manufacturers:
      a. Armstrong Flooring, Inc.
      b. Shannon Specialty Floors, Inc.
      c. Substitutions: See Section 01 6000 - Product Requirements.
   3. Thickness: 0.080 inch nominal.
   4. Sheet Width: 49 inch minimum.
   5. Static Load Resistance: 250 psi minimum, when tested as specified in ASTM F970.
   6. Color: To be selected by Architect from manufacturer's full range.

2.02 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove.
   1. Manufacturers:
      a. Burke Flooring
      b. Johnsonite, a Tarkett Company
      c. Roppe Corp
      d. Substitutions: See Section 01 6000 - Product Requirements.
   2. Height: 4 inch.
   3. Thickness: 0.125 inch.
   5. Color: Color as selected from manufacturer's standards.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. 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. Verify that required floor-mounted utilities are in correct location.

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. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

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.

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.

3.06 CLEANING
A. Remove excess adhesive from floor, base, and wall surfaces without damage.
B. Clean in accordance with manufacturer’s written instructions.

3.07 PROTECTION
A. Prohibit traffic on resilient flooring for 48 hours after installation.

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. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. 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. Glass.
   8. Concealed pipes, ducts, and conduits.

1.02  RELATED REQUIREMENTS

1.03  REFERENCE STANDARDS

D. SSPC-SP 2 - Hand Tool Cleaning; 2018.

1.04  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.

C. Samples: Submit two paper chip samples, 3x3 inch in size illustrating range of colors and textures available for each surface finishing product scheduled.

D. Manufacturer's Instructions: Indicate special surface preparation procedures.

E. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

F. Maintenance Materials: Furnish the following for Southcentral Foundation'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.

1.05 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.

1.06 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. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.

D. 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. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.

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.

C. Colors: To be selected from manufacturer's full range of available colors.
   1. Selection to be made by Architect after award of contract.

2.03 PAINT SYSTEMS - INTERIOR

A. Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board and wood.
   1. Two top coats and one coat primer.
   2. Top Coat(s): High Performance Architectural Interior Latex; MPI #138, 139, 140, or 141.
   3. Top Coat Sheen:
      a. Flat: MPI gloss level 1; use this sheen for ceilings and other overhead surfaces.
      b. Satin: MPI gloss level 4; use this sheen at all locations.
      c. Semi-Gloss: MPI gloss level 5; use this sheen at Laundry, utility, and restrooms.
   4. Primer: As recommended by top coat manufacturer for specific substrate.

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
   1. Interior Drywall Primer Sealer.
      a. Products:
         1) Behr Premium Plus Interior Drywall Primer and Sealer [No. 73].
         2) PPG Paints Speedhide Pro-EV Latex Sealer, 12-900.
         3) Substitutions: Section 01 6000 - Product Requirements.

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 effect 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 are below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

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. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

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. Sand wood and metal surfaces lightly between coats to achieve required finish.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING
A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION
A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION
SECTION 10 1400
SIGNAGE

PART 1  GENERAL

1.01  SECTION INCLUDES
A. Room and door signs.
B. Emergency evacuation maps.
C. Building identification signs.

1.02  REFERENCE STANDARDS

1.03  SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
C. 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 Southcentral Foundation through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
   3. Submit for approval by Southcentral Foundation through Architect prior to fabrication.
D. 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.
E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.
F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.04  QUALITY ASSURANCE

1.05  DELIVERY, STORAGE, AND HANDLING
A. Package signs as required to prevent damage before installation.
B. Package room and door signs in sequential order of installation, labeled by floor or building.
C. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flat Signs:
   1. Best Sign Systems, Inc
   2. Cosco Industries
   3. Inpro
   4. Mohawk Sign Systems, Inc

B. Dimensional Letter Signs:
   1. Cosco Industries; Cast Aluminum
   2. Gemini.

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. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.

   1. Sign Type: Flat signs with engraved panel media as specified.
   2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
   3. Character Height: 1 inch, unless noted otherwise.
   4. Sign Height: 3 inches, unless otherwise indicated.

   5. Office Doors: Identify with room numbers to be determined later, not the numbers indicated on drawings; in addition, provide "window" section for replaceable occupant name.
   6. Conference and Meeting Rooms: Identify with room numbers to be determined later, not the numbers indicated on drawings; in addition, provide "window" section with sliding "In Use/Vacant" indicator.
   7. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.
   8. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.

C. Emergency Evacuation Maps:

   1. Map content to be provided by Southcentral Foundation.
   2. Use clear plastic panel silk-screened on reverse, in brushed aluminum frame, screw-mounted.
D. Building Identification Signs:
   1. Use individual metal letters.
   2. Mount on outside wall in location indicated on drawings.
E. Traffic Signs: To match campus standards.
   1. For Parking lot restrictions and access.

2.03 SIGN TYPES
A. Flat Signs: Signage media without frame.
   1. Edges: Square.
   2. Corners: Square.
B. Color and Font: Unless otherwise indicated:
   1. Character Font: Helvetica, Arial, or other sans serif font.
   2. Character Case: Upper case only.

2.04 DIMENSIONAL LETTERS
A. Metal Letters:
   1. Metal: Aluminum casting.
   3. Letter Height: 12 inches.
   5. Mounting: Concealed screws.

2.05 ACCESSORIES
A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.
B. Exposed Screws: Chrome plated.
C. 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 2600
WALL AND DOOR PROTECTION

PART 1  GENERAL

1.01  SECTION INCLUDES
   A.  Corner guards.

1.02  RELATED REQUIREMENTS
   A.  Section 05 5000 - Metal Fabrications:  Corner guards fabricated from rolled metal sections or bent plate.

1.03  REFERENCE STANDARDS

1.04  SUBMITTALS
   A.  See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B.  Product Data:  Indicate physical dimensions, features, anchorage details, and rough-in measurements.
   C.  Samples:  Submit samples illustrating component design, configurations, joinery, color and finish.
      1.  Submit two sections of corner guards, 10 inches long.

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 moisture damage.
   C.  Protect work from UV light damage.
   D.  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.
   E.  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.

PART 2  PRODUCTS

2.01  MANUFACTURERS
   A.  Corner Guards:
1. Babcock-Davis
2. Inpro
3. Nystrom, Inc
4. 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. Corner Guards - Flush Mounted:
   1. Material: Type 304 stainless steel, No. 4 finish.
   2. Performance: Resist lateral impact force of 100 lbs at any point without damage or permanent set.
   3. Width of Wings: 2 inches.

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.

3.02 INSTALLATION

A. Install components in accordance with manufacturer’s instructions, level and plumb, secured rigidly in position to supporting construction.
B. Position corner guard 4 inches above finished floor to 52 inches high.

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. Commercial shower and bath accessories.
C. Institutional ligature-resistant toilet accessories.
D. Healthcare accessories.
E. Under-lavatory pipe supply covers.
F. Electric hand/hair dryers.
G. Diaper changing stations.
H. Utility room accessories.

1.02  REFERENCE STANDARDS

B. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011.
D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

1.03  ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.04  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.
C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.
PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
   1. AJW Architectural Products
   2. American Specialties, Inc
   3. Bradley Corporation

B. Healthcare Accessories:
   1. Bobrick Washroom Equipment, Inc.

C. Diaper Changing Stations:
   1. American Specialties, Inc
   2. Koala Kare Products
   3. Safe-Strap Company, Inc
   4. 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.
   1. Grind welded joints smooth.

B. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

C. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.03 FINISHES

A. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.

2.04 COMMERCIAL TOILET ACCESSORIES

A. Toilet Paper Dispenser: Single roll, surface mounted bracket type, stainless steel, spindleless type for tension spring delivery designed to prevent theft of tissue roll.

B. Paper Towel Dispenser: Electric, roll paper type.
   2. Paper Discharge: Touchless automatic.
   3. Capacity: 8 inch diameter roll.
   5. Power: AC power adapter.

C. Waste Receptacle: Stainless steel, freestanding style with swing top.

D. 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.

E. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.
   1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
   2. Frame: 0.05 inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.

F. Grab Bars: Stainless steel, textured surface.
   1. Standard Duty Grab Bars:
      a. Push/Pull Point Load: 500 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.

2.05 COMMERCIAL SHOWER AND BATH ACCESSORIES

A. Shower Curtain Rod: Stainless steel tube, 1 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick satin-finished stainless steel flanges, for installation with exposed fasteners.

B. Shower Curtain:
   1. Material: Cotton, machine washable, and mildew-resistant.
   2. Size: 36 by 72 inches, hemmed edges.
   3. Grommets: Stainless steel; pierced through top hem on 6 inch centers.
   5. Shower Curtain Hooks: Chrome-plated or stainless steel spring wire designed for snap closure.

C. Towel Bar: Stainless steel, 3/4 inch square tubular bar; rectangular brackets, concealed attachment, satin finish.
   1. Length: 18 inches.

D. Robe Hook: Heavy-duty stainless steel, double-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.

2.06 HEALTHCARE ACCESSORIES

A. Specimen Pass Thru Cabinet
   1. Cabinet: 18-8, type-304, 22-gauge stainless steel. All-welded construction. Exposed surfaces have satin finish. Two slots located on top and bottom for mounting.
   2. Flanges (2) — 18-8, type-304, 22-gauge (0.8mm) stainless steel with satin finish. Drawn and beveled, one-piece, seamless construction. One mounting tab with screw hole located on top and bottom.
   3. Doors (2) — 18-8, type-304, 18-gauge (1.2mm) stainless steel with satin finish. Each door is spring-loaded and secured to cabinet with a full-length stainless steel
piano-hinge. Doors equipped with cast-aluminum pull knob, interlocking mechanism, and international graphic symbol identifying specimen cabinet.

4. Spillage Tray — 18-8, type-304, 24-gauge (0.6mm) stainless steel. All-welded construction

2.07 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. 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.
   4. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.

2.08 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: Polyethylene.

2.09 UTILITY ROOM ACCESSORIES

A. 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. Mop/broom holders: Four spring-loaded rubber cam holders at shelf front.
   2. Length: Manufacturer's standard length for number of holders/hooks.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.
B. Verify exact location of accessories for installation.
C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.

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
   D. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Provide extinguisher ratings and classifications.

1.05 FIELD CONDITIONS
   A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS
2.01 MANUFACTURERS
   A. Fire Extinguishers:
      1. Ansul, a Tyco Business
      2. Kidde, a unit of United Technologies Corp
      3. Nystrom, Inc
      4. Substitutions: See Section 01 6000 - Product Requirements.
   B. Fire Extinguisher Cabinets and Accessories:
      1. Ansul, a Tyco Business
      2. Kidde, a unit of United Technologies Corp
      3. Nystrom, Inc

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. Size and classification as scheduled.
   2. Finish: Baked polyester powder coat, Red color.

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. Fire Rated Cabinet Construction: One-hour fire rated.
   C. Cabinet Configuration: Semi-recessed type.
      1. Size to accommodate accessories.
   D. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinge.
   E. Door Glazing: Tempered 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. Weld, fill, and grind components smooth.
   H. Finish of Cabinet Exterior Trim and Door: No. 4 - Brushed stainless steel.
   I. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES
   A. Extinguisher Brackets: Formed steel, chrome-plated.
   B. Lettering: FIRE EXTINGUISHER decal, or vinyl self-adhering, pre-spaced black lettering in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify existing conditions before starting work.
   B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION
   A. Install in accordance with manufacturer's instructions.

END OF SECTION
SECTION 12 3600
COUNTERTOPS

PART 1  GENERAL

1.01  SECTION INCLUDES
   A. Countertops for manufactured casework.

1.02  RELATED REQUIREMENTS
   A. Section 12 3553.19 - Wood Laboratory Casework: Laboratory countertops.

1.03  REFERENCE STANDARDS
   E. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
   F. PS 1 - Structural Plywood; 2009.
   G. SEFA 2 - Installations; 2010.
   H. SEFA 3 - Laboratory Work Surfaces; 2010.

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, including:
      1. Preparation instructions and recommendations.
      2. Storage and handling requirements and recommendations.
      3. Specimen warranty.
   C. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.

1.05  DELIVERY, STORAGE, AND HANDLING
   A. Store products in manufacturer's unopened packaging until ready for installation.
   B. 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. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Quality Standard: SEFA 3 for laboratory worksurfaces.

C. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
   1. Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.
      a. Manufacturers:
         1) Formica Corporation
         2) Panolam Industries International, Inc; Nevamar Standard HPL
         3) Wilsonart
         4) Substitutions: See Section 01 6000 - Product Requirements.
      b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      c. Finish: Matte or suede, gloss rating of 5 to 20.
      d. Surface Color and Pattern: As selected by Architect from the manufacturer's full line.
   2. Exposed Edge Treatment: Square, substrate built up to minimum 1-1/4 inch thick; covered with matching laminate.
   3. Back and End Splashes: Same material, same construction.

2.02 MATERIALS

A. Wood-Based Components:
   1. Wood fabricated from old growth timber is not permitted.

B. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.

C. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

2.03 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
   1. Join lengths of tops using best method recommended by manufacturer.
   2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
   3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
2. Height: 4 inches, unless otherwise indicated.

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.
C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

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. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.
C. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES
A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.
B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.
C. Field Joints: 1/8 inch wide, maximum.

3.05 CLEANING
A. Clean countertops surfaces thoroughly.

3.06 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 15 01 00

BASIC MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes basic mechanical requirements, basic mechanical methods, restricted materials, motors for mechanical equipment, vibration isolation, seismic restraint, painting of mechanical systems and mechanical systems testing.

B. Related Sections:
   1. Division 1: All sections of Division 1 as they pertain to general contract requirements.
   2. Division 9 - Painting: Painting of mechanical systems.
   3. Division 16: Electrical requirements for mechanical equipment.

1.02 SUBMITTALS

A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
   1. Mechanical submittals shall be submitted complete and all at one time. Partial submittals will not be considered and will be returned without review. In some cases the Owner's Representative may review partial submittals where early ordering of some equipment is essential to the project. Review of such partial submittals is at the discretion of the Owner's Representative. Any project delay due to the Contractor's failure to make complete submittals shall be the responsibility of the Contractor. Submittals shall be compiled in a notebook. The data shall be arranged and indexed by specification sections.
   2. Catalog sheets shall be complete and the item or model proposed for use by the Contractor shall be clearly marked and identified as to which item in the specifications or on the drawings is being submitted.

1.03 CLOSEOUT SUBMITTALS

A. Contract Closeout Requirements: In addition to contract closeout requirements as outlined under Division 1, mechanical contract closeout requirements shall include the following:
   1. Record Documents:
      a. Record Drawings.
      b. Operation & Maintenance Manuals.
   2. Testing Reports.
   3. Equipment Startup Reports.
   4. Balancing Reports.
   5. Operation & Maintenance Instruction.

1.04 RECORD DOCUMENTS

A. Record Drawings: In addition to record drawing requirements as outlined under Division 1, mechanical record drawings shall include the following:
1. Any and all changes made in the field with respect to original design drawings.
2. Actual valve locations and valve tag identification.

B. Operation & Maintenance Manuals: In addition to Operation & Maintenance Manual requirements as outlined under Division 1, mechanical O&M manuals shall include the following:
   1. Product data for each piece of equipment including local supplier and local manufacturer's representative including address, phone number, and fax number.
   2. Manufacturers operation & maintenance instructions for each piece of equipment.
   3. Identification numbers for all parts and nearest source for obtaining parts.
   4. Summary of maintenance instructions to Owner.
   5. Periodic maintenance form.
   6. Testing reports.
   7. Equipment startup reports.

1.05 OPERATIONS AND MAINTENANCE INSTRUCTION

   A. Notification: The Contractor shall notify the Owner's Representative in a timely manner to schedule O&M instruction such that facility personnel may be present for such instruction.

   B. Instruction: The Contractor shall provide detailed instruction on the operation and maintenance requirements for all mechanical systems. Instruction shall include class time with maintenance personnel and thorough on-site observations and review of each mechanical system and applicable equipment.

1.06 SUBSTITUTIONS

   A. Product substitutions or alternates will not be reviewed for possible installation on this project during the bid phase or prior to a contract being awarded to a contractor.

   B. Substitution Requirements: In addition to substitution requirements as outlined under Division 1, mechanical material and equipment substitutions shall meet the following minimum requirements:

      1. Size: Proposed substitutions shall be of equivalent size and fit within available space with adequate service access as recommended by the equipment manufacturer.
      2. Performance: Proposed substitutions shall have equal or superior performance to specified equipment.
      3. Quality: Proposed substitutions shall be of equal or greater quality to specified equipment.
      4. Weight: Proposed substitutions shall be of equal weight to specified equipment or Contractor shall be responsible for modifications to structure as required for increased weight.
      5. Accessories and Options: Proposed substitutions shall be provided with appropriate accessories and options as required for a complete and operational system.
6. System Modifications: The Contractor shall be responsible for modifications to mechanical systems, electrical systems and building structure and finishes as required for implementing proposed substitute products.

1.07 REGULATORY REQUIREMENTS

A. Conform to applicable local codes and amendments including but not limited to the following.
   2. Uniform Plumbing Code (UPC) – Current Adopted Edition
   3. International Mechanical Code (IMC) – Current Adopted Edition

B. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., as suitable for the purpose specified and indicated.

C. Delivery, Storage and Handling

D. Materials shall be delivered, stored and handled at the project site to prevent damage and facilitate inspection.

E. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering.

1.08 RESTRICTED MATERIALS

A. Materials containing asbestos in any form are not allowed. Where materials or equipment provided by the Contractor are found to contain asbestos, such items shall be removed and replaced with non-asbestos items at no additional cost to the Owner.

B. Materials containing lead are not allowed. Where materials or equipment provided by the Contractor are found to contain lead, such items shall be removed and replaced with lead-free materials at no additional cost to the Owner.

1.09 BASIC MECHANICAL METHODS

A. Installation Instructions: Comply with manufacturer's published instructions for delivery, storage, protection, installation and materials.

B. Operation of Equipment during Construction: When equipment is operable and it is to the advantage of the Contractor to operate the equipment during construction, such equipment may be operated provided that the operation is properly supervised and the Contractor retains full responsibility for the equipment operated. Regardless of whether or not the equipment has or has not been operated, the Contractor shall properly clean the equipment, install new filter media, make all required adjustments and complete all punch list items before final acceptance by the Owner's Representative.

C. Service Access: Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing.
D. Access Doors: Where mechanical equipment requiring access (including valves) is located above GWB ceilings, within wall assemblies, or other non-readily accessible locations; access doors shall be provided. Access doors within areas of public occupancy shall be lockable type.

E. Mounting Heights: Where mounting heights are not detailed or dimensioned, install mechanical services and overhead equipment to provide the maximum headroom possible.

F. Exposed Systems: Items exposed (in areas without ceilings) shall be installed in a neat, orderly manner. Elements shall be perpendicular and parallel to building lines. Items exposed in normally occupied areas (not including mechanical rooms) shall be finished in accordance with specifications. In those conditions where ductwork is exposed in finished areas, careful craftsmanship and only the highest standards of installation will be acceptable. All routing of exposed ducts, pipes, conduits, shall be approved in advance by the Owner's Representative prior to installation.

1.10 DRAWINGS AND SPECIFICATIONS:

A. The Drawings indicate the general arrangement of systems and are to be followed insofar as possible. If substantial deviations from the layout are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted in writing to the Owner's Representative, for approval before proceeding with the work.

B. The Contractor shall make all measurements in the field and shall be responsible for correct fitting. Contractor shall coordinate this work with all other trades in such a manner as to cause a minimum of conflict or delay.

C. Where any work is placed as to cause or contribute to a conflict it shall be readjusted at the expense of the Contractor. The Owner's Representative's decision shall be final in regard to the arrangement of ducts, piping, etc, where conflict arises.

D. Where offsets in systems are required to complete the installation, or for the proper operation of the system, these shall be deemed to be included in the Contract.

E. Significant deviations from Drawings must be approved by the Owner's Representative.

F. Location of Mechanical Systems:
   1. Mechanical layouts indicated on drawings are diagrammatical. Exact locations of ducts, pipes and equipment may vary because of conflicts with work of other trades.
   2. Locate equipment requiring periodic servicing so that it is readily accessible. Do not back up service sides to walls, nor place it too close to other equipment to make service impractical.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials and equipment shall be new, unused and delivered to site in manufacturer's original packaging.

B. 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. Optional items shall be provided as required for proper installation unless noted otherwise. Manufacturer's identification shall be maintained for all equipment.
2.02 MOTORS

A. Motors: Motors for mechanical equipment shall be furnished by the equipment manufacturer, for the specific application and duty applied and as required to deliver rated horsepower without exceeding temperature ratings when operated on power systems with a combined variation in voltage and frequency not more than plus or minus 10% of rated voltage. Motors for pumps and fans shall be selected for non-overloading.

B. Motors shall be ECM type motors where scheduled.

C. Motors controlled by variable frequency drives shall be designed for variable frequency duty and meet NEMA Standard MG 1, part 31.

D. Electrical Characteristics: The Contractor shall verify from the drawings and specifications available electrical power characteristics and furnish equipment that will perform satisfactorily under the conditions as shown and specified.

E. Service Factor: Motors shall be sized for 1.15 service factor and not to exceed 40°C temperature rise above ambient.

F. Motors on belt driven equipment shall have slide rails with adjusting screws for belt tension adjustment. Motors exposed to the weather shall be weather-protected.

G. Fractional horsepower motors shall have self-resetting thermal overload switches.

H. Motor sound power levels shall not be greater than recommended in NEMA MG 1-12.49.

I. Provide motors with drive shafts long enough to extend completely through belt sheaves when sheaves are properly aligned or balanced.

2.03 VIBRATION ISOLATION

A. General: Rotating equipment shall be provided with vibration isolation with the exception of small in-line circulating pumps. Where mechanical equipment is provided with internal vibration isolation, external vibration isolation is not required unless specifically indicated on drawings.

B. Internal Vibration Isolation: Internal vibration isolation equipment shall be sized by the equipment manufacturer to provide appropriate isolation with respect to equipment rotating characteristics. Earthquake snubbers shall be provided where required.

C. External Vibration Isolation: External vibration isolation shall be provided where indicated on drawings. Vibration isolation equipment shall be sized by the manufacturer based equipment rotating characteristics to provide appropriate isolation. Earthquake snubbers shall be provided where required.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required and ready to receive work.

B. Report in writing to Owner's Representative prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.
C. By beginning work, the Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.02 INSTALLATION - GENERAL
A. Install in accordance with manufacturer's instructions.

3.03 INSTALLATION - MOTORS
A. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
B. Check line voltage and phase and ensure agreement with nameplate.
C. Make electrical connections and test motor for proper rotation/ phasing under Division 16.
D. Adjust motors together with driven equipment to ensure equipment is dynamically and statically balanced. Correct any excessive vibration or noise from the equipment.

3.04 SEISMIC RESTRAINT OF MECHANICAL EQUIPMENT
A. Seismically restrain equipment in accordance with the International Building Code and ASCE 7. Seismic restraint assemblies shall be premanufactured, or field fabricated, and secured to building structural components.

3.05 SEISMIC RESTRAINT OF PIPING AND DUCTWORK SYSTEMS
A. Seismically restrain all piping and ductwork systems in accordance with the SMACNA Seismic Restraint Manual - Guidelines for Mechanical Systems.
B. Seismic restraint shall be in accordance with Seismic Hazard Level (SHL) - A - of the SMACNA Seismic Restraint Manual.
C. General Requirements for Ductwork:
   1. Brace rectangular ducts with cross sectional areas of 6 square feet and larger. Brace flat oval ducts in the same manner as rectangular ducts. Brace round ducts with diameters of 28 inch and larger. Brace flat oval ducts the same as rectangular ducts of the same nominal size. Exception: No bracing is required if the duct is suspended by hangers 12 inches or less in length, as measured from the top of the duct to the bottom of the support where the hanger is attached. Hangers must be positively attached to the duct within 2 inches of the top of the duct with a minimum of two #10 sheet metal screws.
   2. Transverse bracing shall occur at the interval specified in the tables in Chapters 5, 6 and 7 of SMACNA manual or at both ends if the duct run is less than the specified interval. Transverse bracing shall be installed at each duct turn and at each end of the duct run, with a minimum of one brace at each end.
   3. Longitudinal bracing shall occur at the interval specified in the tables in Chapters 5, 6 and 7 of SMACNA manual with at least one brace per duct run. Transverse bracing for one duct section connected perpendicular to it if the bracing is installed within four feet of the intersection of the ducts and if the bracing is sized for the larger duct. Duct joints shall conform to SMACNA duct construction standards.
   4. A group of ducts may be combined in a larger frame so that the combined weights and dimensions of the ducts are less than or equal to the maximum weight and dimensions of the duct for which bracing details are selected.
5. Walls, including gypsum board nonbearing partitions, which have ducts running through them may replace a typical transverse brace. Provide solid blocking around duct penetrations at stud wall construction.

6. Unbraced ducts shall be installed with a 6 inch minimum clearance to vertical ceiling hanger wires.

D. General Requirements for Piping:

1. Bracing details, schedules and notes of SMACNA manual apply to all types of pipe, conduit and all types of joints. Exception: Piping suspended by individual hangers 12 inches or less in length, as measured from the top of the pipe to the bottom of the support where the hanger is attached, need not be braced.

2. Brace all fuel oil piping.

3. Brace all piping located in boiler room and mechanical equipment rooms that is 1 inch nominal diameter and larger.

4. Transverse bracing shall be at 40 feet maximum except where a lessor spacing is indicated in the tables for bracing of pipes.

5. Longitudinal bracing shall be at 80 feet maximum except where a lesser spacing is indicated in the tables of SMACNA manual. In pipes where thermal expansion is a consideration, an anchor point may be used as the specified longitudinal brace provided that it has a capacity equal to or greater than a longitudinal brace. The longitudinal braces and connections must be capable of resisting the additional force induced by expansion and contraction.

6. For fuel oil, the bracing details, schedules and notes of SMACNA manual may be used, except that transverse bracing shall be at 20 feet maximum and longitudinal bracing shall be 40 feet maximum.

7. Transverse bracing for one pipe section may also act as longitudinal bracing for a pipe section of the same size connected perpendicular to it if the bracing is installed within 24 inches of the elbow or tee.

8. Seismic braces for pipes on trapeze hangers may be used.

9. Provide flexibility in joints where pipes pass through building seismic joints or expansion joints where rigidly supported pipes connect to equipment with vibration isolators. For threaded piping, the flexibility may be provided by the installation of swing joints. For piping with manufactured ball joints, select the length of piping offset using seismic drift in place of the expansion given in the joint manufacturer's selection table. Seismic drift = 0.015 feet per foot of height above the base where seismic separation occurs.

10. Branch lines may not be used to brace main lines.

11. A rigid piping system shall not be braced to dissimilar parts of the building or to two dissimilar building systems that may respond differently during an earthquake.

12. Cast iron pipe of all types, glass pipe and any other pipe joined with a shield and clamp assembly, where the top of the pipe is 12 inches or more from the supporting structure, shall be braced on each side of a change in direction of 90° or more. Riser joints shall be braced or stabilized between floors.
3.06 PAINTING

A. Coordinate with Division 9.
B. Paint all piping, ductwork, mechanical equipment, hangers and associated appurtenances exposed within finished spaces (except chrome plated or stainless steel). Insulated piping, ductwork and equipment shall also apply. Furnished spaces shall include all spaces except the mechanical room, spaces above ceilings and attic spaces.
C. Paint mechanical equipment delivered to the site with prime coat.
D. Paint mechanical equipment supplied with factory finish where indicated within the contract documents to be field finished.
E. Wall mounted air registers, grilles and diffusers to be factory painted to match adjacent wall color.
F. GWB ceiling mounted air registers, grilles and diffusers to be factory painted to match adjacent ceiling color.
G. Paint access doors to match adjacent wall or ceiling color; or as directed by the Owner's Representative.
H. Paint piping and appurtenances exposed within casework; except chrome plated or stainless steel.
I. Paint fabricated mechanical support systems, other than galvanized.
J. Paint or touch-up, as directed by Owner's Representative, factory painted equipment damaged during shipment or installation.
K. Colors as directed by Owner's Representative.

3.07 TESTING

A. Testing Requirements: The Contractor shall test systems as specified herein and as required by local code and local authority having jurisdiction. The Contractor shall be responsible for all materials, equipment and costs associated with testing. The Contractor shall notify the Owner's Representative with respect to testing schedules in a timely manner such that personnel may be on site to witness testing if so desired by the Owner's Representative. Scheduling of testing with the local authority having jurisdiction shall be the responsibility of the Contractor. The Contractor shall submit testing reports to the Owner's Representative.
B. Test all domestic water, glycol heating water and other similar pressure piping systems hydrostatically at 100 PSI or 150 percent of working pressure, whichever is greater, for a period of 4 hours. Observe piping during this period and repair all leaks.
C. Building Drains, Vents - Water Test: Cap all openings, fill pipe to the highest opening and observe for no drop in water level for 1 hour. Repair all leaks. If freezing could occur in pipes to be tested, provide air test by forcing air into the system to 5 PSI. The pressure must remain for 1 hour without dropping. The gauge must be 0-15 PSI maximum, for high resolution.
D. Building Sewer: Plug the end of the building sewer at its point of connection and fill the system with water from the lowest to the highest point and observe for no leaks over one hour. A 5 PSI air test for 1 hour is an acceptable alternate if freezing could occur.
3.08 SYSTEMS ADJUSTMENT
   A. Systems shall be adjusted as necessary to ensure proper function of all controls, proper air distribution, elimination of drafts, noise and vibration. All systems shall be fully adjusted and in operating condition at final completion.

3.09 SYSTEMS DEMONSTRATION
   A. Notification: The Contractor shall notify and schedule demonstration of systems with the Owner's Representative such that appropriate personnel may be on site for demonstrations.
   B. Demonstration Personnel: The Contractor shall provide qualified personnel and materials on site as required to demonstrate systems.
   C. Demonstration: The Contractor shall demonstrate operation of all mechanical systems to the satisfaction of the Owner's Representative.

END OF SECTION
SECTION 15 06 00
HANGERS & SUPPORTS

PART 1 GENERAL

1.01 SUMMARY
A. Section includes piping, ductwork and equipment supports, hangers, anchors, bases sleeves and the sealing of work to adjacent construction.
B. Related Sections:
   1. Section 15 08 00 – Mechanical Insulation: Interface between insulation and support systems.
   2. Section 15 14 00 – Domestic Water Piping: Support of domestic water piping systems.
   3. Section 15 15 00 – Sanitary Waste and Vent Piping: Support of sanitary and vent piping systems.
   4. Section 15 18 00 – Hydronic Piping: Support of hydronic piping systems.
   5. Section 15 19 00 – Fuel Piping: Support of fuel piping systems.

1.02 REFERENCES
A. ASME B31.1 (American Society of Mechanical Engineers) - Power Piping
B. ASME B31.9 (American Society of Mechanical Engineers) - Building Services Piping
C. ASTM F708 - Design and Installation of Rigid Pipe Hangers.
D. MSS SP58 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Materials, Design and Manufacturer.
E. MSS SP69 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Selection and Application.
F. MSS SP89 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Fabrication and Installation Practices.

1.03 SUBMITTALS
A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
   1. Product Data: Submit manufacturers catalog data including load capacity.
   2. Manufacturer's Installation Instructions: Submit special procedures and assembly of components.

1.04 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.05 FIELD MEASUREMENTS
A. Verify field measurements prior to fabrication.
PART 2 PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

A. Manufacturers:
   1. Grinnell.
   3. Unistrut.
   4. Approved Equal.

B. Plumbing Piping – DWV:
   2. Hangers for Pipe Sizes ½ to 1-1/2 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.
   8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange and concrete pier or steel support.
   9. Copper Pipe Support: Copper-plated, carbon-steel adjustable, ring.

C. Plumbing Piping – Water, Fuel:
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron or Carbon steel, adjustable swivel, split ring.
   3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   4. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.
   5. Vertical Support: Steel riser clamp.
   6. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   7. Floor Support for Hot Pipe Sizes 4 inches and Smaller: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

D. Hydronic Piping:
   2. Hangers for Pipe Sizes ½ to 1-1/2 inch: Malleable iron or Carbon steel, adjustable swivel, split ring.
3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
4. Wall Support for Pipe Sizes to 3 inches: Cast iron hooks.
5. Vertical Support: Steel riser clamp.
6. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange and concrete pier or steel support.
7. Copper Pipe Support: Copper-plated, carbon steel ring.

2.02 ACCESSORIES
   A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

2.03 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.

2.04 FLASHING
   A. Metal Flashing: 26 gage thick galvanized steel.
   B. Metal Counter flashing: 22 gage thick galvanized steel.
   C. Lead Flashing:
      1. Waterproofing: 5 lb./sq. ft sheet lead
      2. Soundproofing: 1 lb./sq. ft sheet lead.
   D. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.
   E. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

2.05 SLEEVES
   A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage thick galvanized steel.
   B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.
   C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed, refer to Division 7.
   D. Sleeves for Round Ductwork: Galvanized steel.
   E. Sleeves for Rectangular Ductwork: Galvanized steel or wood.
   F. Fire-stopping Insulation: Glass fiber type, non-combustible; refer to Division 7.
   G. Sealant: Acrylic; refer to Division 7.

PART 3 EXECUTION
3.01 INSTALLATION – GENERAL
   A. Install materials in accordance with manufacturer's instructions.

3.02 PIPE HANGERS AND SUPPORTS
   A. Install pipe hangers and supports in accordance with ASME B31.9.
   B. Support pipe hangers from building structural components.
C. Support horizontal piping as scheduled.
D. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.
E. Place hangers within 12 inches of each horizontal elbow.
F. Use hangers with 1-1/2 inch minimum vertical adjustment.
G. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
H. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
I. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
J. Support riser piping independently of connected horizontal piping.
K. Provide copper plated hangers and supports for non-insulated copper piping.
L. Design hangers for pipe movement without disengagement of supported pipe.
M. Prime coat exposed steel hangers and supports. Hangers and supports located in pipe shafts and suspended ceiling spaces are not considered exposed.

3.03 DUCTWORK HANGERS AND SUPPORTS
   A. Support ductwork systems in accordance with SMACNA requirements.

3.04 EQUIPMENT BASES AND SUPPORTS
   A. Provide templates, anchor bolts and accessories for mounting and anchoring equipment.
   B. Construct supports of steel members or steel pipe and fittings. Brace and fasten with flanges bolted to structure.
   C. Provide rigid anchors for pipes after vibration isolation components are installed.

3.05 FLASHING
   A. Provide flexible flashing and metal counter-flashing where piping and ductwork penetrate weather or waterproofed walls, floors and roofs.
   B. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked 1 inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counter-flash and seal.
   C. Seal floor drains watertight to adjacent materials.
   D. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms for sound control.
   E. 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 forms. 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. Caulk sleeves.

D. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and caulk. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

E. Install chrome plated steel escutcheons at finished surfaces.

3.07 EXPANSION LOOPS AND ANCHORS

A. Rigidly anchor pipe to building structure where necessary. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.

B. Provide support and equipment required for controlling expansion and contraction of piping. Provide loops, pipe offsets and swing joints, or expansion joints where indicated.

3.08 SCHEDULES

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>MAX. HANGER SPACING</th>
<th>DIAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Inches)</td>
<td>(Feet)</td>
<td>(Inches)</td>
</tr>
<tr>
<td>PEX (all sizes)</td>
<td>2.7’</td>
<td>3/8”</td>
</tr>
<tr>
<td>ABS (all sizes)</td>
<td>4.0’</td>
<td>3/8”</td>
</tr>
<tr>
<td>½ to 1-1/4</td>
<td>6.5’</td>
<td>3/8”</td>
</tr>
<tr>
<td>1-1/2 to 2</td>
<td>10’</td>
<td>3/8”</td>
</tr>
<tr>
<td>C.I. Bell and Spigot or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.I No-Hub and at Joints</td>
<td>5.0’</td>
<td>5/8”</td>
</tr>
</tbody>
</table>

END OF SECTION
SECTION 15 07 50
MECHANICAL IDENTIFICATION

PART 1 GENERAL

1.01 SUMMARY
   A. Section includes nameplates, tags, stencils and pipe markers.
   B. Related Sections:
      1. Division 9 – Paints and Coatings: Execution requirements for painting specified by this section.

1.02 REFERENCES

1.03 SUBMITTALS
   A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
      1. Product Data: Provide manufacturers catalog literature for each product required.
      2. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures and installation.

1.04 CLOSEOUT SUBMITTALS
   A. Division 1 – Closeout Submittals.

1.05 QUALIFICATIONS
   A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.06 FIELD MEASUREMENTS
   A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.01 MANUFACTURERS
   A. Manufacturers:
      2. Safety Sign Co.
      4. Approved Equal.

2.02 NAMEPLATES
   A. Product Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.
2.03 TAGS
   A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inches diameter.
   B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inches diameter with smooth edges.
   C. Tag Chart: Typewritten letter size list of applied tags and location in anodized aluminum frame.

2.04 STENCILS
   A. Stencils: With clean cut symbols and letters of following size:
      1. Piping: 3/4 inch high letters.
   B. Stencil Paint: As specified in Division 9, semi-gloss enamel, colors and lettering size conforming to ASME A13.1.

2.05 PIPE MARKERS
   B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.

PART 3 EXECUTION

3.01 PREPARATION
   A. Degrease and clean surfaces to receive adhesive for identification materials.
   B. Prepare surfaces in accordance with Division 9 for stencil painting.

3.02 INSTALLATION
   A. Apply stencil painting in accordance with Division 9.
   B. Install identifying devices after completion of coverings and painting.
   C. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.
   D. Install tags using corrosion resistant chain. Number tags consecutively by location.
   E. Identify air handling units, pumps and tanks with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
   F. Identify control panels and major control components outside panels with plastic nameplates.
   G. Identify valves in main and branch piping with tags.
   H. Tag automatic controls, instruments and relays. Key to control schematic.
   I. Identify piping located in the boiler room with plastic pipe markers. 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 side of penetration of structure or enclosure and at each obstruction.
   J. Identify piping, concealed or exposed, with plastic pipe markers or stenciled painting. 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.

END OF SECTION
PART 1 GENERAL

1.01 SUMMARY

A. Section includes ductwork insulation, duct liner, insulation jackets, equipment insulation, covering, thermal insulation for piping systems including vapor retarders, jackets and accessories.

B. Related Sections:
   1. Division 9 – Paints and Coatings: Execution requirements for painting insulation jackets and covering specified by this section.
   2. Section 15 06 00 – Hangers and Supports: Execution requirements for inserts for placement by this section.
   3. Section 15 07 50 – Mechanical Identification: Product requirements for mechanical identification for placement by this section.

1.02 REFERENCES

T. NAIMA (North American Insulation Manufacturers Association) - National Insulation Standards.
U. SMACNA (Sheet Metal and Air Conditioning Contractors’ National Association) - HVAC Duct Construction Standards - Metal and Flexible.

1.03 SUBMITTALS
A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
   1. Product Data: Provide product description, thermal characteristics and list of materials and thickness for each service and locations.
   2. Manufacturer’s Installation Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.04 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
B. Applicator: Company specializing in performing Work of this section with minimum three years documented experience.

1.05 DELIVERY, STORAGE AND HANDLING
A. Accept materials on site in original factory packaging, labeled with manufacturer’s identification, including product density and thickness.
B. Protect insulation from weather and construction traffic, dirt, water, chemical and mechanical damage, by storing in original wrapping.

1.06 ENVIRONMENTAL REQUIREMENTS
A. Do not install insulation outside ambient conditions required by manufacturer of each product.
B. Maintain temperature during and after installation for minimum period of 24 hours.

1.07 FIELD MEASUREMENTS
A. Verify field measurements prior to fabrication.
PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers:
   1. Owens Corning.
   2. Certain Teed.
   5. Johns Manville.
   6. Approved Equal.

2.02 MINERAL FIBER PIPE INSULATION

A. Insulation: ASTM C547 Mineral Fiber Pipe Insulation, Type I 850(454).
B. Vapor Retarder Jacket:
   1. White Kraft paper with glass fiber yarn, bonded to aluminized film.
   2. Moisture vapor transmission: ASTM E96; 0.02 perm-inches.
C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
D. Vapor Retarder Lap Adhesive: Compatible with insulation.
E. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
F. Insulating Cement: ASTM C449/C449M.

2.03 ELASTOMERIC CELLULAR FOAM PIPE INSULATION

A. Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular form: ASTM C534; Type I, Tubular form.
B. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.04 MINERAL FIBER, FLEXIBLE (INSULATION FOR THE EXTERIOR OF SHEET METAL DUCTS)

A. Insulation: ASTM C553 Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications, Type II.
B. Vapor Retarder Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture vapor transmission: ASTM E96; 0.02 perm.
   3. Secure with pressure sensitive tape.
C. Vapor Retarder Tape: Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
D. Tie Wire: Annealed steel, 16 gage.

2.05 MINERAL FIBER, RIGID (INSULATION FOR THE EXTERIOR OF SHEET METAL DUCTS)

A. Insulation: ASTM C612 Mineral Fiber Block and Board Insulation, Type IA
B. Indoor Vapor Retarder Finish: Canvas Jacket with vapor retardant finish.
2.06 INSULATION JACKETS
   A. Pipe Fitting Jacket: ASTM D1784, One piece molded type fitting covers, off-white color.
   B. Canvas Jacket: UL listed.
      2. Fire retardant lagging adhesive. Composite of insulation, jacket and lagging adhesive shall have a flame spread index not greater than 25 and a smoke developed index not greater than 50 per ASTM E84.

2.07 STAINLESS STEEL PIPE JACKET:
   A. ASTM A167 Type 304 stainless steel.
   B. Thickness: 0.016 inch thick.
   C. Finish: Corrugated.
   D. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

PART 3 EXECUTION
3.01 EXAMINATION
   A. Division 1 – Administrative Requirements: Coordination and project conditions.
   B. Verify that piping, equipment and ductwork has been tested before applying insulation materials.
   C. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION – GENERAL
   A. Install in accordance with NAIMA National Insulation Standards.

3.03 INSTALLATION – PIPING
   A. Exposed Piping: Locate insulation and cover seams in least visible locations.
   B. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges and strainers.
   C. Mineral fiber insulated pipes conveying fluids below ambient temperature:
      1. Provide factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal all staple penetrations with vapor retarder mastic.
      2. Insulate fittings, joints and valves with molded insulation of like material and thickness as adjacent pipe. Finish with PVC fitting covers.
   D. For hot piping conveying fluids over 120°F, insulate flanges and unions at equipment.
   E. Mineral fiber insulated pipes conveying fluids above ambient temperature:
1. Provide factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or the pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
2. Insulate fittings, joints and valves with insulation of like material and thickness as adjoining pipe. Finish with PVC fitting covers.

F. Inserts and Shields:
   1. Application: Piping or Equipment 1-1/2 inches diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert location: Between support shield and piping and under the finish jacket.
   4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert material: Compression resistant insulating material suitable for the planned temperature range and service.

G. Continue insulation through penetrations of building assemblies or portions of assemblies having a fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions and interruptions. Division 7 for penetrations of assemblies with a fire resistance rating greater than one hour.

H. Pipe Exposed within 6’ of floor in Mechanical Equipment Rooms: Finish with steel jacket.
I. Pipes Exposed in Exterior Spaces: Finish with steel jacket.

3.04 INSTALLATION – EQUIPMENT

A. Factory Insulated Equipment: Do not insulate.
B. Exposed Equipment: Locate insulation and cover seams in least visible locations.
C. Apply insulation close to equipment by grooving, scoring and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
D. Seal all ends of pipe insulation to encapsulate and smooth the insulation.
E. Fill joints, cracks, seams and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.
F. Insulated equipment that contains fluids below ambient temperature: Insulate entire system.
G. Mineral fiber insulated equipment that contains fluids below ambient temperature: Provide vapor retarder jackets, factory-applied or field-applied. Finish with glass-cloth and vapor barrier adhesive.
H. For hot equipment that contains fluids over 120°F, insulate flanges and unions with removable sections and jackets.
I. Mineral fiber insulated equipment that contains fluids above ambient temperature: Provide standard jackets, with or without vapor retarder, factory-applied or field-applied. Finish with glass cloth and adhesive.
J. Finish insulation at supports, protrusions and interruptions.
K. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.
L. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation so it can be easily removed and replaced without damage.

3.05 INSTALLATION – DUCTWORK

A. Insulated ductwork conveying air below ambient temperature:
   1. Provide insulation with vapor retarder jackets.
   2. Finish with tape and vapor retarder jacket.
   3. Continue insulation through walls, sleeves, hangers and other duct penetrations.
   4. Insulate entire system including fittings, joints and flanges.

B. Insulated ductwork conveying air above ambient temperature:
   1. Provide with or without standard vapor retarder jacket.
   2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

C. Ductwork Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with canvas jacket.

D. External Duct Insulation Application:
   1. Secure insulation with vapor retarder with wires and seal jacket joints with vapor retarder adhesive or tape to match jacket.
   2. Secure insulation without vapor retarder with staples, tape, or wires.
   3. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.
   4. Seal vapor retarder penetrations by mechanical fasteners with vapor retarder adhesive.
   5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

3.06 PIPING INSULATION SCHEDULE

A. Glass Fiber Insulation Schedule:

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic Hot Water Supply</td>
<td>All</td>
</tr>
<tr>
<td>Domestic Cold Water</td>
<td>All</td>
</tr>
<tr>
<td>Heating Glycol Supply</td>
<td>All</td>
</tr>
<tr>
<td>Heating Glycol Return</td>
<td>All</td>
</tr>
</tbody>
</table>

B. Cellular Foam Insulation Schedule:

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trap Primer Underfloor Tubing</td>
<td>All</td>
</tr>
<tr>
<td>Vent Through Roof Assemblies</td>
<td>All</td>
</tr>
</tbody>
</table>
3.07 EQUIPMENT INSULATION SCHEDULE
   A. Glass Fiber Insulation Schedule:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Thickness</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Separators</td>
<td>2”</td>
<td>Canvas</td>
</tr>
</tbody>
</table>

3.08 DUCTWORK INSULATION SCHEDULE
   A. Flexible Glass Fiber Duct Wrap Insulation Schedule:

<table>
<thead>
<tr>
<th>Ductwork</th>
<th>Thickness</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Round Exhaust Ducts</td>
<td>1”</td>
<td>Aluminized Film</td>
</tr>
</tbody>
</table>

   B. Rigid Glass Fiber Duct Insulation Schedule:

<table>
<thead>
<tr>
<th>Ductwork</th>
<th>Thickness</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside Air Ductwork</td>
<td>2”</td>
<td>Aluminized Film</td>
</tr>
<tr>
<td>Combustion Air Ductwork</td>
<td>2”</td>
<td>Canvas</td>
</tr>
<tr>
<td>Exhaust Ducts</td>
<td>2”</td>
<td>Aluminized Film</td>
</tr>
</tbody>
</table>

END OF SECTION
SECTION 15 12 00
PIPING SPECIALTIES

PART 1 GENERAL

1.01 SUMMARY

A. Section includes positive displacement meters, pressure gauges and pressure gauge taps, thermometers and thermometer wells, expansion tanks, air vents, air separators, strainers, balance valves, and glycol specialties.

B. Related Sections:
   1. Section 15 18 00 – Hydronic Piping.

1.02 REFERENCES

A. ASME (American Society of Mechanical Engineers) - Boiler and Pressure Vessel Codes, SEC VIII-D - Rules for Construction of Pressure Vessels.

B. ASME B40.1 (American Society of Mechanical Engineers) - Gauges - Pressure Indicating Dial Type - Elastic Element.


E. AWWA C700 (American Water Works Association) - Cold-Water Meters - Displacement Type, Bronze Main Case.


1.03 SUBMITTALS

A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
   1. Manufacturer's data indicating use, operating range, total range, accuracy and location for manufactured components.
   2. Submit product description, model, dimensions, component sizes, rough-in requirements, service sizes and finishes.
   3. Submit schedule indicating manufacturer, model number, size, location, rated capacity, load served and features for each specialty.
   4. Submit electrical characteristics and connection requirements.

B. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures, application, selection and hookup configuration. Include pipe and accessory elevations.

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

1.04 CLOSEOUT SUBMITTALS

A. Division 1 – Closeout Submittals.
B. Project Record Documents: Record actual locations of actual locations of components and instrumentation.

C. Operation and Maintenance Data: Submit instructions for calibrating instruments, installation instructions, assembly views, servicing requirements, lubrication instruction and replacement parts list.

1.05 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.06 DELIVERY, STORAGE AND HANDLING
A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Protect systems from entry of foreign materials by temporary covers, caps and closures, completing sections of the work and isolating parts of completed system until installation.

D. Do not install instruments when areas are under construction, except for required rough in, taps, supports and test plugs.

1.07 FIELD MEASUREMENTS
A. Verify field measurements prior to fabrication.

1.08 WARRANTY
A. Division 1 – Closeout Submittals.

B. Provide one year manufacturer warranty for piping specialties.

PART 2 PRODUCTS

2.01 PRESSURE GAUGES
A. Manufacturers:
   1. Trerice.
   3. Ashcroft.
   4. Approved Equal.

B. Gauge: ASME B40.1, with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.
   2. Bourdon Tube: Phosphor bronze.
   3. Dial Size: 3-1/2 inch diameter.
   4. Mid-Scale Accuracy: One percent.
   5. Scale: Psi.
2.02 PRESSURE GAUGE TAPS
   A. Needle Valve: Brass, ¼ inch NPT for minimum 300 psi.
   B. Ball Valve: Brass for 250 psi.
   C. Pulsation Damper: Pressure snubber, brass with ¼ inch NPT connections.

2.03 STEM TYPE THERMOMETERS
   A. Manufacturers:
      1. Trerice.
      2. Marshalltown.
      3. Ashcroft.
      4. Approved Equal.
   B. Thermometer: ASTM E1, adjustable angle, red appearing mercury, lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device.
      1. Size: 9 inch scale.
      2. Window: Clear Lexan.
      3. Stem: Extended brass, ¾ inch NPT.
      4. Accuracy: ASTM E77, 2 percent.
      5. Calibration: Both °F and °C.

2.04 THERMOMETERS SUPPORTS
   A. Socket: Brass separable sockets for thermometer stems with or without extensions as required and with cap and chain.

2.05 DIAPHRAGM TYPE EXPANSION TANKS
   A. Manufacturers:
      1. Amtrol.
      2. Taco.
      3. Armstrong.
      4. Approved Equal.
   B. Construction: Welded steel, rated for working pressure of 100 psig, with flexible EPDM diaphragm sealed into tank and steel support legs or saddles. If required by the drawing schedules: tested and stamped in accordance with ASME SEC 8-D; supplied with National Board Form U-1. Hot water expansion tank shall be welded steel, constructed, tested and listed by NSF61 and rated for a working pressure of 250 psig.
   C. Accessories: Pressure gauge, air-charging fitting, tank drain; pre-charge to scheduled psig.

2.06 AIR VENTS
   A. Manufacturers:
      1. Hoffman.
      2. Armstrong.
3. Bell & Gossett.
4. Approved Equal.

B. 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. 500 or equal; provide with air chamber, brass construction, 6 cubic inch volume, Hoffman No. 550 or equal.

C. Float Type: Brass or semi-steel body, copper float, stainless steel valve and valve seat; 1/8 inch NPT connection to atmosphere with drain piping suitable for system operating temperature and pressure; with isolating valve. Hoffman No. 79 or equal.

D. High Capacity Automatic Air Vent: Cast iron body, stainless steel and brass trim, EPDM diaphragm, rated for 300°F, 350 PSI, ¾ inch system connection, 1/2 inch NPT connection to atmosphere with drain piping. Provide with isolation valve and strainer upstream of vent. Hoffman 792 or equal.

2.07 AIR SEPARATORS

A. Manufacturers:
   1. Spirotherm.
   2. Taco.
   3. Approved Equal.

B. Combination Air Separators and Dirt Separators:
   1. Steel, 150 psig operating pressure, copper core tube bundle with continuous wound copper medium permanently affixed to the core, internal full port float actuated brass vent, valved side tap to flush floating dirt, bottom valved tap to flush separated dirt.

2.08 BALANCE VALVES

A. Manufacturers:
   1. Bell & Gossett.
   2. Taco.
   3. Approved Equal.

B. Calibrated, ball or plug type balance valve with precision machined orifice, readout valves equipped with integral check valves and gasketed caps, calibrated nameplate and indicating pointer. Threaded connections.

2.09 RELIEF VALVES

A. Manufacturers:
   1. Watts.
   2. Taco.
   3. Bell & Gossett.
   4. Approved Equal.

B. Bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated capacities ASME certified and labeled.
2.10 GLYCOL CHARGING
   A. Manufacturers:
      1. Axiom
      2. Wessels.
      3. Approved Equal.
   B. Prefabricated automatic glycol make-up tank. Complete with pump, magnetic starter, pressure tank, pressure control, strainer, priming valve, adjustable pressure reducing valve set at 12 psig, shut off valve, pressures gauge.
   C. Factory automatic controls: Maintains fill pressure of glycol system, low level or excess pressure shall cut-off pump, audible low-level or excessive pressure alarm with silence switch, low-level or excessive pressure visible alarm, signal for remote alarm
   D. Construction: 6 gallon translucent polyethylene tank with lid. Lid shall be capable of accommodating system relief piping. Pumping assembly shall be mounted on steel frame with legs. Tank shall be mounted on wall above pumping assembly.

2.11 GLYCOL SOLUTION
   A. Manufacturers:
      1. Dowfrost-HD.
      2. Approved Equal.
   B. Solution: Inhibited propylene glycol and water solution, pre-mixed 50 percent glycol - 50 percent water, suitable for operating temperatures down to –30°F.

2.12 POSITIVE DISPLACEMENT METERS (LIQUID)
   A. Manufacturers:
      1. Badger.
      2. Brooks.
      4. Approved Equal.
   B. AWWA C700, positive displacement disc type suitable for fluid with lead-free bronze case and cast iron bottom cap, permanently sealed register.
   C. Meter: Nutating disc, positive displacement, magnetic drive register with engineered polymer measuring chamber.
      1. Service: Domestic cold water metering.
      3. Accuracy: 1-1/2 percent.
      4. Maximum Counter Reading: 10 million gallons.
      5. Pipe Size: 1 inch.
PART 3 EXECUTION

3.01 INSTALLATION

A. Install positive displacement meters in accordance with AWWA M6, with isolating valves on inlet and outlet.
B. Install one pressure gauge per pump, with taps on suction and discharge of pump; pipe to gauge.
C. Install gauge taps in piping.
D. Install pressure gauges with pulsation dampers. Provide needle valve or ball valve to isolate each gauge. Extend nipples to allow clearance from insulation.
E. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
F. Install thermometer sockets adjacent to controls systems thermostat, transmitter, or sensor sockets. Where thermometers are provided on local panels, or pipe mounted thermometers are not required.
G. Provide instruments with scale ranges selected according to service with largest appropriate scale.
H. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
I. Adjust gauges and thermometers to final angle, clean windows and lenses and calibrate to zero.
J. Where large air quantities can accumulate, provide enlarged air collection standpipes.
K. Provide manual air vents at system high points and as indicated.
L. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.
M. Provide air separator and expansion tank on suction side of system circulation pump as indicated.
N. Provide drain and hose connection with valve on strainer blow down connection.
O. Provide balancing valves on water outlet from terminal heating units such as radiation, unit heaters and heating coils units.
P. Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.
Q. Pipe water relief valve to nearest floor drain and glycol relief valve to glycol tank.
R. Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.
S. Feed glycol solution 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.

3.02 FIELD QUALITY CONTROL

A. Division 1 – Quality Requirements.
B. Test for strength of glycol and water solution and submit written test results.

### 3.03 CLEANING

A. Division 1 – Closeout Submittals.

B. Clean and flush glycol system before adding glycol solution. Refer to Section 15 18 00 – Hydronic Piping.

### 3.04 PROTECTION OF INSTALLED CONSTRUCTION

A. Do not install hydronic gauges until after systems are cleaned.

### 3.05 AIR VENT APPLICATION SCHEDULE

<table>
<thead>
<tr>
<th>Location</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminal heating units, mains below</td>
<td>Manual</td>
</tr>
<tr>
<td>Terminal heating units, mains above</td>
<td>None</td>
</tr>
<tr>
<td>Heating mains, at high points in system</td>
<td>Automatic</td>
</tr>
<tr>
<td>Air separators</td>
<td>High capacity</td>
</tr>
<tr>
<td>As Indicated on Drawings</td>
<td>Per Drawings</td>
</tr>
</tbody>
</table>

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 15 13 00
PUMPS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes in-line circulators.

B. Related Sections:
   1. Section 15 18 00 – Hydronic Piping: Execution requirements for connection to pumps specified by this section.
   2. Division 16 – Wiring Connections: Execution requirements for electrical connections to pumps specified by this section.
   3. Division 16 – Motors: Product requirements for motors for placement by this section.

1.02 REFERENCES

A. ASME (American Society of Mechanical Engineers) - Boiler and Pressure Vessel Codes, SEC VIII-D - Rules for Construction of Pressure Vessels.

B. UL 778 (Underwriters Laboratories, Inc.) - Motor Operated Water Pumps.

1.03 PERFORMANCE REQUIREMENTS

A. 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.

1.04 SUBMITTALS

A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
   1. Product Data: Submit certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements. Submit also, manufacturer model number, dimensions, service sizes and finishes.
   2. Manufacturer's Installation Instructions: Submit application, selection and hookup configuration with pipe and accessory elevations. Submit hanging and support requirements and recommendations.
   3. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 CLOSEOUT SUBMITTALS

A. Division 1 – Closeout Submittals.

B. Operation and Maintenance Data: Submit installation instructions, servicing requirements, assembly views, lubrication instructions and replacement parts list.

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 three years experience.

1.07 DELIVERY, STORAGE AND HANDLING
   A. Protect systems from entry of foreign materials by temporary covers, completing sections of the work and isolating parts of completed system.

1.08 FIELD MEASUREMENTS
   A. Verify field measurements prior to fabrication.

1.09 WARRANTY
   A. Division 1 – Closeout Submittals.
   B. Provide one year manufacturer warranty for pumps.

1.10 EXTRA MATERIALS
   A. Supply one set of mechanical seals for each pump.

PART 2 PRODUCTS

2.01 IN-LINE CIRCULATOR (BC-1, CP-2, CP-3)
   A. Manufacturers:
      1. Grundfos.
      2. Taco.
      3. Bell & Gossett.
      4. Approved Substitution.
   B. Type: Single stage, direct ECM motor drive, wet rotor motor for in-line mounting, for 125 psig maximum working pressure, 230°F maximum water temperature. Provide pump with NSF label for domestic water system pumps.
   C. Casing: Cast iron, Bronze or Stainless Steel (where scheduled) with flanged pump connections.
   D. Impeller, Shaft, Rotor: non-metallic or stainless steel.
   E. Bearings: Metal Impregnated carbon (graphite) and ceramic.
   F. Motor: ECM.

2.02 IN-LINE VARIABLE FREQUENCY DRIVE CIRCULATORS (CP-1A/B)
   A. Manufacturers:
      1. Grundfos.
      2. Taco.
      3. Bell & Gossett.
      4. Approved Substitution.
   B. Type: Single stage, direct ECM motor with integral variable frequency drive, wet rotor motor for in-line mounting, for 145 psig maximum working pressure, 230°F maximum water temperature.
C. Casing: Cast iron, Bronze or Stainless Steel (where scheduled) with flanged pump connections.
D. Impeller, Shaft, Rotor: Non-metallic or stainless steel.
E. Bearings: Metal Impregnated carbon (graphite) and ceramic.
F. Motor: ECM.

PART 3 EXECUTION

3.01 INSTALLATION
A. Install long radius reducing elbows or reducers between pump and piping. Support piping adjacent to pump such that no weight is carried on pump casings.
B. Provide line sized shut-off valve on pump suction and line sized spring actuated, soft seat check valve and balancing valve on pump discharge.
C. Lubricate pumps before start-up.

3.02 FIELD QUALITY CONTROL
A. Division 1 - Quality Requirements: Testing and Inspection Services.
B. Section 15 95 00 - Testing, Adjusting and Balancing.

END OF SECTION
SECTION 15 14 00
PLUMBING PIPING

PART 1 GENERAL

1.01 SUMMARY
   A. Section includes domestic water piping, dental air piping, dental vacuum piping, valves, fittings and accessories.
   B. Related Sections:
      1. Section 15 06 00 – Hangers and Supports.
      2. Section 15 08 00 – Mechanical Insulation.
      3. Section 15 41 00 – Plumbing Fixtures.

1.02 REFERENCES
   A. ASME B16.18 (American Society of Mechanical Engineers) - Cast Copper Alloy Solder Joint Pressure Fittings.
   B. ASME B16.22 (American Society of Mechanical Engineers) - Wrought Copper and Bronze Solder Joint Pressure Fittings.
   C. ASME B16.26 (American Society of Mechanical Engineers) - Cast Bronze Fittings for Flared Copper Tubes.
   D. ASME B31.9 (American Society of Mechanical Engineers) - Building Service Piping.
   E. ASTM B32 - Solder Metal.
   F. ASTM B88 - Seamless Copper Water Tube.
   G. AWWA C651 (American Water Works Association) - Disinfecting Water Mains.
   H. MSS SP-71 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Cast Iron Swing Check Valves, Flanged and Threaded Ends.
   I. MSS SP-80 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Bronze Gate, Globe, Angle and Check Valves.
   J. MSS SP-110 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.
   K. ASME A1126.1 (American Society of Mechanical Engineers) - Water Hammer Arrestors.
   M. PDI WH-201 (Plumbing and Drainage Institute) - Water Hammer Arrestors.

1.03 SUBMITTALS
   A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
      1. Product Data: Submit data on pipe materials; pipe fittings, valves and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
2. Manufacturer’s Installation Instructions: Submit installation instructions for pumps, valves and accessories.

1.04 CLOSEOUT SUBMITTALS
A. Division 1 – Closeout Submittals.
B. Project Record Documents: Record actual locations of valves and equipment.
C. Operation and Maintenance Data: Submit spare parts list, exploded assembly views and recommended maintenance intervals.

1.05 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented.
B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.06 DELIVERY, STORAGE AND HANDLING
A. Accept valves and equipment on site in shipping containers with labeling in place. Inspect for damage.
B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work and isolating parts of completed system.

1.07 FIELD MEASUREMENTS
A. Verify field measurements prior to fabrication.

1.08 WARRANTY
A. Division 1 – Closeout Submittals.
B. Provide manufacturer's warranty for equipment if available.

PART 2 PRODUCTS
2.01 WATER PIPING, ABOVE GRADE
A. Copper Tubing: ASTM B88, Type L, hard drawn.
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, solder, Grade 95TA, lead free.

2.02 PLASTIC WATER PIPING
A. Polyethylene Pipe (PEXa): ASTM F877, oxygen barrier, cross-linked polyethylene manufactured using the T Engle method, 100 psig operating pressure at 180 °F.
B. Fittings: Brass and copper.
C. Joints:
   2. Above floor: Mechanical compression fittings.
2.03 DENTAL AIR PIPING
   A. Copper Tubing: ASTM B88, Type L drawn.
      1. Fittings: ASME B16.18 cast copper alloy or ASME B16.22, wrought copper and bronze.
      2. Joints: ASTM B32, solder, Grade 95TA, lead free.

2.04 DENTAL VACUUM PIPING
   A. Copper Tube: ASTM B88, Type K, annealed.
      2. Joints: AWS A5.8 Classification BCuP-3 or BCuP-4 silver braze.

2.05 FLANGES, UNIONS AND COUPLINGS
   A. Copper Tubing Pipe Size 2 inches and Under:
      1. Copper tube and pipe: Class 150 bronze unions with soldered joints.
   B. Copper Tubing Pipe Size Over 2 inch:
      1. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
   C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.06 BALL VALVES
   A. Manufacturers:
      1. Nibco.
      2. Crane.
      3. Hammond.
      4. Approved Equal.
   B. Construction, 4 inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle, solder or threaded ends.

2.07 SWING CHECK VALVES
   A. Manufacturers:
      1. Nibco.
      2. Crane.
      3. Hammond.
      4. Approved Equal.
   B. Up To and Including 3 inches:
      1. MSS SP-80, Class 125, bronze body and cap, bronze swing disc with rubber seat, solder or threaded ends.

2.08 SPRING LOADED CHECK VALVES
   A. Manufacturers:
      1. Nibco.
2. Crane.
3. Hammond.
4. Approved Equal.

B. Up To and Including 2 inches:
   1. MSS SP-80, Class 125, bronze body, resilient discs, inline lift type, stainless steel spring and stem/holder, solder or threaded ends.

2.09 WATER HAMMER ARRESTORS
   A. Manufacturers:
      1. J.R. Smith.
      2. Zurn.
      4. Approved Equal.
   B. ANSI A112.1; stainless steel construction, bellows type sized in accordance with PDI WH-201.
   C. Pre-charged suitable for operation in temperature range -100°F to 300°F and maximum 250 psi working pressure.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that excavations are to required grade, dry and not over-excavated

3.02 PREPARATION
   A. Ream pipe and tube ends. Remove burrs.
   B. Remove scale and dirt, on inside and outside, before assembly.

3.03 CERTIFICATION
   A. Provide Owner with copy of reduced pressure backflow preventer certification.

3.04 INSTALLATION
   A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
   B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
   C. Install piping to maintain headroom and neither interfere with use of space nor take more space than necessary.
   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 in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 15 06 00.
   G. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Division 8.
H. Do not install underground piping when bedding is wet or frozen.
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 exposed, unfinished pipe, fittings, supports and accessories ready for finish painting. Refer to Division 9.
K. Excavate and backfill in accordance with Division 2.
L. Install valves with stems upright or horizontal, not inverted.
M. Install water piping to ASME B31.9.
N. Install potable water protection devices on plumbing lines where contamination of domestic water may occur.
O. Install plastic water piping per manufacturer's requirements.
P. Pipe relief from valves, back-flow preventers and drains to nearest floor drain.
Q. Install water hammer arrestors complete with accessible isolation valve.
R. Where water hammer arrestors are not indicated on the drawings, install water hammer arrestors on each hot and cold water supply piping to each fixture.

3.05 INTERFACE WITH OTHER PRODUCTS
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. Solder adapters to pipe.
C. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
D. Install ball valves for throttling, bypass, or manual flow control services.
E. Provide spring loaded check valves on discharge of water pumps.
F. Provide balancing valves in water circulating systems where indicated.
G. Slope water piping minimum 0.25 percent and arrange to drain at low points.

3.06 CLEANING
A. Division 1 – Closeout Submittals.
B. Prior to starting work, verify system is complete, flushed and clean.
C. Ensure pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
D. Inject disinfectant, free chlorine in liquid, powder and tablet or gas form, throughout system to obtain a residual from 50 to 80 mg/L.
E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
F. Maintain disinfectant in system for 24 hours.
G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry and analyze in accordance with AWWA C651. Provide the Owner with a copy of the disinfection report.

END OF SECTION
SECTION 15 15 00
SANITARY WASTE AND VENT PIPING

PART 1 GENERAL

1.01 SUMMARY
A. Section includes pipe, pipe fittings, connections and equipment for sanitary sewer piping systems. This section also includes cleanouts.

B. Related Sections:
   1. Section 15 06 00 – Hangers and Supports.
   2. Section 15 07 50 – Mechanical Identification: Product requirements for pipe identification for placement by this section.
   3. Section 15 41 00 – Plumbing Fixtures.

1.02 REFERENCES
A. ASME B123 (American Society of Mechanical Engineers) - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.
B. ASME B129 (American Society of Mechanical Engineers) - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
C. ASTM A74 - Cast Iron Soil Pipe and Fittings.
D. ASTM B32 - Solder Metal.
E. ASTM B306 - Copper Drainage Tube (DWV).
F. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
H. CISPI 310 (Cast Iron Soil Pipe Institute) - Joints for Hubless Cast Iron Sanitary Systems.
I. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

1.03 SUBMITTALS
A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
   1. Product Data: Submit data on pipe materials, fittings and accessories. Provide manufacturers catalog information. Provide component sizes, rough-in requirements, service sizes and finishes.
   2. Manufacturer’s Installation Instructions: Submit installation instructions for all material and equipment.

1.04 CLOSEOUT SUBMITTALS
A. Division 1 – Closeout Submittals.
B. Project Record Documents: Record actual locations of equipment and clean-outs.

1.05 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.06 DELIVERY, STORAGE AND HANDLING
A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work and isolating parts of completed system.

1.07 FIELD MEASUREMENTS
A. Verify field measurements prior to fabrication.

1.08 WARRANTY
A. Division 1 – Closeout Submittals.

PART 2 PRODUCTS
2.01 SANITARY WASTE AND VENT PIPING
A. Cast Iron Pipe: CISPI 301, hub-less, service weight.
   1. Fittings: Cast iron.
B. Copper Tube: ASTM B306, DWV.
1. Fittings: ASME B123, cast bronze, or ASME B129, wrought copper.
2. Joints: ASTM B32, solder, Grade 50B.
C. ABS Pipe: ASTM D2751 or ASTM F628.
   1. Fittings: ABS.

2.02 CLEANOUTS
A. Manufacturers:
   1. J.R. Smith.
   2. Josam.
   3. Zurn.
   4. Approved Equal.
B. Interior Finished Floor Areas: Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly and round scored cover with gasket in service areas and round depressed cover with gasket to accept floor finish (vinyl or tile) in finished floor areas. Provide adjustable carpet clamping frame at carpeted areas.
C. Interior Finished Wall Areas: Line type with lacquered cast iron body and round epoxy coated cover with gasket and round stainless steel access cover secured with machine screw.

PART 3 EXECUTION
3.01 PREPARATION
A. Ream pipe and tube ends. Remove burrs.
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. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for snaking drainage system.
B. Install floor cleanouts at elevation to accommodate finished floor.
C. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
D. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
E. Do not install plastic piping in return air plenums.
F. Install piping to maintain headroom. Do not spread piping, conserving space.
G. Group piping whenever practical at common elevations.
H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
I. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 15 08 00.
J. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Division 8.

K. Install piping penetrating roofed areas to maintain integrity of roof assembly.

L. Where pipe support members are welded to structural building framing, scrape, brush clean and apply one coat of zinc rich primer to welding.

M. Prepare exposed, unfinished pipe, fittings, supports and accessories ready for finish painting. Refer to Division 9.

N. Establish invert elevations, slopes for drainage to 1/4 inch per foot minimum unless otherwise indicated on drawings. Maintain gradients.

O. Route all sanitary waste and vent piping within the thermal envelope of the building.

P. Do not route any sanitary waste or vent piping within insulation located in floors, walls, attics, or roofs.

END OF SECTION
SECTION 15 18 00
HYDRONIC PIPING

PART 1 GENERAL

1.01 SUMMARY
A. Section includes systems, accessories, valves, pipe and pipe fittings for glycol heating.
B. Related Sections:
   1. Division 8 – Access Doors: Product requirements for access doors for placement by this section.
   2. Division 9 - Paints and Coatings: Product requirements painting for placement by this section.
   3. Section 15 08 00 - Mechanical Insulation: Product requirements for Piping Insulation for placement by this section.
   4. Division 16 – Wiring Connections: Execution requirements for electric connections specified by this section.

1.02 REFERENCES
A. ASME (American Society of Mechanical Engineers) - Boiler and Pressure Vessel Codes, SEC IX - Qualification Standard for Welding and Brazing Procedures, Welders, Brazers and Welding and Brazing Operators.
B. ASME B31.9 (American Society of Mechanical Engineers) - Building Services Piping.
C. ASME B16.18 (American Society of Mechanical Engineers) - Cast Copper Alloy Solder Joint Pressure Fittings.
D. ASME B16.22 (American Society of Mechanical Engineers) - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
E. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
F. ASTM A234 - Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
G. ASTM B32 - Solder Metal.
H. ASTM B88 - Seamless Copper Water Tube.
I. ASTM F876 - Crosslinked Polyethylene (PEX) Tubing.

1.03 SYSTEM DESCRIPTION
A. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union and couplings for servicing are consistently provided.
B. Use unions, flanges and couplings downstream of valves and at equipment or apparatus connections. Use non-conducting dielectric nipple or flange connections or bronze union...
whenever jointing dissimilar metals in systems. Do not use direct welded or threaded connections to valves, equipment or other apparatus.

C. Use ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

D. Use ball valves for throttling or bypass services.

E. Use ¾-inch ball valves with hose connection end and cap for drains at main shut-off valves, low points of piping, bases of vertical risers and at equipment.

F. Valve seat materials shall be compatible with glycol solutions applicable to this project.

1.04 SUBMITTALS

A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:


2. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures and isolation.

1.05 CLOSEOUT SUBMITTALS

A. Division 1 – Closeout Submittals.

B. Project Record Documents: Record actual locations of valves.

C. Operation and Maintenance Data: Submit instructions for installation and changing components, spare parts lists, exploded assembly views.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with ASME B31.9 code for installation of piping systems and ASME SEC IX for welding materials and procedures.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Fabricator or Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.08 DELIVERY, STORAGE AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work and isolating parts of completed system.

1.09 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 WARRANTY

A. Division 1 – Closeout Submittals.
B. Provide one year manufacturer warranty for valves excluding packing.

PART 2 PRODUCTS

2.01 GLYCOL HEATING PIPING

A. Copper Tubing: ASTM B88, Type L, hard drawn.
   1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
   2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535°F.

B. Polyethylene Pipe (PEXa): ASTM F876 and DIN 4726, oxygen barrier, cross-linked polyethylene manufactured using the Engel method, 100 psig operating pressure at 180 degree F.
   1. Fittings: Brass and copper.
   3. Locations Allowed: PEX tubing only allowed for branch piping to terminal units located above finished floor. Not allowed to be used for heating mains, branch piping underfloor, or within mechanical room. Insulation cannot be reduced and must be sized per specification if used in lieu of copper tubing.

2.02 EQUIPMENT DRAINS AND OVERFLOWS

A. Copper Tubing: ASTM B88, Type L, hard drawn.
   1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
   2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535°F.

2.03 UNIONS, FLANGES AND COUPLINGS

A. Unions for Pipe 2 inches and Under:
   1. Ferrous Piping: 150 psig malleable iron, threaded.
   2. Copper Pipe: Bronze, soldered joints.

B. Flanges for Pipe Over 2 inches:
   1. Ferrous Piping: 150 psig forged steel, slip-on.
   2. Copper Piping: Bronze.
   3. Gaskets: 1/16 inch thick preformed neoprene.

C. Dielectric Connections: Non-conducting dielectric nipple or flange connections or bronze union whenever jointing dissimilar metals in systems.

2.04 BALL VALVES

A. Manufacturers:
   1. Nibco.
   2. Crane.
   3. Milwaukee.
   4. Approved Equal.
B. Bronze two piece body, chrome plated brass or stainless steel ball, teflon seats and stuffing box ring, lever handle, solder or threaded ends.

2.05 GATE VALVES AND BUTTERFLY VALVES
A. Not allowed.

2.06 SWING CHECK VALVES
A. Manufacturers:
   1. Nibco.
   2. Crane.
   3. Milwaukee.
   4. Approved Equal.
B. Bronze body and trim, bronze rotating swing disc, with composition disc, solder or threaded ends.

2.07 SPRING LOADED CHECK VALVES
A. Manufacturers:
   1. Nibco.
   2. Crane.
   3. Hammond.
   4. Approved Equal.
B. Up To and Including 2 inches:
   1. MSS SP-80, Class 125, bronze body, resilient discs, inline lift type, stainless steel spring and stem/holder, solder or threaded ends.

2.08 SYSTEM CLEANER
A. Product Description: Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products: sodium tri-poly phosphate.

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. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
E. Operate, fill, start and vent systems prior to cleaning. Place terminal control valves in open during cleaning.

3.02 CLEANING
A. Concentration:
   1. As recommended by manufacturer.
B. Hot Water Heating Systems:
   1. Apply heat while circulating, slowly raising temperature to 195°F and maintain for 12 hours minimum.
   2. Remove heat and circulate to 100°F or less; drain systems as quickly as possible and refill with clean water.
   3. Circulate for 6 hours at design temperatures, then drain.
   4. Refill with clean water and repeat until system cleaner is removed.
   5. Remove, clean and replace strainer screens.
   6. Inspect, remove sludge and flush low points with clean water after cleaning process is completed. Include disassembly of components as required.

3.03 INSTALLATION
   A. Install glycol heating piping in conformance with ASME B31.9.
   B. Route piping parallel to building structure 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. Sleeve pipe passing through partitions, walls and floors.
   F. Install piping to allow for expansion and contraction without stressing pipe, joints or connected equipment. Refer to Section 15 06 00 and 15 12 00.
   G. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Division 8.
   H. Slope piping and arrange systems to drain at low points.
   I. Prepare unfinished pipe, fittings, supports and accessories, ready for finish painting. Refer to Division 9.
   J. Install valves with stems upright or horizontal, not inverted.
   K. Insulate piping; refer to Section 15 08 00.
   L. Route all hydronic piping within the thermal envelope of the building.
   M. Do not route any hydronic piping within insulation located in floors, walls, attics, or roofs.

END OF SECTION
SECTION 15 19 00
FUEL PIPING

PART 1 GENERAL

1.01 SUMMARY
A. Section includes piping, fittings, valves, and tanks for fuel piping systems.
B. Related Sections:
   1. Division 9 - Paints and Coatings: Product requirements for painting for placement by this section.
   2. Section 15 07 50 - Mechanical Identification: Product requirements for valve and pipe identification for placement by this section.

1.02 REFERENCE
A. API 650 (American Petroleum Institute) - Welded Steel Tanks for Oil Storage.
B. API 2000 (American Petroleum Institute) - Venting Atmospheric and Low Pressure Storage Tanks.
C. ASME SEC IX (American Society of Mechanical Engineers) - Welding and Brazing Qualifications.
D. ASME B16.3 (American Society of Mechanical Engineers) - Malleable Iron Threaded Fittings.
E. ASME B16.18 (American Society of Mechanical Engineers) - Cast Copper Alloy Solder-Joint Pressure Fittings.
F. ASME B16.22 (American Society of Mechanical Engineers) - Wrought Copper and Bronze Solder-Joint Pressure Fittings.
G. ASME B16.26 (American Society of Mechanical Engineers) - Cast Bronze Fittings for Flared Copper Tubes.
H. ASME B31.1 - Power Piping.
I. ASME B31.9 - Building Services Piping.
J. ASME B36.10 (American Society of Mechanical Engineers) - Welded and Seamless Wrought Steel Pipe.
K. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
L. ASTM A234/A234M - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
M. AWS A5.8 (American Welding Society) - Brazing Filler Metal.
N. AWWA C105 (American Water Works Association) - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.
O. NFPA 30 (National Fire Protection Association) - Flammable and Combustible Liquids Code.
P. NFPA 31 (National Fire Protection Association) - Installation of Oil Burning Equipment.
Q. UL 80 (Underwriters Laboratories, Inc.) - Steel Inside Tanks Oil-Burner Fuel.
R. UL 142 (Underwriters Laboratories, Inc.) - Steel Aboveground Tanks for Flammable and Combustible Liquids.
S. UL 1479 (Underwriters Laboratories, Inc.) - Fire Tests of Through-Penetration Firestops.

1.03 SUBMITTALS
A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
   2. Manufacturer's Installation Instructions: Submit oil pump data.
   3. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.04 CLOSEOUT SUBMITTALS
A. Division 1 - Contract Closeout.
B. Operation and Maintenance Data: Submit installation instructions, spare parts lists.

1.05 QUALITY ASSURANCE
A. Perform Work in accordance with ASME SEC IX and NFPA 31 standard.
B. Maintain one copy of each document on site.
C. Perform Work in accordance with NFPA 54.

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 three years experience.

1.07 DELIVERY, STORAGE AND HANDLING
A. Division 1 – Product, Storage and Handling.
B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
C. Protect piping and fittings from soil and debris with temporary end caps and closures. Maintain in place until installation. Provide temporary protective coating on cast iron and steel valves.

1.08 ENVIRONMENTAL REQUIREMENTS
A. Division 1 - Product Requirements and Substitutions.

1.09 FIELD MEASUREMENTS
A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS
2.01 OIL PIPING
A. Copper Tubing: ASTM B88, Type L, hard drawn.
   1. Fittings: ASME B16.18 cast copper alloy or ASTM B16.22 wrought copper and bronze.
   2. Joints: AWS A5.8 Classification BCuP-3 or BCuP-4 silver braze or ASTM B32, solder, Grade 95TA.
B. Copper Tubing: ASTM B88, Type L, annealed.
   3. Jacket: AWWA C105 polyethylene or double layer, half-lapped 10 mil polyethylene tape.

2.02 FLANGES, UNIONS AND COUPLINGS
A. Unions:
   1. Ferrous pipe: 150-psi malleable iron threaded unions.
   2. Copper tube: 150-psi bronze unions with brazed joints.

2.03 GATE VALVES
1. Not allowed.

2.04 BALL VALVES
A. Manufacturers:
   1. Nibco.
   2. Crane.
   3. Milwaukee.
   4. Substitutions: Division 1 - Product Requirements and Substitutions.
B. MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle, threaded ends.

2.05 SWING CHECK VALVES
A. Manufacturers:
   1. Nibco.
   2. Crane.
   3. Milwaukee.
   4. Approved Equal.
B. MSS SP-80, Class 125, bronze body and cap, bronze swing disc, solder or threaded ends.

2.06 ABOVEGROUND FUEL STORAGE TANKS
A. Manufacturers:
   1. Greer Tank.
   2. Anchorage Tank.
   3. Ace Tank.
   4. Approved Equal.
B. Tank: UL 142, welded steel, double wall, seismic rated hold downs, taps for accessories, threaded connections. Factory applied paint, one epoxy coat and one urethane coat.

C. Accessories: Tank fill, 3.5 gallon spill container, gauge, vents, outlet connections, ladder, and support stand, foot valves and secondary tank drain. Ladder and support stand to have factory applied paint, one epoxy coat and one urethane coat, matching tank. Secondary tank leak gauge with pop-up indicator.

PART 3 EXECUTION

3.01 EXAMINATION

A. Division 1 - Project Management and Coordination.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs.
B. Remove scale and dirt, on inside and outside, before assembly.
C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

A. Provide non-conducting dielectric connections wherever jointing dissimilar metals. Install to NACE RP-01-69.
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 access where valves and fittings are not exposed.
G. Where pipe support members are welded to structural building framing, scrape, brush clean, weld and apply one coat of zinc rich primer.
H. Prepare pipe, fittings, supports and accessories not pre-finished, ready for finish painting. Refer to Division 9.
I. Identify piping systems. Refer to Section 15 07 50.
J. Install valves with stems upright or horizontal, not inverted.
K. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work and isolating parts of completed system.
L. Install fuel piping along exterior of building, firmly secure to structure.
M. Do not route fuel piping underground or supported off the ground.

3.04 FUEL TANK INSTALLATION

A. Clean and flush aboveground tanks after installation. Seal until pipe connections are made.
B. Provide piping connections to tanks with unions and swing joints. Provide venting to API 2000.
C. Fill fuel tank full at project turnover with appropriate fuel.

END OF SECTION
SECTION 15 41 00
PLUMBING FIXTURES

PART 1 GENERAL

1.01 SUMMARY
A. Section includes water closets, lavatories, sinks, janitor sinks, showers/baths, washer boxes, and floor drains.
B. Related Sections:
   1. Section 15 14 00 – Domestic Water Piping.
   2. Section 15 15 00 – Sanitary Waste and Vent Piping.
   3. Division 16 – Wiring Connections: Execution requirements for electric connections to sensor valves and faucets specified by this section.
   4. Division 7 – Joint Sealers: Product requirements for calking between fixtures and building components for placement by this section.

1.02 REFERENCES
A. ASME A112.6.1 (American Society of Mechanical Engineers) - Supports for Off-the-Floor Plumbing Fixtures for Public Use.
B. ANSI Z124.2 - Gel-Coated Glass-Fiber Reinforced Polyester Resin Shower Receptor and Shower Stall Units.
C. ASME A112.18.1 (American Society of Mechanical Engineers) - Finished and Rough Brass Plumbing Fixture Fittings.
D. ASME A112.19.2 (American Society of Mechanical Engineers) - Vitreous China Plumbing Fixtures.
E. ASME A112.19.3 (American Society of Mechanical Engineers) - Stainless Steel Plumbing Fixtures.
F. ASSE 1011 (American Society of Sanitary Engineering) - Hose Connection Vacuum Breakers.
G. ASME A1121.1 (American Society of Mechanical Engineers) - Floor Drains.

1.03 SUBMITTALS
A. Division 1 – Administrative Requirements.
B. Product Data: Submit catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim and finishes.
C. Manufacturer’s Installation Instructions: Submit installation methods and procedures.
D. Lead Free Certification: Submit lead free certification from manufacturer for all fixtures and trim.

1.04 CLOSEOUT SUBMITTALS
A. Division 1 – Closeout Submittals.
B. Operation and Maintenance Data: Submit fixture, trim, exploded view and replacement parts lists.
1.05 QUALITY ASSURANCE
   A. Ensure that products requiring electrical connections are listed and classified by Underwriters Laboratories Inc.
   B. Lead Free: All fixtures and trim shall be lead free and certified as lead free by the manufacturer.

1.06 QUALIFICATIONS
   A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
   B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE AND HANDLING
   A. Accept fixtures on site in factory packaging. Inspect for damage.
   B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.08 WARRANTY
   A. Division 1 – Closeout Submittals.
   B. Provide one-year manufacturer warranty for plumbing fixtures.

PART 2 PRODUCTS

2.01 MANUFACTURERS
   A. Manufacturers – China Fixtures:
      1. Kohler.
      3. Eljer.
   B. Manufacturers – Stainless Steel Sinks:
      1. Elkay.
      2. Just.
   C. Manufacturers – Mop and Utility Sinks:
      1. Fiat.
   D. Manufacturers – Sink and Lavatory Trim:
      1. Delta.
      2. Fiat.
      3. Sloan.
   E. Manufacturers – Showers:
      1. Maax.
      2. Kohler.
4. Eljer.

F. Manufacturers – Showers Trim:
   1. Delta.

G. Manufacturers – Washer Box:
   1. Oatey.
   2. Guy Gray.

H. Manufacturers – Eye Wash:
   1. Speakman.

I. Manufacturers - Floor Drains and Floor Sinks:
   1. J.R. Smith.
   2. Josam.
   3. Zurn.

J. Approved Equal.

2.02 FLUSH TANK WATER CLOSET, ADA – (WC-1)
   A. Bowl: ASME A112.19.2; floor mounted, 1.28 gallon per flush, Class Five flushing system, vitreous china, 16-1/2 inches high with elongated rim, vitreous china, insulated closet tank with fittings, lever flushing valve, tank cover locks, and bolt caps.
   B. Seat: Solid white plastic, open front, extended back, self-sustaining hinge and brass bolts, and cover.

2.03 WALL MOUNT LAVATORY, ADA – (LV-1)
   A. Vitreous China Wall Hung Basin: ASME A112.19.2; vitreous china wall hung lavatory 21” x 18” minimum, with 5 inch high back, drillings on 4 inch centers, rectangular basin with splash lip, front overflow.
   B. Faucet: ASME A112.18.1; chrome plated combination supply fitting, metal grid strainer drain, water aerator with maximum 1.2 gpm flow, single lever handle.
   C. Wall Mounted Carrier: ASME A112.6.1; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, concealed arm supports, bearing plate and studs.
   D. Accessories: Chrome plated 17-gauge brass P-trap and arm with escutcheon, screwdriver stops and flexible braided stainless steel supplies.
   E. Pipe Insulation: ADA compliant under sink protective covers for drain piping, hot water piping, cold water piping and angle stops. Molded closed cell vinyl with antimicrobial surface, white color, hinged snap lock lids at angle stops. Truebro or equal.

2.04 DENTAL / EXAM / BEHAVIORAL SINK – (SK-1, SK-2)
   A. Bowl: ASME A112.19.3; stainless steel, rectangular drop-in bowl, center drain, drillings on 4 inch centers.
B. Faucet: ASME A112.18.1; heavy duty cast brass faucet, with gooseneck spout, aerator outlet, two blade handles with sanitary hoods.

C. Accessories: Chrome plated 17gauge brass P-trap and arm with escutcheon, screwdriver stop and flexible braided stainless steel supplies.

2.05 EXAM / TRAUMA SINK – (SK-3)

A. Bowl: ASME A112.19.3; stainless steel, rectangular drop-in bowl, center drain, drillings on 4 inch centers.

B. Faucet: ASME A112.18.1; gooseneck faucet with independently operated eye wash, aerated plastic spray outlets with flip-top dust caps, eye wash flow rate of 2.8gpm, wrist blade handles, 2.2 gpm faucet flow rate.

C. Accessories: Chrome plated 17gauge brass P-trap and arm with escutcheon, screwdriver stop, flexible braided stainless steel supplies.

2.06 JANITOR SINK – (SK-4)

A. Bowl: 24 x 24 x 10 inch high, white, molded stone, floor mounted, with one-inch wide shoulders, vinyl bumper guard, stainless steel strainer.

B. Trim: ASME A112.18.1 exposed wall type supply with lever handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges.

C. Accessories: 5 feet of ½ inch diameter plain end reinforced rubber hose, hose hanger, bumper guard and mop hanger.

2.07 SHOWER, ADA - (SH-1)

A. Enclosure: ANSI-ICC A117.1-2009; one piece fiberglass unit with textured floor, accessible shower, 36”L x 36”W x 76-5/8”H enclosure, center drain, one horizontal L-shaped textured stainless steel grab bar, L-shaped fold-up Phenolic white seat, recessed soap dish, brass drain with chrome plated stainless steel grid, ADA compliant.

B. Trim Mixing Valve: ASME A112.18.1; temperature only mix valve, solid brass body with screwdriver stops.

C. Shower Trim: ASME A112.18.1; ADA compliant shower trim, chrome plated finish, pressure balanced cartridge, temperature limiting stops, integral check stops, single lever with hot/cold indicators, 1.5 gpm hand held shower spray head with ADA compliant adjustable slide mechanism on 24” stainless steel slide bar, 70” double spiral metal flexible hose, vacuum breaker, 90° chrome wall supply elbow.

D. Accessories: Vinyl curtain and chrome curtain rod.

2.08 WASHER BOX – (WB-1)

A. High impact polystyrene, rough-in box, white finish, face plate, water tight construction with sloped bottom, with ¼ turn brass valves with water hammer arrestors, socket for 2 inch waste, drain adaptor for DWV copper if required.

2.09 FLOOR DRAINS - (FD-1)
A. ANSI A1121.1; round lacquered cast iron body with 4” wide drainage flange, gasketed clamping collar design for wood floor installations, adjustable nickel bronze strainer. Provide trap primer connection.

2.10 FLOOR SINK - (FS-1)
A. Square lacquered cast iron body with integral seepage pan, epoxy coated interior, aluminum dome strainer, clamp collar, nickel bronze frame and half grate, suitable for wood floor installation. Provide trap primer connection.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
B. Verify that electric power is available and of the correct characteristics if applicable.
C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION
A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION
A. Install each fixture with trap, easily removable for servicing and cleaning.
B. Provide flexible supplies to fixtures with screwdriver stops, reducers and escutcheons.
C. Install components level and plumb.
D. Install and secure fixtures in place with wall carriers and bolts.
E. Seal fixtures to wall and floor surfaces with sealant as specified in Division 7, color to match fixture.

3.04 INTERFACE WITH OTHER PRODUCTS
A. Review millwork shop-drawings. Confirm location and size of fixtures and openings before rough in and installation.
B. Review dental equipment shop-drawings. Confirm location and size of fixtures and openings before rough in and installation.

3.05 ADJUSTING
A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING
A. Division 1 – Closeout Submittals.
B. Clean plumbing fixtures and equipment.

3.07 PROTECTION OF INSTALLED CONSTRUCTION
A. Do not permit use of fixtures before final acceptance.

END OF SECTION
SECTION 15 48 50
HOT WATER GENERATORS

PART 1 GENERAL

1.01 SUMMARY
A. Section includes commercial hot water generators and tempering valves.
B. Related Sections:
   1. Division 16 - Wiring Connections: Execution requirements for electric connections specified by this section.

1.02 SUBMITTALS
A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
   1. Product Data: Submit dimensioned drawings of hot water generators indicating components and connections to other equipment and piping. Provide electrical characteristics and connection.
   2. Manufacturer's Installation Instructions: Submit mounting and support requirements.

1.03 CLOSEOUT SUBMITTALS
A. Coordinate with Division 1.
B. Operation and Maintenance Data: Submit replacement part numbers and availability.

1.04 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.05 DELIVERY, STORAGE AND HANDLING
A. Coordinate with Division 1.
B. Accept hot water generators on site in original labeled cartons. Inspect for damage.

1.06 FIELD MEASUREMENTS
A. Verify field measurements prior to fabrication.

1.07 WARRANTY
A. Coordinate with Division 1.
B. Provide one year manufacturer warranty for hot water generator.

PART 2 PRODUCTS

2.01 HOT WATER GENERATORS (HWG-1)
A. Manufacturers:
   1. Triangle Tube.
   2. Amtrol.
3. Well McLain.
4. Approved Equal.

B. Type: Indirect using boiler heating fluid, vertical storage.

C. Storage Tank: Vertical tank, stainless steel water reservoir, thermally insulated with minimum of 2 inch polyurethane.


E. Accessories: Union at connections, ASME rated temperature and pressure relief valve, pressure gauge, temperature gauge.

F. Controls: Closed well aquastat. Electronic control capable of selecting desired hot water temperature, digital readout of temperature.

2.02 TEMPERING VALVE (TV-1)

A. Manufacturers:
   1. Watts.
   2. Honeywell.
   3. Approved Equal.

B. Type: ASSE 1017 and CSA B125 compliant, lead free copper silicon alloy body with integral check valves and solid wax hydraulic principle thermostatic control. Size and performance as scheduled.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install hot water generators in accordance with the manufacturer's requirements.

B. Coordinate with plumbing piping, hydronic piping and electrical work to achieve operating system.

C. Seismically restrain units in accordance with International Building Code requirements.

END OF SECTION
SECTION 15 51 00
HEATING BOILERS AND ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY
A. Section includes boilers, controls and boiler trim, hot water connections, fuel burning system and connections.
B. Related Sections:
   1. Section 15 18 00 - Hydronic Piping: Execution requirements for hot water and steam piping for piping connections to boilers specified by this section.
   2. Section 15 19 00 – Fuel Piping: Execution requirements for oil and gas piping connections to boilers specified by this section.
   3. Division 16 – Wiring Connections: Execution requirements for electric connections to boilers specified by this section.

1.02 REFERENCES
B. HI (Hydronics Institute) - Testing and Rating Standard for Cast Iron and Steel Heating Boilers.
C. NEMA 250 (National Electrical Manufacturers Association) - Enclosures for Electrical Equipment (1000 Volts Maximum).

1.03 SUBMITTALS
A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
   1. Product Data: Submit general layout and dimensions. Include size and location of water, fuel, electric and vent connections, electrical characteristics, weight and mounting loads.
   2. Test Reports: Indicate specified performance and efficiency is met or exceeded. Provide combustion test that includes boiler firing rate, over fire draft, gas flow rate, heat input, burner manifold gas pressure, percent carbon monoxide (CO), percent oxygen (O), percent excess air, flue gas temperature at outlet, ambient temperature, net stack temperature, percent stack loss, percent combustion efficiency and heat output.
   3. Manufacturer's Installation Instructions: Submit assembly, support details, connection requirements and include start-up instructions.
   4. Manufacturers Field Reports: Indicate condition of equipment after start-up including control settings and performance chart of control system.

1.04 CLOSEOUT SUBMITTALS
A. Division 1 – Closeout Submittals.
B. Operation and Maintenance Data: Submit manufacturer’s descriptive literature, operating instructions, cleaning procedures, replacement parts list and maintenance and repair data.
1.05 QUALITY ASSURANCE
   A. Conform to ASME SEC IV for construction of boilers. The boiler shall be registered with the National Board Of Boiler And Pressure Vessel Inspectors
   B. Conform to applicable code for internal wiring of factory wired equipment.
   C. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc.

1.06 QUALIFICATIONS
   A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
   B. Installer: Company specializing in performing work of this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE AND HANDLING
   A. Accept boilers and accessories on site in factory shipping packaging. Inspect for damage.
   B. Protect boilers from damage by leaving packing in place until installation.

1.08 FIELD MEASUREMENTS
   A. Verify field measurements prior to fabrication.

1.09 WARRANTY
   A. Division 1 – Closeout Submittals.
   B. Provide manufacturers limited warranty for boilers.

PART 2 PRODUCTS
2.01 BOILERS
   A. Manufacturers:
      1. Weil McLain.
      2. Approved substitutions.
   B. Hot Water Boilers: Natural draft with insulated steel jacket, sectional cast iron heat exchanger, oil burning system, controls and boiler trim.
   C. Performance rating shall be in accordance with HI - Testing and Rating Standard for Cast Iron and Steel Heating Boilers.

2.02 CAST IRON BOILER FABRICATION
   A. Assembly: Cast iron sections with 50 psig water ASME Boilers and Pressure Vessels Code rating, assembled with push nipples or gaskets and draw rods.
   B. Provide access for flue passages, for cleaning and two flame observation ports, one in front and one in back.
   C. Seismic Base: Boiler section with integral cast legs built on and secured to channel steel base assembly for securing boiler.
   D. Jacket: Insulated steel jacket.
2.03 HOT WATER BOILER TRIM
   A. ASME pressure relief valve, T&P gauge, low water cut-off with manual reset, high limit temperature controller with manual reset, cold start aquastat and reverse acting aquastat for protection against condensation.
   B. ASME rated pressure relief valve, 30 psig.
   C. Combination water pressure and temperature gage. Scale on pressure gage shall be graduated from 1-1/2 to 3 times the pressure relief valve set pressure
   D. Low water cut-off shall be automatic reset. One low water cut-off shall be manual reset.
   E. Operating temperature controller to maintain boiler water temperature.
   F. High limit temperature controller with manual reset for burner to prevent boiler water temperature from exceeding safe system temperature. Honeywell Model L4006E.
   G. Any additional trim requirements to provide a fully compliant ASME CSD-1 installation.
   H. Provide boiler control panel for heating control functions, Tekmar or equal.

2.04 CAST IRON BOILER FUEL BURNING SYSTEM
   A. Burner Manufacturers:
      1. Beckett.
      2. Carlin
      3. Riello
      4. Approved equal.
   B. Burner Operation: Adjustable firing rates.
   C. Oil Burner: Primary with interrupted ignition, oil valve with primary pre-purge.
   D. Oil Burner Safety Controls: Energize burner motor and electric ignition, limit time for establishment of main flame, monitor flame continuously during burner operation and stop burner on flame failure with manual reset necessary, solenoid oil delay valve opens after burner motor energized and closes when de-energized
   E. Combustion Air Intake: Provide combustion air intake.
   F. Controls: Pre-wired, factory assembled electronic controls in control cabinet. Provide sensors for auxiliary high limit, low water cut-off, and outdoor air reset.

PART 3 EXECUTION

3.01 INSTALLATION
   A. Install boilers and connection of fuel oil piping in accordance with NFPA 31.
   B. Provide piping connections and accessories as indicated and required.
   C. Pipe relief valves to glycol tank.
   D. Provide all sensors and control elements as required for the boiler's sequence of operation.
   E. Provide for connection to electrical service. Refer to Division 16.

3.02 DEMONSTRATION AND TRAINING
   A. Demonstrate operation and maintenance procedures to Owner.
END OF SECTION
SECTION 15 55 00
BREECHING, CHIMNEYS AND STACKS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes manufactured double wall chimneys for fuel fired equipment.

B. Related Sections:
   1. Section 15 06 00 – Hangers and Supports: Product requirements for hangers and supports for placement by this section.
   2. Section 15 51 00 – Heating Boiler and Accessories: Positive pressure chimney for forced draft boilers.

1.02 REFERENCES

A. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
D. UL 103 (Underwriters Laboratories, Inc.) - Standard for Factory Built Low Heat Chimneys.
E. UL 441 (Underwriters Laboratories, Inc.) - Standard for Gas Vents.

1.03 DESIGN REQUIREMENTS

A. Factory built vents and chimneys used for venting natural draft appliances shall comply with NFPA 211 and be UL listed and labeled.

B. Design premanufactured metal chimneys for wind loading of 110 mph and seismic loads for Zone 4.

1.04 SUBMITTALS

A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
   1. Shop Drawings: Indicate general construction, dimensions, weights, sizes, support and layout of chimney systems. Submit layout drawings indicating plan view and elevations.
   2. Manufacturer’s Calculations: Submit manufacturer’s calculations for chimney system sizing based on proposed system layout.
   3. Product Data: Submit data indicating factory built chimneys, including dimensional details of components and flue caps, dimensions and weights, electrical characteristics and connection requirements.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.
1.06 ENVIRONMENTAL REQUIREMENTS
   A. Maintain water integrity of roof during and after installation of chimney or vent.

1.07 FIELD MEASUREMENTS
   A. Verify field measurements prior to fabrication.

1.08 WARRANTY
   A. Division 1 – Closeout Submittals.
   B. Provide one year manufacturer warranty for all manufactured units.

PART 2 PRODUCTS

2.01 NATURAL DRAFT CHIMNEY SYSTEM - BOILERS
   A. Manufacturers:
      1. Metalbestos.
      2. Approved Equal.
   B. Provide double wall metal stacks, tested to UL 103 and UL listed, for use with building heating equipment, in compliance with NFPA 211.
   C. Fabricate with 1-inch minimum, insulated space between walls. Construct inner jacket of 20 gauge ASTM A167 Type 304 stainless steel. Construct outer jacket of Type 304 stainless steel 24 gauge.
   D. Accessories, UL labeled:
      1. Ventilated Roof Thimble: Consists of roof penetration assembly, support assembly, vent flashing with spacers and storm collar.
      2. Stack Cap: Consists of conical rain shield with inverted cone for partial rain protection with low flow resistance.
      3. Additional components as may be required for a properly functioning system.

PART 3 EXECUTION

3.01 INSTALLATION
   A. Install in accordance with manufacturer's instructions.
   B. Install venting and chimneys with minimum of joints. Align accurately at connections, with internal surfaces smooth.
   C. Support venting and chimneys from building structure, rigidly with suitable ties, braces, hangers and anchors to hold to shape and prevent buckling.
   D. Pitch venting and chimneys with positive slope up from fuel-fired equipment.
   E. Maintain UL listed minimum clearances from combustibles. Assemble pipe and accessories as required for complete installation.
   F. Clean vents and chimneys during installation, removing dust and debris.
   G. At appliances, provide slip joints permitting removal of appliances without removal or dismantling of venting and chimneys.
   H. Provide venting and chimney systems with drain tee with valved drain connection.
I. Provide positive pressure chimney systems continuously from breeching collar connections.

J. Venting and chimney systems with drain tee with valved drain connection.

K. Provide natural draft chimney systems continuously from breeching collar connections.

L. Provide guide wires as required for chimney anchoring to roof structure. Coordinate final connection to building with architectural and structural as required.

M. Coordinate with architectural to ensure an adequately sized snow shield is provided on the high side of the chimney to ensure adequate protection is provided against potential snow and ice shearing concerns.

END OF SECTION
SECTION 15 76 00
TERMINAL HEATING UNITS

PART 1 GENERAL

1.01 SUMMARY
A. Section includes baseboard, unit heaters, duct coils, and cabinet unit heaters.
B. Related Sections:
   1. Section 15 18 00 – Hydronic Piping: Execution requirements for piping fittings and drains lines specified by this section.
   2. Division 16 – Wiring Connections: Execution requirements for electric connection to units specified by this section.

1.02 REFERENCES
B. SMACNA (Sheet Metal Air Conditioning Contractors' National Association) - HVAC Duct Construction Standards, Metal and Flexible.

1.03 SUBMITTALS
A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
   1. Product Data: Submit equipment data including performance, construction and electrical requirements.
   2. Manufacturer's Installation Instructions: Submit.

1.04 CLOSEOUT SUBMITTALS
A. Division 1 – Closeout Submittals.
B. Project Record Documents: Record actual locations of components and locations of access doors in radiation cabinets required for access to valves.
C. Operation and Maintenance Data: Submit manufacturers descriptive literature, operating instructions, installation instructions, maintenance and repair data and parts listings.

1.05 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
B. Installer: Company specializing in performing work of this section with minimum three years documented experience.

1.06 DELIVERY, STORAGE AND HANDLING
A. Accept units on site in factory packing. Inspect for damage. Store under roof.
B. Protect coil fins from crushing and bending by leaving in shipping cases until installation and by storing indoors. Protect coils from entry of dirt and debris with pipe caps or plugs.
1.07 FIELD MEASUREMENTS
   A. Verify field measurements prior to fabrication.

1.08 WARRANTY
   A. Division 1 – Closeout Submittals.
   B. Provide one year manufacturer’s warranty for terminal heating units.

PART 2 PRODUCTS

2.01 BASEBOARD RADIATION (BB-1)
   A. Manufacturers:
      1. Sterling.
      2. Embassy Industries
      3. Trane.
      4. Approved Equal.
   B. Heating Elements: 3/4 inch ID copper tubing mechanically expanded into flanged collars of evenly spaced aluminum fins, one tube end belled. 50 fins per foot with 0.020” aluminum fins.
   C. Enclosure: 18 inch high back and top of one piece; front panel, end panel, end caps, corners and joiner pieces to snap together, with front panel easily removable. Provide full-length damper.
   D. Finish: Factory applied baked enamel, color as selected by Architect.
   E. Capacity: As scheduled, based on 65°F entering air temperature, 170°F average water temperature.

2.02 BASEBOARD RADIATION (BB-2)
   A. Manufacturers:
      1. Sterling.
      2. Embassy Industries
      3. Trane.
      4. Approved Equal.
   B. Heating Elements: 3/4 inch ID copper tubing mechanically expanded into flanged collars of evenly spaced aluminum fins, one tube end belled. 50 fins per foot with 0.020” aluminum fins.
   C. Enclosure: None, bare fintube.
   D. Finish: None.
   E. Capacity: As scheduled, based on 65°F entering air temperature, 170°F average water temperature.

2.03 UNIT HEATER (UH-1)
   A. Manufacturers:
      1. Modine.
      2. Trane.
4. Approved Equal.

B. Coils: Seamless copper tubing, silver brazed to steel headers and with evenly spaced aluminum fins mechanically bonded to tubing.

C. Casing: 0.0478-inch thick steel with threaded pipe connections for hanger rods.

D. Finish: Factory applied baked enamel of color as selected by Architect.

E. Fan: Direct drive propeller type, statically and dynamically balanced, with fan guard; horizontal models with permanently lubricated sleeve bearings.

F. Air Outlet: Adjustable two-way louvers.

G. Motor: Permanently lubricated sleeve bearings.

H. Control: Local disconnect switch.

I. Capacity: As scheduled.

2.04 CABINET UNIT HEATER (CUH-1, CUH-2, CUH-3)

A. Manufacturers:
   1. Embassy.
   2. Modine.
   3. Trane.
   4. Approved Equal.

B. Coils: Evenly spaced aluminum fins mechanically bonded to copper tubes, designed for 100 psi and 220°F.

C. Cabinet: 0.0598 inch thick steel with exposed corners and edges rounded, easily removed panels, glass fiber insulation and integral air outlet and inlet grilles, frame for recessed wall installation.

D. Finish: Factory applied baked enamel of color as selected by Architect on visible surfaces of enclosure or cabinet.

E. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.

F. Motor: Tap wound multiple speed permanent split capacitor with sleeve bearings, resiliently mounted.

G. Control: Multiple speed switch, factory wired, located in cabinet.

H. Filter: Easily removed 1inch thick glass fiber throw-away type, located to filter air before coil.

I. Capacity: As Scheduled.

2.05 DUCT COIL (DC-1)

A. Manufacturers:
   1. Greenheck.
   2. Titus.
4. Approved Equal.
   B. Headers: Seamless copper with die formed tube holes.
   C. Coils: 1/2” O.D. x 0.016” seamless copper tube mechanically expanded into fin collars. Fins shall be die formed plate type, 0.006” aluminum fins, 10 fins per inch, continuous within the steel coil casing.
   D. Leak Testing: Air test under water to 350 psig for working pressure of 250 psig and 220°F. Performance is to be certified under ARI Standard 410.
   E. Configuration: Self-draining serpentine circuitry, with threaded plugs for drain and vent and threaded plugs in return bends and in headers opposite each tube.
   F. Capacity: As Scheduled.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Division 1 - Administrative Requirements.
   B. Verify wall construction and ductwork are ready for installation.
   C. Verify concealed blocking and supports are in place and connections are correctly located.

3.02 INSTALLATION
   A. Install equipment exposed to finished areas after walls and ceilings are finished and painted. Avoid damage.
   B. Protection: Provide finished cabinet units with protective covers during balance of construction.
   C. Baseboard Radiation: Locate on outside walls and run cover continuously 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. Install end trim where units butt against walls. Install exposed elements in utilidor and within floor joists as low as possible.
   D. Unit Heaters: Hang from building structure, with pipe hangers anchored to building, not from piping. Seismically restrain units. Mount as high as possible to maintain greatest headroom unless otherwise indicated.
   E. Cabinet Unit Heaters: Install as indicated. Seismically restrain units. Coordinate to assure correct recess size for recessed units.

3.03 CLEANING
   A. Division 1 – Closeout Submittals.
   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 15 81 00
DUCTS

PART 1 GENERAL

1.01 SUMMARY
A. Section includes low pressure metal ductwork.
B. Related Sections:
   1. Division 9 - Painting: Execution requirements for Weld priming, paint or coating specified by this section.
   2. Section 15 06 00 – Hangers and Supports: Product requirements for hangers, supports and sleeves for placement by this section.

1.02 REFERENCES
A. ASTM A90 - Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.
B. ASTM A525 – General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
C. ASTM A527 – Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock Forming Quality.
E. SMACNA (Sheet Metal Air Conditioning Contractors' National Association) - HVAC Air Duct Leakage Test Manual.
F. SMACNA (Sheet Metal Air Conditioning Contractors' National Association) - HVAC Duct Construction Standards - Metal and Flexible.
G. UL 181 (Underwriters Laboratories, Inc.) - Factory-Made Air Ducts and Connectors.

1.03 PERFORMANCE REQUIREMENTS
A. No variation of duct configuration or sizes other than those of equivalent or lower loss coefficient is permitted except by written permission.

1.04 SUBMITTALS
A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
   1. Product Data: Submit data for duct materials, duct connectors, flexible duct.

1.05 CLOSEOUT SUBMITTALS
A. Division 1 – Closeout Submittals.
B. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.06 QUALITY ASSURANCE
A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and flexible.
B. Construct ductwork to NFPA 90A standards.
1.07 QUALIFICATIONS
   A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
   B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.08 ENVIRONMENTAL REQUIREMENTS
   A. Do not install duct sealant when temperatures are less than those recommended by sealant manufacturers.
   B. Maintain temperatures during and after installation of duct sealant.

1.09 FIELD MEASUREMENTS
   A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.01 DUCT MATERIALS
   B. Fasteners: Rivets, bolts, or sheet metal screws.
   C. Hanger Rod: ASTM A36; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.02 LOW PRESSURE DUCTWORK FABRICATION
   A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible and as indicated. Provide duct material, gages, reinforcing and sealing for 2” w.g. duct pressure class.
   B. Construct T’s, bends and elbows with minimum radius 1-1/2 times centerline duct width. If not possible and when rectangular elbows are used, provide airfoil turning vanes.
   C. Increase duct sizes gradually, not exceeding 15° divergence wherever possible; maximum 30° divergence upstream of equipment and 45° convergence downstream.
   D. Provide standard 45° lateral wye takeoffs unless otherwise indicated where 90° conical tee connections may be used.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify sizes of equipment connections before fabricating transitions.

3.02 INSTALLATION
   A. Install ducts in accordance with SMACNA HVAC Duct Construction Standards.
   B. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
   C. Use double nuts and lock washers on threaded rod supports.
3.03 INTERFACE WITH OTHER PRODUCTS

A. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

END OF SECTION
SECTION 15 82 00
DUCT ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY
A. Section includes fire dampers.

1.02 REFERENCES
B. SMACNA (Sheet Metal Air Conditioning Contractors' National Association) - HVAC Duct Construction Standards - Metal and Flexible.
C. UL 33 (Underwriters Laboratories, Inc.) - Heat Responsive Links for Fire-Protection Service.
D. UL 555 (Underwriters Laboratories, Inc.) - Fire Dampers and Ceiling Dampers.

1.03 SUBMITTALS
A. Division 1 - Administrative Requirements.
B. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
   1. Product Data: Submit manufacturer's product data.
   2. Manufacturer's Installation Instructions: Submit for fire dampers.

1.04 CLOSEOUT SUBMITTALS
A. Division 1 - Closeout Submittals.
B. Contract Closeout Requirements: In addition to contract closeout requirements as outlined under Division 1, mechanical contract closeout requirements shall include the following:
   1. Operation and Maintenance Data: Submit for Fire Dampers.

1.05 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.06 DELIVERY, STORAGE AND HANDLING
A. Protect dampers from damage to operating linkages and blades.

1.07 FIELD MEASUREMENTS
A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.01 FIRE DAMPERS
A. Manufacturers:
   1. Ruskin.
   2. Greenheck.
   3. Approved Equal.
B. Provide in accordance with NFPA 90A and UL 555 and manufacturer's condition of listing. Dampers shall be permanently marked for use in a dynamic system.

C. Fire damper shall be UL 555 classified and labeled as a 1-1/2 hour fire damper.

D. Fusible link shall be in accordance with UL 33 and separate at 165°F.

PART 3 EXECUTION

3.01 EXAMINATION

A. Division 1 – Administrative Requirements.

B. Verify ducts and equipment installations are ready for accessories.

3.02 INSTALLATION

A. Install fire dampers at locations indicated on the drawings and in accordance with manufacturer's UL approved installation instructions.

B. Install fire dampers square and free from racking with blades running horizontally.

C. Do not stretch or compress fire damper frame into duct or opening.

D. Install in accordance with NFPA 90A and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 15 81 00 for duct construction and pressure class.

END OF SECTION
SECTION 15 83 00
FANS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Ceiling exhaust fans.
   2. Inline fans.
   3. Range hood.
   5. Motors.
   6. Drives.
   7. Accessories.

B. Related Sections:
   1. Section 15 08 00 – Mechanical Insulation: Product requirements for power ventilators for placement by this section.
   2. Section 15 81 00 - Ducts: Product requirements for hangers for placement by this section.
   3. Division 16 – Wiring Connections: Execution and product requirements for connecting equipment specified by this section.

1.02 REFERENCES

A. ABMA STD 9 (American Boiler Manufacturers Association) - Load Ratings and Fatigue Life for Ball Bearings.
D. AMCA 300 (Air Movement and Control Association) - Reverberant Room Method for Sound Testing of Fans.
E. AMCA 301 (Air Movement and Control Association) - Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

1.03 SUBMITTALS

A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
   1. Product Data: Submit data on all fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity and electrical characteristics and connection requirements.
   2. Manufacturer's Installation Instructions: Submit fan manufacturers instructions.
1.04 CLOSEOUT SUBMITTALS
   A. Division 1 – Closeout Submittals.
   B. Operation and Maintenance Data: Submit instructions for lubrication, motor and drive replacement, spare parts list and wiring diagrams.

1.05 QUALIFICATIONS
   A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
   B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.06 DELIVERY, STORAGE AND HANDLING
   A. Protect motors, shafts and bearings from weather and construction dust.

1.07 ENVIRONMENTAL REQUIREMENTS
   A. Do not operate fans for any purpose until ductwork is clean, filters in place, bearings lubricated and fan has been test run under observation.

1.08 FIELD MEASUREMENTS
   A. Verify field measurements prior to fabrication.

1.09 WARRANTY
   A. Division 1 – Closeout Submittals.
   B. Provide one year manufacturer warranty for fans.
   C. Furnish heat recovery ventilators with warranty as follows:
      1. Two year warranty on all parts not including heat recovery cores.
      2. Heat recovery cores shall have 15 year unconditional warranty.

1.10 EXTRA MATERIALS
   A. Supply one set of belts for each fan.

PART 2 PRODUCTS
2.01 CEILING EXHAUST FANS (EF-1 & EF-2)
   A. Manufacturers:
      1. Greenheck.
      2. Panasonic.
      3. Approved Equal.
   B. Construction:
      1. Centrifugal Fan Unit: Direct driven with galvanized steel housing, resilient mounted motor, and spring or gravity back-draft damper.
      2. Disconnect Switch: Cord and plug in housing for thermal overload protected motor and wall mounted switch.
3. Controls: On-off function of fan via switch or wall mounted reverse acting thermostat, as scheduled. Provide with speed controller.
4. Grille: Molded white plastic.

2.02 INLINE VENT FAN (VF-1)
A. Manufacturers:
   1. Greenheck.
   2. Approved Equal.
B. Construction:
   1. Centrifugal Fan Unit: Direct driven with galvanized steel or aluminum housing, backward inclined centrifugal fan type.
   2. Disconnect Switch: Cord and plug in housing for thermal overload protected motor and wall mounted switch.
   3. Controls: Automatic control via reverse acting thermostat.
   4. Accessories: Insulated housing, speed controller, and outlet guard.

2.03 INLINE PRESSURIZATION FAN (PF-1)
A. Manufacturers:
   1. Greenheck.
   2. Approved Equal.
B. Construction:
   1. Centrifugal Fan Unit: Direct driven with galvanized steel or aluminum housing, backward inclined centrifugal fan type.
   2. Disconnect Switch: Cord and plug in housing for thermal overload protected motor and wall mounted switch.
   4. Accessories: Insulated housing and speed controller.

2.04 HEAT RECOVERY VENTILATORS (HRV-1)
A. Manufacturers:
   1. Lifebreath.
   2. Approved Equal.
B. General: Furnish and install a heat recovery ventilator as indicated on the drawings. Unit shall be factory assembled, tested, and shipped as a complete, packaged assembly, for indoor mounting, consisting of the following:
   1. Dual aluminum heat exchangers.
   2. Supply and exhaust centrifugal blowers
   3. Washable filters
   4. Electronic control system
C. Cabinet: Unit casing shall be of 20 gauge, pre-painted steel lined with foil-faced fiberglass insulation. Vibration Isolators shall be provided for the unit and installed by the Contractor.

D. Heat Exchangers: Unit shall have dual modular aluminum plate heat exchanger cores, corrosion resistant.

E. Blowers: Blowers shall be centrifugal, forward-curved and shall have permanently lubricated bearings. Separate blower shall be provided for supply and exhaust air.

F. Motors: Motors shall be direct drive held in rubber isolated mounts for vibration control, multiple speed controls.

G. Filter: Unit shall have washable air filters in both supply and exhaust air streams.

H. Electronic Control System: Electronic controller per schedule and sequence of operation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install fans with resilient mountings and flexible electrical leads.

C. Provide sheaves required for final air balance.

D. Provide safety screen where inlet or outlet is exposed.

E. Provide backdraft dampers on discharge of exhaust fans or as indicated.

F. Do not operate fans in normal operation until ductwork is clean, filters are in place, bearings are lubricated and fan has been test run under observation.

END OF SECTION
SECTION 15 85 00
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SUMMARY
   A. Section includes diffusers, registers and grilles.
   B. Related Sections:
      1. Division 9 - Painting: Execution and product requirements for Painting of ductwork visible behind outlets and inlets specified by this section.

1.02 REFERENCES
   B. AMCA 500 (Air Movement and Control Association) - Test Method for Louvers, Dampers and Shutters.
   D. SMACNA (Sheet Metal and Air Conditioning Contractors’ National Association) - HVAC Duct Construction Standard - Metal and Flexible.

1.03 SUBMITTALS
   A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
      1. Product Data: Submit data outlets and inlets sizes, finish, performance and type of mounting.

1.04 CLOSEOUT SUBMITTALS
   A. Division 1 - Closeout Submittals.
   B. Project Record Documents: Record actual locations of air outlets and inlets.

1.05 QUALIFICATIONS
   A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.06 WARRANTY
   A. Division 1 – Closeout Submittals.

PART 2 PRODUCTS

2.01 MANUFACTURERS – GRILLES, REGISTERS, DIFFUSERS
   A. Manufacturers:
      1. Lifebreath.
      2. Titus.
      3. Approved Equal.
2.02 **CEILING DIFFUSERS (SA, SB, EA, EB)**

A. Type: round plastic, multi-core diffuser to discharge air in 360 degree pattern, adjustable cone to allow variable ventilation flow.

2.03 **COUNTER TRANSFER AIR GRILLE (BG)**

A. Type: aluminum “pencil proof” linear bar grille for transfer of warm air off of baseboard to above architectural counter. 7/16” bar spacing, 7/32” bars, zero-degree deflection, #01 Aluminum finish. Length as required to provide grille above all baseboard in 104 Office. Coordinate framing requirements with architectural for seamless installation.

**PART 3 EXECUTION**

3.01 **EXAMINATION**

A. Verify inlet/outlet locations.

B. Verify ceiling and wall systems are ready for installation.

C. Verify architectural counter is ready for installation.

3.02 **INSTALLATION**

A. Install diffusers to ductwork with airtight connection.

B. Paint ductwork visible behind air outlets and inlets matte black. Refer to Division 9.

3.03 **INTERFACE WITH OTHER PRODUCTS**

A. Check location of outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry and lighting arrangement.
SECTION 15 90 50
INSTRUMENTATION AND CONTROL ELEMENTS

PART 1 GENERAL

1.01 SUMMARY
A. Section includes thermostats, control valves, damper operators and miscellaneous accessories.
B. Related Sections:
   1. Section 15 01 00 - Basic Mechanical Requirements.
   2. Section 15 18 00 - Hydronic Piping: Installation of control valves, flow switches, temperature sensor sockets, gage taps.
   3. Section 15 81 00 - Ducts: Installation of automatic dampers.
   4. Division 16 – Electrical.

1.02 REFERENCES
A. AMCA 500 - Test Methods for Louvers, Dampers and Shutters.
B. NEMA DC 3 - Low-Voltage Room Thermostats.
C. NFPA 70 - National Electrical Code.
D. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

1.03 SUBMITTEDS
A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
   1. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.
   2. Manufacturer’s Instructions: Provide for all manufactured components.

1.04 CLOSEOUT SUBMITTEDS
A. Division 1 – Closeout Submittals.
B. Project Record Documents: Record actual locations of control components, including thermostats and sensors.
C. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials and calibration tolerances.
D. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owners name and registered with manufacturer.

1.05 QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.
B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and factory trained by manufacturer.
1.06 REGULATORY REQUIREMENTS
   A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.07 WARRANTY
   A. Division 1 – Closeout Submittals.
   B. Correct defective Work within a one year period after Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS
   A. Siemens.
   B. Honeywell.
   C. Approved equal.

2.02 CONTROL VALVES
   A. Globe Pattern:
      1. Bronze body, bronze trim, 2 or 3 port as indicated, replaceable plugs and seats, union and threaded ends.
      2. Rate for service pressure of 125 psig at 250°F.
      3. Size for 3 psig maximum pressure drop at design flow rate.
      4. Two way valves shall have equal percentage characteristics, three way valves linear characteristics. Size two way valve operators to close valves against pump shut off head.
      5. Operators (Modulating): Self contained, linear motorized actuator with approximately 3/4 inch stroke, 60 second full travel with transformer and SPDT contacts: 24 v DC, 6 watt maximum input.
   B. Electronic Operators:
      1. Valves shall spring return to normal position (full heat).
      2. Select operator for full shut off at maximum pump differential pressure.

2.03 INPUT/OUTPUT SENSORS
   A. Temperature:
      1. Resistance temperature detectors with resistance tolerance of plus or minus 0.1 percent at 70°F, interchangeability less than plus or minus 0.2 percent, time constant of 13 seconds maximum for fluids and 200 seconds maximum for air.
      2. Measuring current maximum 5 mA with maximum self-heat of 0.031°F/mW in fluids and 0.014°F/mW in air.
      3. Provide 3 lead wires and shield for input bridge circuit.
      4. Use insertion elements in ducts not affected by temperature stratification or smaller than one square meter. Use averaging elements where larger or prone to stratification sensor length 8 feet or 16 feet as required.
5. Insertion elements for liquids shall be with brass socket with minimum insertion length of 2-1/2 inches.

6. Outside air sensors: Watertight inlet fitting, shielded from direct rays of sun.

2.04 THERMOSTATS

A. Electric Room Thermostats:
   1. Type: NEMA DC 3, 24 volt, night setback, 7 day program, temperature control.
   2. Service: heating only or cooling and heating as required.
   3. Covers: Locking with set point adjustment, setpoint indication, with thermometer.

B. Line Voltage Thermostats:
   1. Integral manual On/Off/Auto selector switch, single or two pole as required.
   2. Dead band: Maximum 2°F.
   3. Cover: Locking with set point adjustment, setpoint indication, with thermometer.

C. Room Thermostat Accessories:
   1. Insulating Bases: For thermostats located on exterior walls.
   2. Adjusting Key: As required for device.
   3. Thermostat Guards: Locking transparent plastic mounted on separate base as indicated.

D. Immersion Thermostat:
   1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint and adjustable throttling range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that systems are ready to receive work.
B. Beginning of installation means installer accepts existing conditions.
C. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.
D. Coordinate installation of system components with installation of mechanical systems equipment.
E. Ensure installation components are complementary to installation of similar components.
F. Coordinate installation of system components with installation of mechanical systems equipment.

3.02 INSTALLATION

A. Install in accordance with manufacturers instructions.
B. Check and verify location of thermostats and other exposed control sensors with plans and room details before installation. Locate 48 inches above floor. Align with lighting switches.
C. Mount freeze protection thermostats using flanges and element holders.
D. Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.

E. Provide separable sockets for liquids and flanges for air bulb elements.

F. Provide valves with position indicators where sequenced with other controls.

G. Provide locking thermostat covers at thermostats located in public areas and as indicated.

H. Provide conduit and electrical wiring in accordance with Division 16. Electrical material and installation shall be in accordance with appropriate requirements of Division 16.

I. Line voltage thermostats are only allowed on horizontal unit heaters.

J. Baseboard and cabinet unit heater thermostats shall be low voltage, 7 day programmable, electric thermostats.

**END OF SECTION**
SECTION 15 95 00
TESTING, ADJUSTING AND BALANCING

PART 1 GENERAL

1.01 SUMMARY
A. Section includes testing, adjusting and balancing of air systems, testing, adjusting and balancing of hydronic systems and measurement of final operating condition of HVAC systems.

1.02 REFERENCES
A. AABC (Associated Air Balance Council) - National Standards for Total System Balance.
C. NEBB (National Environmental Balancing Bureau) - Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems.

1.03 SUBMITTALS
A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
   1. Test Reports: Indicate data on AABC, NEBB, or Contractors standard forms.
   2. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting and balancing of systems and equipment to achieve specified performance.
   3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect/Engineer and for inclusion in operating and maintenance manuals.
   4. Provide reports in hard cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side.

1.04 CLOSEOUT SUBMITTALS
A. Division 1 – Closeout Submittals.
B. Project Record Documents: Record actual locations of balancing valves and rough setting.

1.05 QUALITY ASSURANCE
A. Perform Work in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance or NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

1.06 QUALIFICATIONS
A. Agency: Company specializing in the testing, adjusting and balancing of systems specified in this section with minimum three years documented experience certified by AABC or NEBB.
B. Perform Work under supervision of an AABC Certified Test and Balance Engineer, NEBB Certified Testing, Balancing and Adjusting Supervisor or registered professional engineer experienced in performance of this Work and licensed in the State of Alaska.
1.07 SEQUENCING
   A. Sequence balancing between completion of systems tested and date of Substantial Completion.

PART 2 PRODUCTS
   Not used.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
      1. Systems are started and operating in a safe and normal condition.
      2. Temperature control systems are installed complete and operable.
      3. Proper thermal overload protection is in place for electrical equipment.
      4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
      5. Duct systems are clean of debris.
      6. Fans are rotating correctly.
      7. Diffuser cones are in place and open.
      8. Air outlets are installed and connected.
      9. Duct system leakage is minimized.
     10. Hydronic systems are flushed, filled and vented.
     11. Pumps are rotating correctly.
     12. Proper strainer baskets are clean and in place or in normal position.
     13. Service and balance valves are open.
   B. Submit field reports. Report defects and deficiencies noted during performance of services, which prevent system balance.

3.02 PREPARATION
   A. Provide instruments required for testing, adjusting and balancing operations.

3.03 INSTALLATION TOLERANCES
   A. Air Handling Systems: Adjust to within plus or minus 10 percent of design.
   B. Air Outlets and Inlets: Adjust total space to within plus 10 percent and minus 5 percent of design. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
   C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.04 ADJUSTING
   A. Ensure recorded data represents actual measured or observed conditions.
   B. Permanently mark settings of valves, dampers and other adjustment devices allowing settings to be restored. Set and lock memory stops.
C. After adjustment, take measurements to verify balance has not been disrupted or that such
disruption has been rectified.
D. Leave systems in proper working order, replacing belt guards, closing access doors, closing
doors to electrical switch boxes and restoring thermostats to specified settings.

3.05 AIR SYSTEM PROCEDURE
A. Adjust air handling and distribution systems to provide required or design supply, return and
exhaust air quantities at site altitude.
B. Make air quantity measurements in main ducts by pitot tube traverse of entire cross sectional
area of duct.
C. Measure air quantities at air inlets and outlets.
D. Adjust distribution system to obtain uniform space temperatures free from objectionable
drafts.
E. Use volume control devices to regulate air quantities only to extent that adjustments do not
create objectionable air motion or sound levels.
F. Provide written record with required and actual air quantities recorded at each outlet or inlet.
G. Measure static air pressure conditions on air supply units, including filter and coil pressure
drops and total pressure across the fan. Make allowances for 50 percent loading of filters.

3.06 WATER SYSTEM PROCEDURE
A. Adjust water systems, after air balancing, to provide design quantities.
B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to
determine flow rates for system balance. Where flow-metering devices are not installed, base
flow balance on temperature difference across various heat transfer elements in the system.
C. Adjust systems to provide specified flows through heat transfer elements prior to thermal
testing. Perform balancing by measurement of temperature differential in conjunction with air
balancing.
D. Effect system balance with automatic control valves fully open or in normal position to heat
transfer elements.
E. Effect adjustment of water distribution systems by means of balancing valves. Do not use
service or shut-off valves for balancing.
F. Where available pump capacity is less than total flow requirements or individual system parts,
full flow in one part may be simulated by temporary restriction of flow to other parts.

3.07 SCHEDULES
A. Equipment Requiring Testing, Adjusting and Balancing
   1. Plumbing Pumps
   2. HVAC Pumps
   3. Terminal Heat Transfer Units
   4. Heat Recovery Ventilators
   5. Fans
6. Air Inlets and Outlets

B. Report Forms

1. Title Page:
   a. Name of Testing, Adjusting and Balancing Agency
   b. Address of Testing, Adjusting and Balancing Agency
   c. Telephone and facsimile numbers of Testing, Adjusting and Balancing Agency
   d. Project name and location
   e. Project Architect
   f. Project Engineer
   g. Project Contractor
   h. Project altitude
   i. Report date

2. Summary Comments:
   a. Design versus final performance
   b. Notable characteristics of system
   c. Description of systems operation sequence
   d. Summary of outdoor and exhaust flows to indicate amount of building pressurization
   e. Nomenclature used throughout report
   f. Test conditions

3. Instrument List:
   a. Instrument
   b. Manufacturer
   c. Model number
   d. Serial number
   e. Range
   f. Calibration date

4. Electric Motors:
   a. Manufacturer
   b. Model/Frame
   c. HP/BHP and kW
   d. Phase, voltage, amperage; nameplate, actual, no load
   e. RPM
   f. Service factor
   g. Starter size, rating, heater elements
5. Pump Data:
   a. Identification/number
   b. Manufacturer
   c. Size/model
   d. Impeller
   e. Service
   f. Design flow rate, pressure drop, BHP and kW
   g. Actual flow rate, pressure drop, BHP and kW
   h. Discharge pressure
   i. Suction pressure
   j. Total operating head pressure
   k. Shut off, discharge and suction pressures
   l. Shut off, total head pressure

6. Heat Recovery Ventilator
   a. Location
   b. Manufacturer
   c. Model number
   d. Serial number
   e. Arrangement/Class/Discharge
   f. Air flow, specified and actual
   g. Return air flow, specified and actual
   h. Outside air flow, specified and actual
   i. Total static pressure (total external), specified and actual
   j. Inlet pressure
   k. Discharge pressure
   l. Sheave Make/Size/Bore
   m. Number of Belts/Make/Size
   n. Fan RPM

7. Fan Data:
   a. Location
   b. Manufacturer
   c. Model number
   d. Serial number
e. Air flow, specified and actual
f. Total static pressure (total external), specified and actual
g. Inlet pressure
h. Discharge pressure
i. Fan RPM

8. Grille, Register, Diffuser Test Sheet:
   a. GRD number
   b. Room number/location
c. GRD type
d. GRD size
e. Area factor
f. Design air flow
g. Test (final) velocity
h. Test (final) air flow
i. Percent of design air flow

END OF SECTION
SECTION 16 0100
ELECTRICAL GENERAL PROVISIONS

PART 1 GENERAL

1.01 SUMMARY
A. This section includes general requirements for electrical installation and is applicable to all Division 16, telecommunication and fire detection and alarm Sections.

1.02 SCOPE OF WORK
A. Provide all labor, equipment, materials, and services required for a complete installation, testing, and startup of all systems denoted on the plans and specifications.
B. Bring questionable or obscure items, apparent conflicts between plans, specifications, governing codes or utilities regulations to the attention of the Project Manager in writing using the standard Request for Information (RFI) Format.
C. Verify existing and local conditions affecting the electrical work prior to bid and commencement of project.
D. Coordinate all work with the Project Manager, including but not limited to, electrical data, building security and fire alarm control panel. Provide and install all equipment according to all applicable requirements.

1.03 ELECTRICAL DRAWINGS AND SYMBOLS
A. Electrical drawings are diagrammatic and are not intended to show all features of work. However, the Contractor shall provide products necessary for a complete and operable system in accordance with the NEC, EIA/TIA, NFPA 72, NFPA 101, IBC, and all state and local amendments.
B. Install un-dimensioned electrical items in a manner to provide symmetrical appearance. Do not scale drawings for equipment location. Review architectural, structural and mechanical drawings for locations. Adjust work to conform to actual conditions.
C. The drawings and specifications are complementary. Refer to specifications for description outlining products to be provided.
D. Drawing symbols used for basic materials, equipment, etc., are denoted by industry standard symbols. Special items are denoted by symbol legend or called out on the drawings or specification.

1.04 DEFINITIONS
A. “BASIS OF DESIGN” - Particular specialized products around which a system was designed. In such cases, the products specified may be critical with regard to physical sizes and performance characteristics. Where variations or substitutions to products are made, the Contractor is solely responsible for resolving all impacts of such a deviation. Approval of a substitution and/or variation request does not relieve the Contractor of responsibility for complying with the design intent.
B. “CALL OUT” - Products specifically denoted by manufacturer's model and part number, or referenced standards listed on the drawings without further specification. In these cases the Contractor shall provide the products and/or perform in accordance with the references listed.
C. “DATA” – Telecommunication CAT 6 equipment.
D. “EQUAL” - A product, system or installation which:
1. Meets or exceeds all ratings, performance characteristics, standard features and denoted options of specified item.
2. Includes primary characteristics identified in the drawings and specifications.
3. Complies with requirements similar to the “Basis of Design.”
4. Is produced by a manufacturer specifically listed as an acceptable manufacturer on the drawings, or in the specifications.
5. Is acceptable and approved to the Architect/Engineer specifically addressed in writing.

E. “EXPOSED” - Exposed to view after construction is completed.

F. “FURNISH” - Purchase materials as shown and specified. Deliver to project site at location shown to be installed by supporting crafts.

G. “INSTALL” - Set in place and connect equipment furnished by others for a complete and ready to use installation.

H. “PRODUCT” - Term which includes materials, equipment, fixtures, and devices for any tangible item used on the project.

I. “PROVIDE” - Furnish all products, equipment, subcontracts, labor, testing, etc., required and install for a complete ready to use installation.

J. “SHOP DRAWING” - Detailed, dimensioned working construction drawing drawn to a particular scale adequately showing installation intent, details and coordination of interrelated trades.

K. “SUBSTITUTION” - A product, system or installation which is not listed as an acceptable manufacturer, but the Contractor warrants meets or exceeds specified equipment denoted in the contract documents. Approval through submittal process is required to establish product or system is “equal”.

L. “WIRING” - Electrical conductors, raceway, devices, connections and associated accessories, or any combination of labor and material thereof in order to provide a complete and operable system.

M. “WEATHERPROOF” - Electrical equipment noted as weatherproof or “WP” shall be provided with rain tight enclosures or device plates as applicable.

1.05 COORDINATION

A. Exposed Raceways and Cables where specifically allowed shall be routed in such a manner agreeable to the Architect. Coordinate all such work prior to installation.

B. Coordinate the work specified in this Division under the provisions of Division 1.

C. Prepare shop drawings showing proposed rearrangement of work to meet job conditions, including changes to work specified under other sections. Obtain permission of Architect/Engineer before proceeding.

D. At each switchboard, panel board and electrical device that requires working clearance by the NEC the contractor shall arrange equipment to provide adequate clearance including rearrangement of such equipment to optimize actual field conditions. The Contractor shall monitor the work of all trades to assure that the space and clearance requirements of the code are met.

E. The horsepower and wattage of equipment denoted on the drawings are estimated requirements of equipment furnished under other divisions of this contract. Advise the
Architect/Engineer of any equipment changes or substitutions affecting the electrical system. Coordinate overload elements to match actual equipment nameplates.

F. Obtain written permission from Architect/Engineer prior to cutting, drilling or weakening structural components.

1.06 PAINTING AND REPAIR

A. All building materials, equipment and existing furniture damaged during the installation of the work must be repaired or replaced with materials in like kind and quality of the original by skilled labor experienced in that particular building trade.

B. Items scratched or marred in shipment or installation shall be refinished with touchup paint selected to match installed equipment finish.

1.07 CODES AND STANDARDS

A. Codes: Perform all work in accordance with all latest legally enacted editions of National, State and Local codes including:
   1. NFPA 70 - National Electrical Code (NEC).
   2. NFPA 72 and 101 - Fire Alarm Design and Installation Requirements.

B. Standards: Provide all equipment, materials and installation in conformance with the following latest current publications and standards as applicable:
   1. Underwriter's Laboratory (UL).
   2. American National Standards Institute - ANSI.
   4. Institute of Electrical and Electronics Engineers - IEEE.
   5. National Electrical Manufacturers' Association - NEMA.
   7. EIA/TIA Telecommunications Standards.

1.08 SUBMITTALS

A. Provide submittals for products or systems specified by call out, equipment list items shown on the drawings and products or systems described in Divisions 16 Specifications. Submittals shall comply with all requirements of Division 1. In addition, submittal shall comply with the following:
   1. Each submittal shall be bound in a PDF, with the data arranged and indexed by specification sections.
      a. Mark the submittal with job name.
      b. List the submittal contents in an index by specification section numbers and titles under first tab of PDF.
c. Provide subsequent tabs in the PDF for each specification section numbers for which material is being submitted. Provide additional tabs at the end for equipment called out on drawings, according to equipment name, type or equipment number.

d. Material and tabs in the PDF shall be arranged in ascending numerical order by specification number.

2. Submittal shall provide the following for each item submitted on:
   a. Manufacturer's name, addresses, nearest supplier addresses and phone number.
   b. Equipment designation and/or model number.
   c. Submit catalog cuts, printed product data, pamphlets and specification sheets.
   d. Rough-in data and dimensional aspects.
   e. Operational features, included options and characteristics.
   f. Wiring diagrams.
   g. All equipment characteristics required to verify short-circuit interrupting ratings as specified.
   h. Shop drawings.
   i. Documentation denoting equipment is listed by a third party testing organization acceptable to the authority having jurisdiction.
   j. All proposed substitutions and deviations from the products or systems specified shall be denoted as such at the beginning of each section. Each deviation shall be specifically itemized for comparison to specified equipment. Submittal approval does not include any deviations not specifically itemized. Substitution submittal approval does not relieve the Contractor of responsibility for complying with design intent. Unapproved products or installation deviations shall be corrected as described by the Project Manager.
   k. Delete all extraneous material data from submittal which does not apply to equipment specified and/or highlight the specific items which are being submitted on.

B. Submittal review is for general design criteria and does not relieve the Contractor from any of the contract requirements. Partial submittals will be reviewed in the following categories:

   1. Systems – Fire Alarm, Security
   2. Disconnects, Switchgear, Panels and Transformers
   3. Lighting
   4. Raceways, Fittings, Supports, Wire, Cable and Wiring Devices
   5. Telecommunication Equipment, Devices, Cable.

   Submittals not conforming to these requirements will be returned for correction, without review.

1.09 QUALITY ASSURANCE

A. Workmanship is considered important and is subject to approval. Employ workmen skilled in the trade and familiar with particular techniques applicable to various sections of work.

B. Materials shall conform to applicable industry standards, and Underwriters Laboratories standards. Whenever possible, similar items shall be supplied by the same manufacturer throughout the project.
1.10 RECORD DRAWINGS
A. Contractor shall maintain one set of electrical drawings and specifications of the most current issue on the job site and progressively record thereon any change in installation from that indicated on the drawings. Final approval will be withheld until drawings marked in a satisfactory manner are delivered to the Engineer.
   1. Mark record drawings with red pencil the actual installation which varies from the work originally shown.
   2. Include addendum and revisions items made during construction.
   3. Erase, white out or “X-out” to clearly convey as actual “as constructed” condition.
B. Transmit the record drawing set to the Architect/Engineer at the completion of the work.

1.11 EQUIPMENT SCHEDULES
A. Fixture and equipment schedules on the drawings denoting capacities, ratings, sizes, etc., shown are the minimum acceptable and may not necessarily correspond with catalog ratings or equipment specified.

1.12 DEMONSTRATION OF ELECTRICAL SYSTEM
A. During final inspection, conduct an operating test for approval by Architect/Engineer. Demonstrate installation of the contract documents. Should any portion of the installation fail to meet requirements of Contract Documents, repair or replace items failing to meet requirements until items can be demonstrated to comply. Have instruments available for measuring voltage and current values, and for demonstration of continuity, grounds or open circuit conditions. Have personnel available to take measurements and make tests.
B. Furnish assistant to Architect/Engineer for inspection at any time, as requested, to remove covers, operate machinery, perform continuity tests, and as necessary to demonstrate quality and adequacy.

1.13 PROJECT CLOSE OUT
A. Test all equipment as required in Specifications and as recommended by equipment manufacturer.
B. Clean-Up - Leave project completely free of debris resulting from electrical work, and leave all electrical items clean.

1.14 WARRANTY
A. As required in the general conditions of the contract.
B. All workmanship, labor and materials shall be warranted for a minimum period of one (1) year from the date of final acceptance.
C. Warranty work shall be promptly performed at Contractor’s sole expense.
D. Correction of Work: Within one year after the Substantial Completion of the work, any work found to not be in conformance with the Contract Documents will be corrected by the Contractor promptly after written notice from the owner outlining the deficiency. This requirement shall survive the acceptance of the work under this Contract and termination of the contract.

1.15 OPERATION AND MAINTENANCE MANUALS
A. Submittals shall comply with provisions of Division 1 and this section. Submit (3) copies of the manual no later than five (5) working days prior to final inspection.
B. Manuals shall be assembled in three-ring binders. Binders shall be 3" thick or less, and more than
one binder shall be used for each set of data if required to prevent overfilling. All information
shall be arranged in the same order as the specifications, by equipment list item and by specific
drawing call out as applicable, each section to identify equipment and specification number with
a heavy paper divider with a protruding tab and label. The first section shall be the index. Shop
drawings which are larger than 8-1/2" x 11" shall be individually folded so they are 8-1/2" x 11" or
less and inserted behind the appropriate tabs.

C. Provide the following items as applicable for each product or system:
   1. Provide manufacturer’s catalog cuts, brochures and descriptive literature. Highlight all
      applicable data or mark out information not applicable.
   2. Narrative/diagrams required describing procedures for start-up, operation, emergency
      operation and shutting down of each system. If a particular sequence is required for
      operation, provide step by step instructions in chronological order.
   3. Outline seasonal adjustments required.
   4. Provide manufacturer’s recommended preventative maintenance for each product,
      including time intervals for each task.
   5. Provide instructions for all adjustments and minor repairs. Provide trouble shooting
      information for lighting equipment, motor starters, panelboards, and special systems.
   6. Provide all information with regard to warranty and special requirements. Include copy of
      warranty, name, address and phone number of personnel to contact for warranty service.
   7. Provide complete information on all replacement parts. Identify each part by manufacturer
      and part number (graphically when available).
   8. Provide shop drawings for, but not limited to, Telecommunication System.

D. Provide test reports for each system test as required by specification sections.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT
   A. Materials and Equipment shall be acceptable to the authority having jurisdiction as suitable for
      the use intended. All electrical equipment shall bear the seal of a nationally recognized testing
      laboratory for the purpose for which it is installed.

PART 3 EXECUTION

3.01 WORKMANSHIP
   A. All electrical work must be installed in strict accordance with the National Electrical Code and any
      applicable state or local codes. Equipment support and anchorage shall meet the seismic
      requirements of the International Building Code for the appropriate seismic zone.

END OF SECTION
SECTION 16 0600
GROUNDING AND BONDING

PART 1 GENERAL

1.01 SUMMARY
A. Section includes:
   1. Rod electrodes.
   2. Wire.
   3. Mechanical connectors.
   4. Exothermic connections.
   5. Telecommunication Grounding and Bonding.

1.02 REFERENCES
A. ANSI/TIA/EIA - 607 Commercial Building Grounding and Bonding Requirements for Telecommunications.
C. NFPA 70 (National Fire Protection Association) - National Electrical Code.

1.03 SYSTEM DESCRIPTION
A. Grounding systems use the following elements as grounding electrodes:
   1. Metal underground water pipe.
   2. Metal building frame.
   3. Concrete-encased electrode.
   4. Rod electrode.

1.04 PERFORMANCE REQUIREMENTS
A. Grounding System Resistance: 25 ohms maximum or provide additional grounding as required by the NEC.

1.05 SUBMITTALS
A. Division 1 - Submittal Procedures: Requirements for submittals and Section 16 0100 – Electrical General Provisions.
B. Product Data: Submit data on grounding electrodes and connections.

1.06 CLOSEOUT SUBMITTALS
A. Operation and Maintenance Data: Submit Test Reports per Division 16 specifications.

1.07 COORDINATION
A. Division 1 - Administrative Requirements: Requirements for coordination.
B. Complete grounding and bonding of building reinforcing steel prior concrete placement.

PART 2 PRODUCTS

2.01 ROD ELECTRODES
A. Product Description:
1. Material: Copper-clad steel.
3. Length: 10 feet.
   B. Connector: Connector for exothermic welded connection.

2.02 WIRE
   A. Material: Bare or insulated stranded copper. Use only insulated copper conductor for telecommunication grounding conductors.
   B. Grounding Electrode Conductor: Copper conductor bare or insulated.
   C. Bonding Conductor: Copper conductor bare or insulated.

2.03 MECHANICAL CONNECTORS
   A. General Use: Non-reversible crimp type lugs only. Use factory made compression lug for all terminations.
   B. Telecommunication Use: Copper, copper alloy, or Tin-plated copper. Non-reversible long barrel crimp type bolt lugs with two bolt tongues for 6 AWG or larger conductors. Crimp type one hole for conductors smaller than 6 AWG.

2.04 EXOTHERMIC CONNECTIONS
   A. Product Description: Exothermic materials, accessories, and tools for preparing and making permanent field connections between grounding system components.

2.05 TELECOMMUNICATION GROUND BUS BAR
   A. Wall mounted, Solid copper, 20 inches wide, 1/4" inch thick, pre-drilled lug attachment holes and two 4 inch insulated stand-off brackets.

PART 3 EXECUTION

3.01 PREPARATION
   A. Remove paint and surface contaminants at connection points.

3.02 SERVICE
   A. Provide an equipotential ground system for the building service by bonding all of the following systems and components to the service entrance ground bus:
      1. Metal underground water pipe.
      2. Metal building frame and pilings.
      3. Concrete-encased electrode.
      4. Metal piping systems.
      5. Rod electrodes.
      6. Utility neutral to the ground system at the service entrance disconnect switch.
      7. Telephone service entrance.
      8. Telecommunication TMGB.

3.03 GENERAL INSTALLATION
   A. Install rod electrodes at locations in compliance with the NEC as indicated by the serving electrical utility.
B. Install up to two ground rods per electrical service if the single ground rod does not have a resistance to earth of 25 ohms or less.
C. Install grounding and bonding conductors concealed from view except in mechanical and electrical rooms.
D. Provide raceway for each grounding or bonding conductor. Bond the raceway and conductor together at each ferrous conduit termination with grounding bushings.
E. Provide exothermically welded connections to all connections that will be concealed or located below grade.
F. Clean each mechanical connection and coat with antioxidant prior to connection.
G. Bond together metal siding not attached to grounded structure; bond to ground.
H. Install grounding and bonding in patient care spaces to meet requirements of NFPA 99.
I. Equipment Grounding Conductor: Install separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing. Provide bond to every electrical box and enclosure.
J. Provide bonding for each metallic raceway and wireway system to provide continuous electrical continuity. Provide bond to every box and enclosure.
K. Provide bonding jumper around inline meters, water heaters, filters, removable devices and discontinuities in metallic piping systems. Provide bonding jumper of equal to or larger than the grounding electrode conductor to that system required by NEC.
L. Permanently ground entire light and power system in accordance with NEC, including service equipment, distribution panels, lighting panelboards, switch and starter enclosures, motor frames, grounding type receptacles, and other exposed non-current carrying metal parts of electrical equipment.
M. Accomplish grounding of electrical system by using insulated grounding conductor installed with feeders and branch circuit conductors in conduits. Size grounding conductors in accordance with NEC. Install from grounding bus of serving panel to ground bus of served panel, grounding screw of receptacles, lighting fixture housing, threaded screw in light switch and outlet boxes or metal enclosures of service equipment.
N. Grounding electrical system using continuous metal raceway system enclosing circuit conductors in accordance with NEC.
O. Permanently attach equipment and grounding conductors prior to energizing equipment.

3.04 TELECOMMUNICATION GROUNDING AND BONDING
A. Provide telecommunication grounding in accordance with ANSI/TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications and as denoted by this specification.
   1. Provide a Telecommunication Grounding Bus bar (TGB) in the telecommunication room.
   2. Provide an insulated copper conductor, sized as required, Telecommunication Bonding Backbone (TBB) conductor.
   3. Provide all bonds and bonding jumpers the same size as the TBB except where noted otherwise.
   4. Bond the TGB to the intersystem bonding termination located adjacent to the electrical service entrance ground.
5. Provide a green color code or stripe with phase tape at each termination or accessible section.

3.05 FIELD QUALITY CONTROL
   A. Test electrical service ground system per Section 16 9500 – Electrical Testing.

END OF SECTION
SECTION 16 0700
HANGERS AND SUPPORTS FOR ELECTRICAL

PART 1 GENERAL

1.01 SUMMARY
A. Section Includes:
   1. Conduit supports.
   2. Formed steel channel.
   4. Equipment bases and supports.
   5. Seismic Restraints.

1.02 REFERENCES

1.03 SUBMITTALS
A. Division 1 - Submittals and Section 16 0100 – Electrical General Provisions.
B. Submit manufacturers Product Data:
   1. Hangers and Supports.
   2. Conduit Straps.
   3. Anchors.
   4. Seismic Shop Drawings.
C. Manufacturer's Installation Instructions:
   1. Hangers and Supports: Submit special procedures and assembly of components.

PART 2 PRODUCTS

2.01 CONDUIT SUPPORTS
A. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads.
B. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.
C. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.
D. Conduit clamps - general purpose: One hole galvanized stamped steel or malleable iron for surface mounted conduits.

2.02 FORMED STEEL CHANNEL AND ACCESSORIES
A. Product Description: U-channel strut Exterior and Wet Areas – Hot dipped galvanized 12 gage thick steel. Dry Indoor Areas – Zinc or Cadmium Plated 12 gage thick steel.
B. Accessories: Modular to match channel finish and configuration by the same manufacturer.

2.03 SPRING STEEL CLIPS
A. Product Description: “Caddy” spring steel electrical support systems for each type required (Provide only where concealed in walls or above ceilings).

2.04 MANUFACTURED SEISMIC RESTRAINT SYSTEMS
A. Product Description: Provide pre-approved manufactured seismic restraint systems for all seismic support. Systems to be Superstrut seismic restraint system pre-approval No. R-0003, Kinline pre-approval No. R-0071, or B-Line pre-approval No. R-0114.

2.05 SEISMIC SUPPORT WIRE AND CABLE
A. Product Description: #12 gauge ceiling support wire where concealed. Aircraft stainless steel cable where exposed.

2.06 CABLE TIES
A. Product Description: High strength nylon temperature rated to 185 degrees F. Self locking. Provide plenum rated cable ties where located above ceilings.

PART 3 EXECUTION
3.01 INSTALLATION - HANGERS AND SUPPORTS
A. Anchors and Fasteners:
   1. Concrete Structural Elements: Provide expansion anchors and powder actuated anchors.
   2. Steel Structural Elements: Provide beam clamps. Provide spring steel clips where concealed.
   3. Concrete Surfaces: Provide expansion anchors.
   5. Hollow Masonry: Provide toggle bolts.
   7. Sheet Metal: Provide sheet metal screws.
   8. Wood Elements: Provide wood screws.
B. Supports:
   1. Fabricate supports from structural steel or formed steel channel. Install hexagon head bolts to present neat appearance with adequate strength and rigidity.
   2. Install spring lock washers under nuts. Double nut all trapeze hanger supports.
   3. Install surface mounted cabinets and panelboards with minimum of four anchors.
   4. In wet and damp locations install steel channel supports to stand cabinets and panelboards 1 inch off wall.
   5. Provide conduit back spacers in all wet or wash down areas.
C. Seismic Bracing:
   1. Support and brace all electrical equipment and associated raceways as required by the IBC, based on seismic information as determined by and shown on the structural drawings.
   2. Provide manufactured seismic restraint systems.
3. Bracing is not required for individual raceways less than 2.5” inside diameter and conduits hung on hangers so that the top of the conduit is 12 inches or less from the bottom of the support hanger.

D. Support vertical conduit at every floor.

E. Install raceway supports in accordance with NEC and do not exceed 10 feet.

F. 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. Exception: Outlet boxes for ceiling mounted light fixtures, speakers and smoke detectors may be mounted in the ceiling system.

G. Provide two minimum 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.

H. Provide support for fixtures and components that weigh more than 50 pounds directly from building structure independent of wiring system capable of supporting total weight and seismic loading.

I. Provide support for wall mounted emergency lights to electrical box and four independent wall mounted anchors.

J. Provide swivel hangar assembly for pendant mounted light fixtures with restraining cables for seismic support.

K. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.

L. Install multiple conduit runs on common hangers.

M. Do not drill or cut structural members except where specifically approved.

3.02 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

A. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.

B. Construct supports of formed steel channel for seismic bracing. Brace and fasten with flanges bolted to structure.

END OF SECTION
SECTION 16 0750
ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.01 SUMMARY
A. Section includes:
   1. Nameplates.
   2. Labels.
   3. Wire markers.
   5. Underground warning tape.
   7. One-line Diagram and Panel Map.

1.02 SUBMITTALS
A. Division 1 - Submittal Procedures: Requirements for submittals and Section 16 0100 – Electrical General Provisions.
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.
C. Manufacturer’s Installation Instructions: Indicate installation instructions, special procedures, and installation.

1.03 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. Attach to equipment using threaded screws or pop-rivets.
B. Letter Size:
   1. Minimum of 1/4 inch high letters for identifying individual panel or equipment.
   2. Minimum 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 LABELS
A. Product Description: Embossed adhesive tape labels, with 3/16 inch white letters on black background made using Dynamo 5500 label printer or equal.

2.03 WIRE MARKERS
A. Power and Lighting Description: Cloth tape type wire markers for all neutrals and Phase conductors.
   1. Power and Lighting Circuits: Panel board name and branch circuit or feeder number.
   2. Control Circuits: Control wire number as indicated on schematic and shop drawings.
B. Low Voltage System Description: Printed label with unique wire number that is shown on shop drawing for system.
C. Telecommunication Description: See section 16 7100 – Communications Services Cabling.

2.04 UNDERGROUND WARNING TAPE
A. Product Description: Red 6 inch wide detectable.
B. Wording to read “Caution – Buried Electric Line Below”.

2.05 ONE-LINE DIAGRAM AND PANEL MAP
A. Product Description: Clear laminated one-line diagram and building panel board map screwed to wall on four corners each.
B. Provide final version electronically in AutoCAD format.

2.06 PANELBOARD CIRCUIT DIRECTORY
A. Typed schedule denoting each circuit load type and location by the room number or name as the final room numbers and names actually installed not the names or numbers shown on the contract drawings unless no changes were made.
B. Provide panel schedule in Microsoft Excel format.

PART 3 EXECUTION

3.01 INSTALLATION
A. Install identifying devices after completion of painting.
B. Nameplate Installation:
   1. Install nameplate parallel to equipment lines.
   2. Secure nameplate to inside surface of door on recessed panel board in finished locations.
   3. Panel board Nameplates.
      a. Provide name plate for each new panel board with the following information:
         1) Line 1: Panel board Name.
         2) Line 2: Source from which the panel board is fed.
         3) Line 3: Voltage, phase and wire configuration.
         4) Line 4: AIC rating of the panel board.
   4. Disconnects, Starters, or Contactors:
      a. Provide nameplate for each device with the following information:
         1) Line 1: Load served.
         2) Line 2: Panel board and circuit number from which the device is fed.
         3) Line 3: Fuse or Circuit amperage and poles. Where fused disconnect denote the maximum fuse size to be installed.
   5. Control or Low Voltage System Panels:
a. Provide nameplate for each control panel with the following information:
   1) Line 1: Panel name as shown on the shop drawings.
   2) Line 2: System Description the panel is controlling (Fire alarm, BAS).
   3) Line 3: Panel board and circuit number from which the panel is fed if applicable.

C. Label Installation:
   1. Device Faceplate Labels: Provide label on every outlet box, switch box, or point of connection label affixed at the top of the device plate denoting the panel board name and circuit numbers.

D. Wire Marker Installation:
   1. Install wire marker for each conductor at panelboards; pull boxes, outlet and junction boxes, and each load connection.
   2. Junction boxes: Mark with outside cover of junction boxes with indelible black marker where boxes are concealed from view. Mark the panel board and circuit numbers of wiring on all junction boxes with sheet steel covers. On exposed junction boxes in finished areas, mark on inside of cover or device plate to allow circuit identification without removal of the device. Mark all other Special System junction boxes with sheet steel covers with appropriate system designation, e.g., “Telecom,” etc.
   3. Color code phases, neutral, and ground per NEC requirements and Section 16 1200 – Wire and Cable.

E. Warning Placards:
   1. Provide warning placards and labels, warning messages for all of the following cases:
      a. Series Rated Equipment per NEC 110.22 and 240.86.
      b. Multiple voltage system ungrounded conductor identification per NEC 210.4(d) at each panel board.
      c. Multiple power service warning to single unit.
      d. External power sources that receive power from a second source and are not de-energized by the disconnecting means of the equipment.
      e. All other places, as required by the NEC.

F. Underground Warning Tape Installation:
   1. 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.

G. Provide laminated one-line diagram of building power system with all feeder overcurrent devices and conductor sizes shown.

H. Provide circuit directory in every panel board with load data.

END OF SECTION
SECTION 16 1200
WIRE AND CABLE

PART 1 GENERAL

1.01 DESCRIPTION
A. This section describes the requirements, products, and installation methods for wire and cable, 600 volts or less.

1.02 QUALITY ASSURANCE
A. Conductors shall conform to UL and ICEA specifications.

1.03 SUBMITTALS
A. Submit shop drawings and product data under the provisions of Division 1 and Section 16 0100 – Electrical General Provisions.
B. Submit manufacturer's instructions.
C. Submit manufacturer's instructions for splicing, where applicable.

1.04 DESIGN REQUIREMENTS
A. Conductor size: Provide conductors sized in accordance with all ANSI/NFPA 70 requirements and guidelines.

PART 2 PRODUCTS

2.01 BUILDING WIRE
A. Thermoplastic-insulated Building Wire: NEMA WC 5.
C. Feeders and Branch Circuits: Copper, stranded conductor, 600 volt insulation, XHHW, or THHN, #10, smaller stranded or solid.
D. Control Circuits: Copper, stranded conductor 600 volt insulation, XHHW or THHN, as indicated on installation schedule. Inside control panels MTW, XHHW, or THHN.

2.02 MC CABLE
A. Type: Aluminum armored Type MC with Ground – Health Care Facilities Rated.
B. Basis of Design: Southwire HCF MCAP
C. Circuit Conductors
   1. Conductor: Soft drawn solid copper for 12 and 10 awg conductors sizes. Stranded copper conductors shall be class B stranded or equivalent.
   2. Insulation: The conductors shall be constructed with THHN or THHWN insulation rated for 90°C dry and rated for 600 volts.
D. Equipment Grounding Conductors
   1. Insulated Copper Conductor: A green insulated grounding conductor shall be cabled with copper circuit conductors and located under the nonmetallic tape covering.
   2. Interlocked Armor: Interlocked armor shall be listed and identified as being suitable for grounding. Armor ground path performance shall be equivalent in performance to an NEC 250.122 sized equipment grounding conductor.
E. Cable Assembly
1. All insulated circuit conductors and any insulated grounding conductors shall be cabled together and contained under an overall nonmetallic tape covering.
2. A single bare aluminum grounding/bonding conductor shall be placed outside of the nonmetallic tape covering and have the same lay (twist) as the insulated conductor assembly.

F. Grounding/Bonding Conductor
1. Grounding/bonding conductor shall be 8000 series aluminum-alloy conductor material, and shall be sized based on NEC table 250.122 and Table 6.1 in UL 1569.

G. Metal-Clad Sheath / Armor Assembly
1. Interlocked Armor: The interlocking metal tape armor shall be aluminum and shall be green.
2. Aluminum interlocking metal tape shall be formed and helically wrapped around the cable assembly such that the interlocked armor and aluminum grounding/bonding conductor are in intimate contact throughout the entire cable.
3. Interlocked armor shall be listed as being suitable for grounding.

H. Industry Standards and References:
1. UL Standards 1569, 83, 44, 1479, and 514B
2. NEC 230, 250, 300, 330, and 517
3. IEEE 1202

I. Color Code Power Conductors:
1. ICEA Method 1 (colored compounds)

2.03 HEAT TRACE CABLE – PIPE FREEZE PROTECTION – SEWER AND WASTE WATER
A. Furnish and install a complete UL listed system of temperature limiting heat trace cable and components listed specifically for underground pipe freeze protection applications. The basis of design: Arctic Trace “TL” system.
B. This section applies for heattrace to be used for Sewer lines, Septic Tanks, waste water discharge lines, and other lines and tanks with hazardous/classified liquids.
C. The heating cables shall be listed for Classified Class I, Division 1 and 2.
D. The heating cables shall be temperature limiting with a power output of 5 watts/foot when exposed an ambient temperature of 50º F or less.
E. The heating cable shall be constructed as follows:
1. An outer tefzel over jacket.
2. A nickel plated copper braid under the jacket.
3. A tefzel jacket.
4. A welded heater-bus connection.
5. Temperature limiting metal resistance wire.
6. Two 12 AWG (minimum) copper bus wires.
7. The heating cable shall operate at voltage (120v or 240v single phase) as indicated on the electrical drawings.

F. Installation: The heating cable shall be installed per the manufacturers written instructions in arctic piping, as detailed in the civil drawings. Access to junction box, disconnect, and heat trace shall be provided so that heat trace can be replaced without demolition of adjacent materials. 30 milliamp ground fault circuit breakers shall be used for all heat trace branch circuits. After installation the insulation of the inner jacket shall be tested with a 500 VDC insulation resistance tester. The resistance between the bus wires and ground shall be at least 20 mega ohms. Cables which do not meet this criterion shall be replaced.

2.04 HEAT TRACE CABLE – PIPE FREEZE PROTECTION – NON-HAZARDOUS FLUIDS

A. This section applies for heattrace to be used for water lines, and other non-hazardous/ classified liquified lines and locations.

B. Furnish and install a complete UL listed system of temperature limiting heat trace cable and components listed specifically for underground pipe freeze protection applications. The basis of design: Arctic Trace “E” system.

C. The heating cables shall be temperature limiting with a power output of 5 watts/foot when exposed an ambient temperature of 50º F or less.

D. The heating cable shall be constructed as follows:
   1. An outer tefzel over jacket.
   2. A nickel plated copper braid under the jacket.
   3. A tefzel jacket.
   4. A welded heater-bus connection.
   5. Temperature limiting metal resistance wire.
   6. Two 16 AWG (minimum) copper bus wires.
   7. The heating cable shall operate at voltage (120v or 240v single phase) as indicated on the electrical drawings.

E. Installation: The heating cable shall be installed per the manufacturers written instructions in arctic piping, as detailed in the civil drawings. Access to junction box, disconnect, and heat trace shall be provided so that heat trace can be replaced without demolition of adjacent materials. 30 milliamp ground fault circuit breakers shall be used for all heat trace branch circuits. After installation the insulation of the inner jacket shall be tested with a 500 VDC insulation resistance tester. The resistance between the bus wires and ground shall be at least 20 mega ohms. Cables which do not meet this criterion shall be replaced.

2.05 THERMOSTATIC CONTROLS:

A. Provide thermostatic controls for each similar system to be heat traced (Sewer line; water lines). The controls shall have:
   1. External temperature sensor rated for wet locations, length as required for locations and operation as intended.
   2. 40F setpoint
   3. Enclosure rated for indoor or outdoor locations.
   4. Operating voltage of 120 VAC.
   5. UL listed.
6. Basis of Design: Arctic Trace TRF115 Series, where 60” capillary length is adequate. Reference
drawings for heattrace locations.
7. Basis of Design: Arctic Trace SST-2 Series, where capillary length needs to be longer than 60”.
Reference drawings for heattrace locations.

2.06 GROUNDING CONDUCTORS
A. No. 6 AWG and larger: Stranded copper, bare, soft drawn.
B. No. 8 AWG and smaller:
   1. Bare-solid copper, soft drawn.
   2. Insulated-stranded copper with green insulation.

2.07 TELECOMMUNICATION CABLE
A. See Section 16 7100.

PART 3 EXECUTION

3.01 GENERAL WIRING METHODS
A. Provide quantity of conductors in each raceway as necessary for connected equipment, sized in
   accordance with NEC requirements, unless otherwise denoted larger or greater quantities, on the
drawings.
B. Size conductors to provide maximum voltage drop not to exceed 3% in branch circuits or feeders,
   and a total of not more than 5% combined to the furthest outlet, based on steady state load
   condition noted on the panel schedules, actual field conductor lengths, and NEC Table 9 values.
   In general, 20 amp circuit with one way lengths measured to furthest outlet from branch circuit
   breaker shall have a minimum size as follows:
   1. 120 volt circuits 75' to 125' shall be #10 AWG;
   2. 120 volt circuits 125' to 200' shall be #8 AWG;
C. Install all material and equipment in accordance with manufacturer's recommendation,
   instructions, and installation drawings, unless otherwise indicated.
D. Install conductors in approved raceways systems.
E. Use no wire smaller than 12 AWG for power and lighting circuits, and no smaller than 14 AWG for
   control wiring.
F. Splice only in junction or outlet boxes.
G. Neatly train and lace wiring inside boxes, equipment, and panelboards.
H. Group the ungrounded and grounded conductors of each multi-wire branch circuit with wire ties
   or similar approved means within the panel boards.
I. Make Conductor lengths for parallel circuits equal. Comply with NEC 310.4.
J. Provide conductors of same insulation type if used for similar purposes.

3.02 WIRING INSTALLATION IN RACEWAYS
A. Pull all conductors into a raceway at the same time. 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. Completely and thoroughly swab raceway system before installing conductors.
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 metal cable ties to support cables from structure. Include bridle rings or drive rings.
   C. Use suitable cable fittings and connectors.
   D. Do not exceed manufacturer's recommended pulling tensions.
   E. Color codes for all conductors throughout the entire electrical system as phase A-Black phase B-Red, neutral (grounded conductor)-White and equipment grounding conductor-Green unless stated otherwise on the plans.

3.04 WIRING CONNECTIONS AND TERMINATIONS
   A. Splice only in accessible junction boxes.
   B. Use solderless pressure connectors with insulating covers for copper wire splices and taps, 8 AWG and smaller. For 10 AWG and smaller, use insulated spring wire connectors with plastic caps.
   C. Use split bolt connectors for copper wire splices and taps, 6 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of the insulation value of conductor.
   D. Thoroughly clean wires before installing lugs and connectors.
   E. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.
   F. Terminate spare conductors with electrical tape.
   G. Flashover or insulation value of joints: Equal that of conductor. UL listed, rated 600 volts for general use and for use within fixtures.

3.05 FIELD QUALITY CONTROL
   A. Inspect wire and cable for physical damage and proper connection.
   B. Torque test conductor connections and terminations to manufacturer's recommended values.
   C. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.

3.06 WIRE AND CABLE INSTALLATION SCHEDULE
   A. All conductors shall be installed in raceways, unless otherwise noted, with insulation type as follows:
      1. Heated spaces - THHN or XHHW;
      2. Outdoor, below grade, unheated areas, attics, crawl spaces - XHHW.

END OF SECTION
SECTION 16 1300
RACEWAY AND BOXES

PART 1 GENERAL

1.01 SUMMARY
A. Section includes:
   1. Metal conduit.
   2. Flexible metal conduit.
   3. Liquid tight metal conduit.
   4. Electrical metallic tubing.
   5. Nonmetal conduit.
   6. Fittings and conduit bodies.
   7. Wall and ceiling outlet boxes.
   8. Pull and junction boxes.
   10. Floorboxes.

1.02 REFERENCES
A. National Electrical Manufacturers Association (NEMA):
   1. NEMA FB 1 (National Electrical Manufacturers Association) - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
   2. NEMA OS 1 (National Electrical Manufacturers Association) - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
   3. NEMA OS 2 (National Electrical Manufacturers Association) - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.
   4. NEMA RN 1 (National Electrical Manufacturers Association) - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
   5. NEMA TC 2 (National Electrical Manufacturers Association) - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).
   6. NEMA TC 3 (National Electrical Manufacturers Association) - PVC Fittings for Use with Rigid PVC Conduit and Tubing.
   7. NEMA 250 (National Electrical Manufacturers Association) - Enclosures for Electrical Equipment (1000 Volts Maximum).
B. National Fire Protection Association (NFPA):
   1. NFPA 70 - National Electrical Code.
C. Telecommunications Industry Association (TIA) and Electronics Industries Association (EIA)
   1. ANSI/TIA/EIA - 569 Commercial Building Standard for Telecommunication Pathways

1.03 SYSTEM DESCRIPTION
A. Provide raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements.
Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system. Note: It is assumed that MC cable will be the installation method of choice.

B. Raceway Minimum Size:
   1. Below Grade: Provide 1 inch minimum.
   2. Above Grade or Slab on Grade: Provide ¾ inch minimum. 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.

C. Underground Outside Foundation Wall:
   1. Raceway: Provide rigid steel conduit and plastic coated conduit. To allow for expansion and deflection, use liquidtight flexible conduit above grade where transitioning from underground to attached to a building or structure.
      a. Provide detectable warning tape over all underground raceways per 16 0750 – Electrical Identification.
      b. Provide 3 inch minimum spacing between raceways.
      c. Provide 0.75 inch minus material 6 inches above and below rigid steel conduit. Backfill remaining trench free of debris or rocks greater than 1 inch in diameter.
   2. Boxes and Enclosures: Provide concrete type 1A handhold.

D. Under or In Slab on Grade:
   1. Raceway: Provide rigid steel conduit, plastic coated conduit, and nonmetallic conduit. Provide transition to rigid steel conduit 12 inches prior to exit penetration through foundations, concrete walls, block walls or roofs. Provide transition to rigid steel conduit elbow and riser for penetration through slab. Arrange raceway so the curved portion of bend is not visible above finished slab. Route conduits in slabs to have 1 inch minimum cover.

E. Outdoor Above Grade, Damp or Wet Locations:
   1. Raceway: Provide rigid steel, and electrical metallic tubing.
   2. Boxes and Enclosures: Provide weatherproof malleable iron for branch circuit junction and outlet boxes. Provide weatherproof NEMA 3R sheet metal for safety and disconnect switches and NEMA 4 sheet metal with gaskets for motor controllers and control panels.

F. Concealed Dry Locations:
   1. Raceway: Provide rigid steel, electrical metallic tubing, and MC cable.
   3. Fittings: Provide cast and steel.

G. Exposed Dry Locations:
   1. Raceway: Provide Surface Raceway. Provide rigid steel and electrical metallic tubing exposed in mechanical rooms, electrical rooms and rooms denoted specifically on the plans.
2. Boxes and Enclosures: Provide Surface raceway and boxes by same manufacturer in all areas except in mechanical rooms, electrical rooms and rooms denoted specifically on the plans provide sheet-metal boxes with raised steel covers.

3. Fittings: Provide galvanized malleable iron and steel.

H. Telecommunication Grounding:
   1. Raceway: Provide aluminum conduit.
   3. Fittings: Provide copper free aluminum.

I. Equipment Connections: Connections to light fixtures, motors, transformers, vibrating equipment or equipment that requires removal for maintenance or replacement: Flexible metal conduit in dry locations and liquid tight flexible metal conduit in damp or wet locations. Maximum length 6 feet in length.

1.04 DESIGN REQUIREMENTS

A. Conduit Minimum Raceway Size: Size all raceways not shown on the drawings 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. Where specific cable is not listed use major diameter provided by the manufacturer.

B. Box Minimum Size: Provide all boxes sized and configured per NEC Article 314.

C. ANSI/TIA/EIA - 569 Commercial Building Standards for Telecommunication Pathways.

1.05 SUBMITTALS

A. Division 1 - Submittals and Section 16 0100 – Electrical General Provisions.

B. Product Data: Submit data for products to be provided.

C. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

1.07 COORDINATION

A. Division 1 – Coordination and project conditions.

B. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.

C. Coordinate layout and installation of raceways and boxes to provide adequate headroom, working clearance and access.

D. Coordinate outlet locations with Architectural drawings and casework shop drawings.

E. Coordinate with architectural for finished wall thickness for installation of outlet boxes and extension rings.

F. Coordinate mounting of outlet boxes on exterior walls to avoid penetration of vapor barrier.

G. Coordinate installation of outlet boxes for equipment connected under Division 15.
PART 2 PRODUCTS

2.01 METAL CONDUIT
   A. Rigid Steel Conduit: ANSI C80.1, UL 6.
   B. Rigid Aluminum Conduit: ANSI C80.5.
   C. 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. Provide copper free aluminum fittings and conduit bodies with Aluminum Conduit.
   D. Provide bushings at all conduit terminations.

2.02 PVC COATED METAL CONDUIT
   A. Product Description: NEMA RN 1; rigid steel conduit with external PVC coating, 20 mil thick.
   B. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

2.03 FLEXIBLE METAL CONDUIT
   A. Product Description: UL 1, galvanized or zinc coated flexible steel construction.
   B. Fittings: NEMA FB 1. Galvanized malleable iron or steel with insulated throats.

2.04 LIQUIDTIGHT FLEXIBLE METAL CONDUIT
   A. Product Description: UL 360, Interlocked steel construction with PVC jacket.
   B. Fittings: NEMA FB 1. Galvanized malleable iron or steel liquid tight.

2.05 ELECTRICAL METALLIC TUBING (EMT)
   A. Product Description: ANSI C80.3, UL 797; galvanized steel tubing.
   B. Fittings and Conduit Bodies: NEMA FB 1; galvanized steel or malleable iron, compression or set screw type. Die cast or pressure cast fittings and locknuts are not permitted.

2.06 NONMETALLIC CONDUIT
   A. Product Description: NEMA TC 2; Schedule 40 PVC.
   B. Fittings and Conduit Bodies: NEMA TC 3.

2.07 INNERDUCT
   A. Product Description: UL910 Plenum Rated; Indoor Corrugated.
   B. Fittings: By same manufacturer as duct.

2.08 SURFACE METAL RACEWAY
   A. Dual Channel
      1. Manufacturers:
         a. Wiremold, Model V4000 or approved equal.
         b. Substitutions: Division 1 - Substitutions.
      2. Product Description: Dual-channel surface metallic raceway with fitted snap on cover, suitable for use as multi-outlet assembly. Keep data and power conductors separate at all times. Provide Category 5 and/or 6 rated raceway, fittings and components.
4. Receptacles: Provide accessories to accept receptacles as specified in Section 16 1400 Wiring Devices.
5. Telecommunication Outlets: As specified in Section 16 7100 Telecommunication.
6. Device Spacing: As indicated on drawings.
7. Channel Finish: Ivory or white as determined by the architect.
8. Fittings: Furnish manufacturer’s standard couplings, entrance fittings, elbows, device brackets, end caps, radius corner inserts, seam covers, wire clips, device faceplates and connectors. Device fittings shall be V4007C-1R.
9. Cuts: Perform all cuts with Wiremold 4000 raceway base and cover shear.

2.09 OUTLET BOXES
   A. Sheet Metal Outlet Boxes: NEMA OS 1, UL514A galvanized steel with plaster ring where applicable.
      1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch male fixture studs where required.
      2. Concrete and Masonry: Concrete type with field installed tape cover to prevent concrete entry to raceway system.
      3. Minimum size 4 inches wide x 4 inches wide x 2-1/8 inch deep.
   B. Cast Boxes: NEMA FB 1, Type FD, galvanized malleable iron. Furnish gasketed cover by box manufacturer. Furnish threaded hubs.
   C. Wall Plates: As specified in Section 16 1400.

2.10 PULL AND JUNCTION BOXES
   A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

2.11 BUSHINGS:
   A. Non-grounding: Threaded impact resistant plastic.
   B. Grounding: Insulated galvanized malleable iron/steel with hardened screw bond to raceway and conductor lug.

2.12 LOCKNUTS:
   A. Threaded Electro Zinc Plated Steel designed to cut through protective coatings for ground continuity.

2.13 WIREWAY
   A. Product Description: General purpose type wireway. Size per NEC minimum fill capacity required.
   B. Knockouts: Field install, no factory knockouts acceptable.
   C. Cover: Screw cover.
   D. Fittings and Accessories: Include factory couplings, offsets, elbows, adapters and support straps required for a complete system. Provide internal ground bonding jumper bonded to each section.

2.14 FLOOR BOXES
A. Manufacturers:
   1. Hubbell SFB Series. [only 1 duplex and 1 data plate]
   2. Hubbell LCFB Series [large – six slots]
   4. Thomas and Betts 667 Series [8 gang]
   5. Substitutions: Division - Substitutions.

B. Floor Boxes: NEMA OS 1, 3-1/2 inches deep maximum.

C. Adjustability: Fully adjustable.

D. Material: Formed steel or cast iron as appropriate for location.

E. Shape: Rectangular or round.

F. Cover: Recessed steel with carpet or tile insert, steel trim and wire management blocks. Cover shall be designed to prevent water, dirt, and debris from entering the power and communication devices.

G. Convenience Receptacle Floorbox: Duplex or quadruplex receptacles as indicated on the drawings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Ground and bond raceway and boxes in accordance with Section 16 0600.

B. Fasten raceway and box supports to structure and finishes in accordance with Section 16 0700 Electrical Hangars and Supports.

C. Identify raceway and boxes with origin and destination in accordance with Section 16 0750 Electrical Identification.

3.02 INSTALLATION - GENERAL RACEWAY

A. Raceways installed in patient care spaces as defined in NEC 517.2 shall be of a type that itself qualifies as an equipment grounding conductor as required by NEC 517.13 and 250.118.

B. Provide raceways concealed in construction unless specifically noted otherwise. Do not route conduits on roofs, outside of exterior walls, or surface on interior finished walls unless specifically noted to do so on the plans.

C. Raceway routing and boxes are shown in approximate locations unless dimensioned. Where raceway routing is not denoted field route to provide complete wiring system.

D. The drawings do not necessarily show every pull or junction box required. Provide boxes as shown or as necessary to facilitate bend limitations and conductor pulling.
E. Do not route raceways on floor. Arrange raceway and boxes to maintain a minimum of 6 feet 6 inches of headroom. Install raceways level and square to a tolerance of 1/8” per 10 feet. Route raceways parallel and perpendicular to walls and ceilings for all exposed and concealed areas.

F. Tape around raceways and boxes that penetrate vapor barriers to establish airtight seal.

G. Provide ground bushing on each raceway termination 1 inch or larger. Provide and size bonding conductor per NEC Article 250.

H. Provide electrical service continuity with ground bushing on each service entrance raceway termination at pull enclosures, current transformer enclosures and service disconnect enclosures bonded to enclosures. Provide and size bonding conductor per NEC Article 250.

I. Provide bonding at each end of raceways, boxes, or enclosures to the grounding electrode conductor where routed in a metallic system. Provide bond of equal size to the grounding electrode conductor size.

J. Provide bushing at each raceway termination not installed within an enclosure threaded to the raceway end or connector.

K. Provide permanent accessibility to all junction boxes; pull boxes and conduit access fittings.

L. Arrange raceway supports to prevent misalignment during wiring installation.

M. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

N. Group related raceway; support using conduit rack. Construct rack using steel channel specified in Section 16 0700; provide space on each for 25 percent additional raceways.

O. Do not support raceway or power cables with wire or perforated pipe straps or cable ties. Remove wire used for temporary supports.

P. Do not attach raceway to ceiling support wires or other piping systems.

Q. Construct wireway supports from steel channel specified in Section 16 0700 Electrical Hangars and Supports.

R. Route conduit in and under slab from point-to-point.

S. Maintain clearance between raceway and piping for maintenance purposes.

T. Maintain 12 inch clearance between raceway and surfaces with temperatures exceeding 104 degrees F.

U. Cut conduit square using saw or pipe cutter; de-burr all conduit ends to smooth finish prior to installation.

V. Bring conduit to shoulder of fittings; fasten securely. Where locknuts are used install with one inside box and one outside with dished part against box.

W. Coat non-ferrous conduit threads prior to joining with conductive metallic grease antioxidant.

X. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting.

Y. Install conduit threaded raintight hubs to fasten conduit to sheet metal boxes for all exterior or interior damp or wet locations. Sealing locknuts are not acceptable.

Z. Install no more than equivalent of four 90 degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams and corners.
AA. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.
BB. Install fittings and flexible metal conduit to accommodate 3 axis movements where raceway crosses seismic joints.
CC. Install fittings to accommodate expansion and contraction where raceway crosses control and expansion joints.
DD. Install suitable pull string or cord in each empty raceway except sleeves and nipples.
EE. Install suitable caps to protect installed conduit against entrance of dirt and moisture.
FF. Surface Raceway: Install flat-head screws, clips, and straps to fasten raceway channel to surfaces; mount plumb and level. Install insulating bushings and inserts at connections to outlets and corner fittings. Provide divider to keep power and data pathways separate at all times.
GG. Close ends and unused openings in wireway and surface raceway.
HH. Do not intermix conductors from separate panelboards or any other system in the same raceway system or junction boxes unless specifically denoted otherwise.
II. Where conduit 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 fire stop sealant or intumescent fire stop, preserving the fire time rating of the construction. Install in accordance with Division 7 Sealants.
JJ. Provide conduit sleeve through wall with insulated bushings on each end for all wall penetrations of cables. Size sleeve for NEC fill requirements.
KK. Route conduit through roof openings for piping and ductwork where possible; otherwise, route through roof pitch pocket.
LL. Use non-hardening duct seal to satisfy requirement of Article 300-7, NEC for different temperature portions of raceways, including those passing from interior to exterior portions of structure.
MM. Provide blank covers or plates for all boxes that do not contain devices.
NN. Where specifically required for electrical connections to penetrate through the roofing system the physical location must be approved by the Project Manager. All penetrations shall be flashed and hot mopped or a pitch pocket installed to provide a weatherproof seal at minimum.
OO. Provide weather head on all raceway stub ups which are outdoors and do not terminate into equipment.
PP. Paint all exposed conduits and junction boxes to match existing décor.

3.03 INSTALLATION – GENERAL BOXES

A. Install wall mounted boxes at elevations to accommodate mounting heights as indicated on Drawings.
B. Adjust box location up to 6 feet prior to rough-in to accommodate intended purpose.
C. Orient boxes to accommodate wiring devices oriented as specified in Section 16 1400 Wiring Devices.
D. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
E. In in-accessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
F. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

G. Do not install flush mounting box back-to-back in walls; install with minimum 6 inches separation.

H. 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 provide UL listed fire stop wrap acceptable to Authority having Jurisdiction.

I. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

J. Install stamped steel bridges to fasten flush mounting outlet box between studs.

K. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

L. Install adjustable steel channel fasteners for hung ceiling outlet box.

M. Do not fasten boxes to ceiling support wires or other piping systems.

N. Support boxes independently of conduit.

O. Install gang box where more than one device is mounted together. Do not use sectional box.

3.04 INSTALLATION – TELECOMMUNICATION PATHWAYS

A. Provide continuous pathway system for all telecommunication cables. Provide continuous cable support system per Section 16 7100 – Communications Services Cabling.

B. 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/TIA-568 – Commercial Building Standard for Telecommunication Pathways and Spaces and Building Industry Consulting Service International (BICSI) Telecommunication Distribution Methods Manual guidelines and recommendations.

C. 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.

D. Clearances:
   1. Provide 3” minimum clearance from bottom of telecommunication pathway to ceiling tile and T-bar ceiling and 12 inches clear space above cable trays for access.
   2. Do not route telecommunication cables adjacent and parallel to unshielded and ungrounded power cabling.
   3. Do not route raceways over or adjacent to boilers.
   4. Do not route pathways in the floor slab of the telecommunication room.
   5. Provide the following minimum separation for telecommunication pathways as summarized in the following table:

<table>
<thead>
<tr>
<th>EMI Source Condition</th>
<th>Minimum Separation Distance in Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>480 V or Less</td>
</tr>
<tr>
<td>&lt;2 KVA</td>
<td>2-5KVA</td>
</tr>
<tr>
<td>&gt;5KVA</td>
<td></td>
</tr>
</tbody>
</table>
Fluorescent and HID Light fixtures, unshielded power conductors, or electrical equipment to open non-ferrous telecommunication pathways 5 12 24

Unshielded power conductors or electrical equipment to grounded ferrous metal telecommunication pathways 2.5 6 12

Power conductors in enclosed in grounded ferrous metal conduit to grounded ferrous metal conduit telecommunication pathways - 3 6

E. Conduit Pathways:

1. Maximum allowable continuous conduit section length of 100 feet between pull boxes.

2. Contain no more than two 90 degree bends or derate conduit capacity 15% for up to one additional 90 degree bend. Conduits less than 33 feet long, oversized one trade size or one of the 90 degree bends within 12 inches of a pull boxes may have up to three 90 degree bends without derating.

3. Rate each offset as a 90 degree bend.

4. Bond each conduit to telecommunication ground system.

5. Contain no 90 degree condulets (LBs).

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” 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 minimum conduit size of 0.75 inch. Size all other conduits and chases according to the following table based on three cables at 0.24 inch diameter to each outlet shown.

<table>
<thead>
<tr>
<th>Conduit Trade size</th>
<th>Conduit Maximum Cable Capacity Based on two 90 degree bends and &lt; 100 ft (Inches OD of Cable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.13”)</td>
<td>6</td>
</tr>
<tr>
<td>(0.18”)</td>
<td>8</td>
</tr>
<tr>
<td>(0.22”)</td>
<td>16</td>
</tr>
<tr>
<td>(0.24”)</td>
<td>20</td>
</tr>
<tr>
<td>(0.29”)</td>
<td>24</td>
</tr>
<tr>
<td>(0.31”)</td>
<td>28</td>
</tr>
<tr>
<td>(0.37”)</td>
<td>36</td>
</tr>
<tr>
<td>(0.53”)</td>
<td>60</td>
</tr>
<tr>
<td>(0.62”)</td>
<td>84</td>
</tr>
<tr>
<td>(0.70”)</td>
<td>108</td>
</tr>
</tbody>
</table>
F. Provide J-Hooks spaced maximum 5 feet on center to provide telecommunication pathway anywhere cable tray, conduit, or ladder rack is not denoted on the plans and 1 or more telecommunication cables are routed. Provide 50% spare capacity above the minimum system capacity requirements.

G. Provide conduits denoted to contain inner ducts to be 4 inch outer conduits with at least three separate internal inner ducts the entire length of the raceway. Size inner ducts to use entire available capacity of the outer conduit.

H. Boxes:
   1. Provide outlet boxes recessed in wall to be 4-11/16”x4-11/16”x2.5” with a single gang ring. Provide cut-in junctions boxes where required for existing walls to be 2”x3”x2.5”.
   2. All boxes shall be readily accessible.
   3. Do not use boxes for angle pulls or change pathway direction. Locate pull boxes in straight through sections of horizontal conduit pathways.
   4. Provide pull boxes for 0.75 inch and 1 inch through pull for horizontal UTP cabling to be 4-11/16”x4-11/16”x2.5” minimum. Provide all other boxes sized per the following table:

<table>
<thead>
<tr>
<th>Maximum Trade Size Conduit</th>
<th>Minimum Size of Pull Box in Inches</th>
<th>For each additional conduit increase width</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Width</td>
<td>Length (direction of conduit)</td>
</tr>
<tr>
<td>0.75”</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>1”</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>1.25”</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>1.5”</td>
<td>8</td>
<td>27</td>
</tr>
<tr>
<td>2”</td>
<td>8</td>
<td>36</td>
</tr>
<tr>
<td>2.5”</td>
<td>10</td>
<td>42</td>
</tr>
<tr>
<td>3”</td>
<td>12</td>
<td>48</td>
</tr>
<tr>
<td>3.5”</td>
<td>12</td>
<td>54</td>
</tr>
<tr>
<td>4”</td>
<td>15</td>
<td>60</td>
</tr>
</tbody>
</table>

3.05 INSTALLATION - FLOORBOXES

A. Provide floor cut and complete repair as necessary to install floor boxes and associated conduits.

B. Set floor boxes level.

C. Install boxes and fittings to preserve fire resistance rating of slabs and other elements, using materials and methods specified.

D. Install floor finish material in floorbox cover to match adjacent floor finish material.
E. Floor Box Requirements: Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.

F. Boxes and fittings are indicated on Drawings in approximate locations unless dimensioned. Adjust box location up to 10 feet to accommodate intended purpose.

3.06 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods in accordance with Division 7.

B. Locate outlet boxes to allow luminaries positioned as indicated on reflected ceiling plan.

C. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

3.07 ADJUSTING – FLOORBOXES

A. Division 1 – Contract Closeout: Testing, adjusting, and balancing.

B. Adjust floor box flush with finish flooring material.

3.08 ADJUSTING

A. Adjust flush-mounting outlets to make front flush with finished wall material.

B. Install knockout closures in unused openings in boxes.

3.09 CLEANING

A. Clean interior of boxes to remove dust, debris, and other material and clean exposed surfaces and restore finish.

END OF SECTION
PART 1 GENERAL

1.01 DESCRIPTION
A. This section describes general requirements and products to furnish and install UL devices for this project.
   1. Switches.
   2. Receptacles.
   3. Device plates and box covers.

1.02 QUALITY ASSURANCE
A. Manufacturers and catalog numbers specified establish configuration, rating and quality level to be provided.
B. References
   1. FS W-C-596 - Electrical Power Connector, Plug, Receptacle, and Cable Outlet.
   2. FS W-S-896 - Switch, Toggle.
   3. NEMA WD 1 - General-Purpose Wiring Devices.
   4. NEMA WD 5 - Specific-Purpose Wiring Devices.

1.03 SUBMITTALS
A. Submit product data under provisions of Division 1 - General Requirements and Section 16 0100 - Electrical General Provisions.
B. Provide product data showing configurations, finishes, dimensions, and manufacturer's instructions.

PART 2 PRODUCTS

2.01 DEVICES
A. Provide all similar devices from the same manufacturer. Color of devices shall be white.

2.02 SWITCHES
A. Manufacturers:
   1. Hubbell.
   2. Leviton.
   4. Bryant.
   5. Cooper Wiring Devices
   6. Acuity Sensor Switch
B. Provide switches as follows:
   a. Single pole, 1 hp at 120-277 volts AC minimum; white plastic handle, quiet type. Body: Nylon.
   b. Pilot Light Type: Red illuminated toggle when in “on” position.
   c. Three-Way and Four-Way Switch: similar to single pole.
   d. Key Switches: tamper-proof lock.
   e. Dimmer Switches: Semi-conductor dimmer suitable and rated (voltage, power, etc) for use with fixtures controlled (LED, fluorescent, etc) and occupancy sensors used.

2.03 OCCUPANCY SENSORS

A. Manufacturer: SensorSwitch, Wattstopper, Hubbell, Leviton, or equal.

B. Product Description: Ceiling or Wall mounted occupant sensing device as shown in the drawings and as appropriate for intended control and with dimmer switches where shown. Occupancy sensor shall be provided with line voltage or low voltage (24V) with power supply, relay modules, etc., as required to switch lighting or loads in zones of detection. Coverage capabilities of devices shall match the physical characteristics of the location installed. The coverage area shall be restricted in accordance with the manufacturer's recommendations to avoid detection in adjacent areas or corridors.

1. Provide wall or ceiling mounted devices as appropriate for spaces.
2. Detectors shall have coverage patterns as appropriate for the quantity and locations in each space.
3. Detectors shall utilize sensing technology appropriate for the usage of each space
4. Detectors shall have a variety of adjustment settings to increase or reduce the sensitivity of each type of detection.
5. Detectors are to have time delay settings
6. Detectors are to operate with 120 volt building power supply.
7. Detectors are to utilize dual technology detection to reduce the likelihood of false operations.
8. Detectors are to be compatible with the LED fixtures, other loads controlled, and Dimmer switch controls.
9. Detectors are to be rated for loads controlled.
10. Sensor shall have standard 5-year warranty and shall be UL and CUL listed.
11. Provide wiring and connections of occupancy sensors, power packs and switches as required by the manufacturer's installation and wiring diagrams for the intended switching control as indicated on the drawings.
12. Provide with power packs as required.
13. White finish.

2.04 RECEPTACLES

A. Manufacturers:
1. Hubbell.
2. Cooper Wiring Devices
3. Leviton
4. Pass-Seymore
5. Substitutions: Division 1 - Substitutions

B. Specification: Commercial Hospital Grade Duplex Receptacle, throughout facility
   1. Straight Blade Duplex Receptacle Type 2 Pole, 3 Wire, Grounding
   2. Amperage: 20A
   3. Voltage: 125V
   4. Color: white
   5. NEMA Number: 5-20R
   6. Horsepower: 1
   7. Certifications:
   8. Weather Resistant: Provide listed weather resistant type where located in wet or damp locations.
   9. Tamper Resistant: Provide listed tamper resistant type throughout entire facility.
   10. GFCI Receptacle: Provide UL listed integral Class A ground fault circuit interrupter type to meet regulatory requirements, where installed above counters in the breakroom, outdoor locations, within 6' of sinks and where required by the NEC.

2.05 DEVICE PLATES
A. Interior-finished, dry area Device Plates: Brushed stainless steel. Provide same manufacturer as device; meet UL 514 requirements.
B. Exterior Switch Cover Plates: weatherproof, extra duty cast metal with hinged gasketed device covers. Flap to open in upward direction. Provide same manufacturer as outlet box.
C. Exterior Outlet Cover Plates: Weatherproof, gasketed, extra duty cast metal, GFCI configuration where device is GFCI, vertical mount, outlet enclosure to allow device to remain weatherproof while in use.
D. Interior Wet Area Outlet Cover Plates: Gasketed, cast aluminum, GFCI configuration where device is GFCI, vertical mount.
E. Interior Dry, Unfinished Area Raised Cover Plates: Galvanized steel.

PART 3 EXECUTION
3.01 INSTALLATION
A. Provide specific-use receptacles at heights shown on Contract Drawings.
B. Receptacles for electric ranges shall be installed so the attachment plug is accessible from the front of the range by removal of the range drawer.
C. Install raised galvanized steel cover plates on all surface mounted and exposed device junction boxes in dry areas.
D. Install device plates on switch, receptacle, and blank cover plates where device is not installed.
E. Install all switches with switch travel in vertical direction.
F. Install devices and device plates flush and level.
G. Install receptacles so that the grounding terminal is down unless receptacle must be oriented horizontally to allow device to fit.

END OF SECTION
SECTION 16 4110
ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SUMMARY
A. Section includes fusible, non-fusible switches, and manual transfer switch.

1.02 REFERENCES
A. NEMA FU1 (National Electrical Contractors Association). - Low Voltage Cartridge Fuses.
B. NEMA KS 1 (National Electrical Contractors Association) - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

1.03 SUBMITTALS
A. Division 1 - Submittals: Submittal procedures.
B. Product Data: Submit switch ratings and enclosure dimensions.

1.04 CLOSEOUT SUBMITTALS
A. Division 1 – Contract Closeout: Closeout procedures.
B. Project Record Documents: Record actual locations of enclosed switches and ratings of installed fuses.

1.05 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 FUSIBLE SWITCH ASSEMBLIES
A. Manufacturers:
   1. Square D
   2. GE Electrical
   3. Siemens
   4. Eaton Cutler-Hammer
   5. Substitutions: Division 1 - Substitutions.
B. Product Description: NEMA KS 1, Type HD with externally operable handle interlocked to prevent opening front cover with switch in ON position, enclosed load interrupter knife switch. Handle lockable in OFF position.
C. Fuse clips: Designed to accommodate NEMA FU 1, Class R fuses.
D. Enclosure: NEMA KS 1, as required to meet conditions. Fabricate enclosure from steel finished with manufacturer’s standard gray enamel.
   1. Interior Dry Locations: Type 1.
   2. Interior damp locations: Type 3R.
3. Exterior Locations: Type 3R.

E. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.

F. Furnish switches with entirely copper current carrying parts.

2.02 NON-FUSIBLE SWITCH ASSEMBLIES

A. Manufacturers:
   1. Square D
   2. GE Electrical
   3. Siemens
   4. Eaton Cutler-Hammer
   5. Substitutions: Division 1 - Substitutions.

B. Product Description: NEMA KS 1, Type HD with externally operable handle interlocked to prevent opening front cover with switch in ON position, enclosed load interrupter knife switch. Handle lockable in OFF position.

C. Enclosure: NEMA KS 1, as required to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
   1. Interior Dry Locations: Type 1.
   2. Interior damp locations: Type 3R.
   3. Exterior Locations: Type 3R.

D. Switches shall have all copper current carrying parts.

E. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.

2.03 MANUAL TRANSFER SWITCH

A. Manufacturers:
   1. Square D
   2. GE Electrical
   3. Eaton Cutler-Hammer
   4. Siemens
   5. Substitutions: Division 1 - Substitutions.

B. Furnish and install manual transfer switch (MTS) with number of poles, amperage, voltage, withstand and close-on ratings as shown on the plans or specified.

C. Product Description: UL 98, NEMA KS1, double throw manual transfer switch, heavy duty quick make/quick break mechanism.

D. Configuration: Manually-operated, mechanically-held transfer switch.

E. Product Features: Solid neutral with fully-rated AL-CU pressure connectors.

F. Enclosure:
   1. Enclosure:
      a. Interior, dry locations - NEMA 1
b. Exterior locations – NEMA 3R.
2. Finish: Manufacturer’s standard gray enamel.
3. Padlock hasp for locking on or off.

2.04 SWITCH RATINGS
A. Switch Rating: Horsepower or ampere rated for load as indicated.

PART 3 EXECUTION
3.01 INSTALLATION
A. Install enclosed switches plumb. Provide supports in accordance with Section 16 0700.
B. Height: 5 ft to operating handle.
C. Locate and install engraved plastic nameplates under the provisions of Section 16 0750.
D. Provide properly sized fuses in all fused switches.
E. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.
F. Spare parts: Provide three spare of each size and rating of fuse installed on this project.

3.02 FIELD QUALITY CONTROL
A. Division 1 – Quality Control, Contract Closeout.

END OF SECTION
SECTION 16 4150
ELECTRICAL SERVICE

PART 1 GENERAL

1.01 REQUIREMENTS
A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.02 SCOPE
A. The work covered under this Section shall include furnishing and installing an underground electrical service complete as shown on the Drawings and herein specified.

1.03 QUALITY ASSURANCE
A. All equipment, materials and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications.
B. All equipment and material shall be listed by Underwriter’s Laboratories, Inc. (UL) for their intended use and shall bear the UL label.
C. Equipment shall be constructed in accordance with National Electrical Manufacturer’s Association (NEMA) standards.
D. All electrical work and service entrance equipment specified under this Section of these Specifications shall conform to the requirements of the electrical utility company.
E. The grounding systems shall comply with the NEC and as hereinafter specified.

1.04 SUBMITTALS
A. Division 1 - Submittal Procedures: Submittal procedures.
B. Submit Utility-Company-prepared as-built drawings with final record documents.
C. Submit service entrance equipment information to local utilities for approval prior to Ordering.

1.05 FIELD MEASUREMENTS
A. Verify measurements and clearance with existing conditions and electrical utility prior to starting work.

PART 2 PRODUCTS

2.01 ELECTRICAL SERVICE
A. Service shall be 120/240V, single phase, and 3 wire with transformer as furnished by the local electric utility.
B. This local electric utility shall install secondary service to the building and to metering equipment as shown on the drawings. Secondary voltage, phase, and number of wires shall be as shown on the Drawings.
C. All necessary equipment, devices, etc shall be furnished by this Contractor unless specifically furnished by the electrical utility company.
D. Installation shall conform with the NEC and the utility requirements and standards.
E. Size and configuration of equipment is to be per local utility’s requirements.

2.02 MATERIALS AND COMPONENTS
A. Materials shall be furnished and installed by this Contractor as shown on the Drawings and as herein specified.
B. All components exposed to the weather shall be UL listed for the application and conditions.

PART 3 EXECUTION

3.01 SERVICE INSTALLATION
A. This Contractor shall coordinate with the utility company to furnish and install a metering system as shown on the Drawings and as required by the local electrical utility company serving the project.
B. This Contractor shall make all necessary final agreements with the owner and electrical utility company for the installation of the permanent electrical service.
C. Coordinate with serving utility and provide all equipment and requirements for service installation.
D. Effectively ground all service entrance equipment enclosures.
E. Installation of primary secondary utility lines and connections of secondary conductors to the transformer bank is to be completed by Utility.
F. Contact utility company regarding charges related to service installation. Coordinate with Owner's Project Manager for preparation and submittal of line extension application. All utility company charges related to this service extension shall be paid for directly by Owner.

END OF SECTION
PART 1 GENERAL

1.01 REQUIREMENTS
   A. The requirements of the Contract, Division 1, and Division 16 apply to work in this Section.

1.02 SECTION INCLUDES
   A. Panelboards

1.03 REFERENCES
   A. The panelboards and protection devices in this specification are designed and manufactured according to latest revision of the following standards (unless otherwise noted).
      1. ANSI 61
      2. ANSI/NEMA KS 1, Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts)
      3. ANSI/NEMA PB 1, Panelboards
      4. ANSI/NFPA 70, National Electrical Code
      5. ASTM - American Society of Testing Materials
      6. CSA C22.2 No. 29, Panelboards and Enclosed Panelboards
      7. CSA C22.2 No. 5.1, Molded Case Circuit Breakers
      8. Federal Specification W-C-375, Rev. B, Amend. 1, Circuit Breakers, Molded Case; Branch Circuit and Service
     10. NEMA AB 1, Molded Case Circuit Breakers and Molded Case Switches
     11. NEMA PB 1.1, General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less
     12. UL 489, Molded-Case Circuit Breakers and Circuit-Breaker Enclosures
     13. UL 50, Enclosures for Electrical Equipment
     14. UL 1699, Arc-Fault Circuit-Interrupters
     15. UL 67, Panelboards
     16. UL 943, Ground-Fault Circuit-Interrupters

1.04 DEFINITIONS
   A. Overcurrent Protective Device - a circuit breaker pole or single fuse. Example: a 2-pole device is considered 2 protective devices.

1.05 SYSTEM DESCRIPTION
   A. Short circuit rating of panelboards shall be the interrupting rating of lowest rated device in the panel or applicable UL series rating for proper main and branch device combinations.
   B. Protective devices shall be molded case circuit breakers.
A. Manufacturer shall provide copies of following documents to owner for review and evaluation in accordance with general requirements of Division 1 and Division 16:
   1. Product Data on specified product;
   2. Shop Drawings on specified product;
   3. Certified trip curves for each specified product;

1.07 PROJECT RECORD DOCUMENTS
A. Maintain an up-to-date set of Contract documents. Note any and all revisions and deviations that are made during the course of the project.

1.08 OPERATION AND MAINTENANCE DATA
A. Manufacturer shall provide copies of installation, operation and maintenance procedures to owner in accordance with general requirements of Division 1 and Division 16.
B. Submit operation and maintenance data based on factory and field testing, operation and maintenance of specified product.

1.09 QUALITY ASSURANCE (QUALIFICATIONS)
A. Manufacturer shall have specialized in the manufacture and assembly of panelboards for 10 years.
B. Panelboards shall be listed and/or classified by Underwriters Laboratories in accordance with standards listed in Article 1.3 of this specification.

1.10 DELIVERY, STORAGE, AND HANDLING
A. Deliver, store, protect, and handle products in accordance with recommended practices in manufacturer's Installation and Maintenance Manuals.
B. Deliver each panelboard in individual shipping cases for ease of handling. Each panel board shall be wrapped for protection.
C. Inspect and report concealed damage to carrier within specified time.
D. Store in a clean, dry space. Maintain factory protection or cover with heavy canvas or plastic to keep out dirt, water, construction debris, and traffic. (Heat enclosures to prevent condensation.)
E. Handle in accordance with NEMA and manufacturer's written instructions to avoid damaging equipment, installed devices, and finish.

1.11 PROJECT CONDITIONS (SITE ENVIRONMENTAL CONDITIONS)
A. Follow (standards) service conditions before, during and after panel board installation.
B. Panelboards shall be located in well-ventilated areas, free from excess humidity, dust and dirt and away from hazardous materials. Location shall be protected to prevent moisture from entering enclosure.

1.12 WARRANTY
A. Manufacturer warrants equipment to be free from defects in materials and workmanship for 1 year from date of installation or 18 months from date of purchase, whichever occurs first.

1.13 MAINTENANCE SERVICE
A. Furnish complete service and maintenance of panelboards for 1 year from date of substantial completion.

1.14 FIELD MEASUREMENTS
A. Make all necessary field measurements to verify that equipment shall fit in allocated space in full compliance with minimum required clearances specified in National Electrical Code.

PART 2 PRODUCTS

2.01 MANUFACTURER
A. Manufacturers:
   1. Square D
   2. Cutler-Hammer
   3. General Electric
   4. Siemens
   5. Substitutions: Division 1 - Substitutions.

2.02 EQUIPMENT
A. Furnish Panelboards, Type as indicated in drawings. Loadcenters and residential style are not acceptable.

2.03 COMPONENTS
A. Refer to Drawings for: actual layout and location of equipment and components; current ratings of devices, bus bars, and components; voltage ratings of devices, components and assemblies; and other required details.

B. Ratings
   1. Panelboards shall be rated as indicated in drawings.
   2. Current ratings for mains, sub-feeds and branches, respectively, shall be as specified in drawings.

C. Enclosure
   1. Boxes shall be a nominal 20 inches wide and 6 inches deep with wire bending space per National Electric Code.
   2. Fronts shall be reinforced steel with concealed hinges. Trim clamps are unacceptable.
   3. All door locks shall be corrosion proof with retractable latches. All door locks shall be keyed for a single key.
   4. Clear Lexan (or equal) directory card holders shall be permanently mounted on front door.
   5. All panel board series ratings shall be prominently displayed on dead front shield.
   6. Interiors shall permit top or bottom incoming cables.

D. Bus bars
   1. Bus bars shall be phase sequenced, fully insulated and supported by high impact interior base assemblies.
   2. Bus bars shall be mechanically supported by zinc finished galvanneal steel frames to prevent vibration and damage from short circuits.
   3. Terminations shall be UL tested and listed and suitable for UL copper wire.
   4. Provide 1 continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors for plug-in or bolt-on branch circuit breakers. Bus bars shall be rated as indicated in drawings.
5. Split solid neutral bus shall be plated and located in main compartment for all incoming neutral cables to be same length.
6. Lugs shall be rated for 75 degree C terminations.
7. Lug bodies to be bolted in place.

E. Circuit Breakers
1. Molded Case Circuit Breakers: NEMA AB 1, bolt on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, type HACR for air conditioning equipment circuits, and Class A ground fault interrupter circuit breakers where scheduled. Do not use tandem circuit breakers. Provide multi-pole breakers or other approved means of simultaneously disconnecting all ungrounded conductors for each multi-wire branch circuit.
2. Molded case circuit breakers shall be plug-in or bolt-on devices for 120/208V or 120/240V panels (voltage as shown in drawings).
3. All circuit breakers shall have thermal and magnetic trip elements in each pole.
4. 2 and 3 pole breakers shall have internal common trip crossbars for simultaneous tripping of each pole.
5. Circuit breakers shall not be restricted to any mounting location due to physical size.
6. Main and sub-feed circuit breakers may be vertically or horizontally mounted.
7. Branch breaker panel board connections shall be copper to copper.
8. All panel board terminations shall be rated as indicated in drawings.
9. All breakers shall have an over center mechanism and be quick make and quick break.
10. All breakers shall have handle trip indication and a trip indicator in window of circuit breaker housing.
11. Breaker handle and faceplate shall indicate rated ampacity.
12. Circuit breaker escutcheon shall have standard ON/OFF markings.
13. Main breakers shall be UL listed for use with: Shunt, Under Voltage, and Ground Fault Shunt Trips; Auxiliary and Alarm Switches; and Mechanical Lug Kits.
14. Branch breakers shall be UL listed for use with: Shunt Trips, Auxiliary and Alarm Switches.
15. Circuit breakers shall be UL listed for back-feed where indicated on the drawings.

2.04 FINISH
A. Boxes shall be corrosion resistant, zinc finish galvanized.
B. Fronts shall be powder finish painted ANSI 61 gray.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify that panelboards are ready to install.
B. Verify field measurements are as shown on Drawings.
C. Verify that required utilities are available, in proper location and ready for use.
D. Beginning of installation means installer accepts conditions.
A. Install per manufacturer's instructions.
B. Install required safety labels.
C. Install multi-pole circuit breakers or other approved means of simultaneously disconnecting all ungrounded conductors where the branch circuit originates for each multi-wire branch circuit.

3.03 FIELD QUALITY CONTROL

A. Inspect installed panelboards for anchoring, alignment, grounding and physical damage.
B. Check tightness of all accessible mechanical and electrical connections. Minimum acceptable values are specified in manufacturer's instructions.
C. Test each key interlock system for proper functioning.

3.04 ADJUSTING

A. Adjust all circuit breakers, access doors, operating handles for free mechanical and / or electrical operation as described in manufacturer's instructions.

3.05 CLEANING

A. Clean interiors of panels to remove construction debris, dirt, shipping materials.
B. Repaint scratched or marred exterior surfaces to match original finish.

END OF SECTION
SECTION 16 5100
LIGHTING

PART 1 GENERAL
1.01 SUMMARY
   A. Section includes lighting, lamps, ballasts, and accessories.

1.02 REFERENCES
   A. ANSI C78.377 – Solid State Lighting Products Specifications
   C. IES LM-80 – Measuring Lumen Maintenance of LED Light Sources.

1.03 SUBMITTALS
   A. Division 1 - Submittal Procedures: Submittal procedures.
   B. Shop Drawings: Indicate dimensions and components for each luminary's not standard product of manufacturer.
   C. Product Data: Submit dimensions, ratings, and performance data.

1.04 QUALIFICATIONS
   A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.05 FIELD MEASUREMENTS
   A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS
2.01 LIGHTING
   A. Product Description: Complete luminaire assemblies, with features, options, and accessories as scheduled and required for complete installation and proper operation.
   B. Refer to Division 1 - Product Requirements for product options.

2.02 GENERAL AND ACCESSORIES
   A. Provide fixtures in conformance with the Fixture Schedule, with all required flanges and supports. Lighting fixtures shall be provided complete with all suspension, trim, mounting, and operating accessories normally considered necessary for a complete, functional, and safe installation, whether specifically called for in the Contract Documents or not.

2.03 LED LAMPS
   A. Lamps for LED fixtures shall be provided by fixture manufacturer or as recommended by fixture manufacturer.
   B. All LEDs used in the LED fixture shall be high brightness and of proven quality from established and reputable LED manufacturers.
   C. Manufacturer shall utilize an advanced production LED binning process such as Optibin consistency from fixture to fixture and project to project over time, while ensuring a reliable supply of LEDs from the supplier.
   D. LED fixtures shall meet lumen maintenance standards as defined in IESNA LM-80-08.
2.04 EXIT SIGNS
A. Manufacturers:
   1. As Scheduled on Drawings
B. Product Description: LED illuminated exit sign with integral battery and charger as scheduled on the Drawings. Suitable for universal mounting position.

2.05 EMERGENCY LIGHTING UNITS
A. Manufacturers:
   1. As Scheduled on Drawings
B. Product Description: Self-contained incandescent, halogen, or led emergency lighting unit with integral battery and charger as scheduled on the drawings.
C. Lamps: As scheduled.

3.02 EMERGENCY LED BATTERY DRIVER
A. Manufacturers:
   1. As Scheduled on Drawings
B. Product Description: Emergency battery power supply suitable for installation within the LED luminaire.
C. Output: The emergency driver shall be capable of operating LED load at maximum rated current for a minimum of 90 minutes.
D. Battery Type: Sealed, maintenance free, high-temperature nickel cadmium.
E. Automatic battery recharge after 90 minute discharge.
F. Integral or remote pilot light and test switch to provide visual and manual means of monitoring system operation.
H. Minimum Three-year total customer satisfaction warranty.

PART 3 EXECUTION
3.01 INSTALLATION
A. Unless specified otherwise, install suspended luminaries using steel conduit pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height. Provide seismic restraint where necessary.
B. Install fixtures level, plumb and true. Align rows accurately in three dimensions. Verify type of ceilings as shown on architectural drawings.
C. Support suspended acoustical ceiling fixtures according to the requirements of the IBC as well as any local amendments.
D. Clean all fixtures and lenses prior to final acceptance.
E. Support luminaries larger than 2 x 4 foot size independent of ceiling framing.
F. Locate recessed ceiling luminaries as indicated on reflected ceiling plan.
G. Install surface mounted luminaries plumb and adjust to align with building lines and with each other. Secure to prevent movement.

H. Exposed Grid Ceilings: Support surface-mounted luminaries on grid ceiling directly from building structure.

I. Install recessed luminaries to permit removal from below.

J. Install recessed luminaries using accessories and fire stopping materials to meet regulatory requirements for fire rating.

K. Install clips to secure recessed grid supported luminaires in place. Provide auxiliary support from fixtures installed in grid ceilings to structure above, to completely suspend fixture upon grid failure in compliance with local requirements.

L. Install wall-mounted luminaries at height as indicated on Drawings or as scheduled.

M. Install accessories furnished with each luminary.

N. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaries.

O. Install specified lamps in each luminary.

P. Coordinate installation of under cabinet with furniture shop drawings with architectural drawings and elevations.

Q. Connect luminaires to branch circuit outlets provided under Section 16 1300. Wiring to each fixture shall originate at a junction box; fixture to fixture wiring will not be acceptable.

R. Install surface-mounted emergency lighting units and exit signs plumb and adjust to align with building lines and with each other. Fasten securely to prevent movement.

S. Provide wall mounting instead of ceiling mounting where ever possible. Install wall-mounted exit signs at height as scheduled. Coordinate exact mounting height of exit signs directly above doorways.

T. Install accessories furnished with each emergency lighting unit and exit sign.

U. Install all accessories necessary for a complete and proper installation of each emergency lighting unit and exit signs.

V. Connect emergency lighting units to branch circuits as indicated.

W. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within unit.

X. Install specified lamps in each emergency lighting unit.

Y. Ground and bond lighting in accordance with Section 16 0600.

3.02 FIELD QUALITY CONTROL

A. Operate each unit after installation and connection. Inspect for proper connection and operation.

3.03 ADJUSTING

A. Aim and adjust lamp fixtures to maximize uniform illumination of exit pathways.

B. Position exit sign directional arrows as indicated.

3.04 PROTECTION OF FINISHED WORK
A. Relamp emergency lighting units that have failed prior to final acceptance.

3.05 FIRE-RESISTIVE CEILINGS

A. Provide "tenting" or other protection acceptable to the Authority Having Jurisdiction for fixtures installed in fire-resistive ceilings to maintain the fire-resistive rating of the complete assembly.

3.06 PERFORMANCE SPECIFICATION

A. The Fixture Schedule is a general guide to type, quality and other characteristics. Fixtures of equal or better performance and quality may be substituted, subject to approval.

END OF SECTION
SECTION 16 6120
FIRE ALARM SYSTEM

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the Contract Documents, including the General and Supplementary General Condition and Division 1 - General Requirements shall apply to the work of this section.

1.02 SCOPE

A. The work covered by this Section of the Specification shall include all labor, equipment, materials and services to design, furnish and install a complete fire alarm system of the addressable or zoned, non-coded general alarm type. It shall be complete with all necessary hardware, software and memory. The system shall consist of, but not be limited to, the following:

1. Fire alarm control panel.
3. System smoke detectors.
5. Alarm horns.
7. DACT
8. Voice Dialer.
9. Battery back-up.

1.03 APPLICABLE CODES AND STANDARDS

A. All equipment shall be UL listed for it’s intended use.
B. NFPA Standards 72.
D. All other local codes and authorities having jurisdiction.

1.04 RELATED DOCUMENTS

A. Section 16 1200 - Wire and Cable.
B. Section 16 1300 – Raceway and Boxes

1.05 REFERENCES

A. The design, equipment, installation and operation shall comply with the current provisions of the following Codes and Standards.
D. Americans with Disabilities Act (ADA)
E. Local and State Codes, as well as the Local Authority Having Jurisdiction
F. Underwriters Laboratories, Inc.

1.06 RELATED WORK
A. The Contractor shall coordinate work in this Section with all related trades. Work and/or equipment provided in other Sections and related to the fire alarm system shall include, but not be limited to:
   1. Secure permits and approvals prior to installation.
   2. Prior to commencement and after completion of work, notify authorities having jurisdiction.
   3. Submit letter of approval for installation before requesting acceptance of system.

1.07 SUBMITTALS
A. Provide description of operation of the system, similar to that provided in Part 2 of this Section of the Specifications, to include any and all exceptions, variances or substitutions listed at the time of bid. Any such exceptions, variances or substitutions which were not listed at the time of bid and are identified in the submittal, shall be grounds for immediate disapproval without comment.
B. A description of the system as it functions by component in the system using model numbers where applicable
C. Provide manufacturer's printed product data, catalog cuts and description of any special installation procedures. This Contractor shall furnish submittals for all components of the security system in accordance with SECTION 16 0100 of these Specifications. Submittals shall include the following for review.
D. A complete list by model number of each component of the system with a statement of how many pieces of each model to be furnished and a listing of the specific data sheet.
E. A data sheet shall be furnished for each component of the system. The specific information shall be highlighted.
F. A detailed set of floor plans for the complete building shall be furnished showing the locations of all equipment and devices and their required interconnections. The interconnections shown shall indicate the number, size, and type of wires as described in this Specification.
G. A detailed drawing shall be furnished of each type of device showing the exact terminal designations.
H. A detailed list shall be furnished of each type of device in the system stating its program function in the system.
I. Single line riser diagram showing all equipment and type, number and size of all conductors.

1.08 WARRANTY
A. Manufacturer shall guarantee the system equipment for a period of two (2) years from date of final acceptance of the system.
B. The contractor shall guarantee all wiring and raceways to be free from inherent mechanical or electrical defects for two (2) years from date of final acceptance of the system.
C. Upon completion of the installation of fire alarm system equipment, the electrical contractor shall provide to the architect a signed written statement, substantially in form as follows: "The undersigned, having engaged as the Electrical Contractor on the Project confirms that the fire alarm system equipment was installed in accordance with the wiring diagrams, instructions and directions provided to us by the manufacturer."

1.09 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience, and with service facilities within the State of Alaska.
B. Installer: Certified fire alarm installer with service facilities within State of Alaska.
C. Design fire alarm under direct supervision of a NICET IV (or higher) Certified system designer, experienced in design of this type of work, hereafter referred to as the “Delegated Engineer”. The Delegated Engineer shall be specifically identified in the submittals and shall be directly responsible for the design of the specific system supplied and installed.

1.10 TRAINING
A. This Contractor shall furnish the Owner's designated representative four (4) hours of on-the-job technical service instructions in the operating, maintenance, and troubleshooting of the system.

1.11 SYSTEM TEST AND ACCEPTANCE
A. Prior to the Architect/Engineer's final site visitation, this Contractor shall conduct an operating test of the complete system including each device. The system shall test free from grounds, shorts, and other faults. All connections shall be thoroughly checked for mechanical and electrical connection. All equipment shall be demonstrated to operate in accordance with the requirements set forth in these Specifications and as shown on the Drawings.
B. This Contractor shall perform all tests in the presence of the Owner. This Contractor shall furnish all personnel for use in the test.
C. When the work on the system has been completed and is ready for final review, a visit shall be made by the Owner at which time the Contractor shall demonstrate that the requirements of the Contract as it applies to this system have been carried out and that the system has been adjusted and operated in accordance herewith.

1.12 MAINTENANCE MATERIALS
A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Smoke Detectors, heat detectors, monitor modules and control modules: Quantity equal to 2% percent of amount of each type installed, but no fewer than 2 unit of each type.
   2. Keys: Ten extra set for access to locked and tamperproof components.
   3. Audible and Visual Notification Appliances: 2% of each type installed.

1.13 QUALITY ASSURANCE
A. All equipment and materials for this system shall be listed by Underwriter's Laboratories, Inc. (UL), bear the UL label, and shall be installed in accordance with all requirements of the National Electrical Code (NEC), all state and local codes, and these Specifications.
B. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.
C. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

PART 2 PRODUCTS

2.01 FIRE ALARM SYSTEM SEQUENCE OF OPERATION
A. Operation of any alarm initiating device shall automatically:
   1. Sound all alarm signals throughout the building.
   2. Turn on all strobe lights throughout the building.
3. Identify alarm at fire-alarm control unit.

4. Operate a Voice Dialer mounted in the Fire Alarm Control Panel to initiate the transmission of a voice message alarm indication to designated contacts as determined by the owner via leased telephone lines.

5. Transmit signal to owner’s monitoring company (if wanted or required).

6. Operate alarm relay contacts to release all magnetically held smoke doors throughout the building.

B. The fire alarm system wiring shall be electrically supervised to automatically detect and report trouble conditions to the fire alarm control panel. Any opens or grounds on system wiring and shorts across notification circuit wiring shall automatically:

1. Sound an audible signal at the fire alarm control panel. The audible signal shall be capable of being silenced during the trouble condition.

2. Slow flash a zone trouble LED to indicate the source of the wire trouble. The visual indication shall remain on until the trouble condition is repaired.

3. Operate a Voice Dialer mounted in the Fire Alarm Control Panel to initiate the transmission of a voice message alarm indication to designated contacts as determined by the owner via leased telephone lines.

4. Sound an audible signal at the remote annunciator panel (if provided). The audible signal may be silenced during the trouble condition.

C. Subsequent alarms, supervisory signals, or trouble activations shall repeat their respective response sequence.

2.02 FIRE ALARM CONTROL PANEL

A. The control panel shall contain a microprocessor with 10/100 ethernet media access controller (MAC). The system shall be designed specifically for fire detection, and notification applications. The control panel shall be listed and approved for the application standard(s) as listed under the General section.

B. The control panel shall include all required hardware, software and system programming to provide a complete and operational system. The control panel shall assure that life safety takes precedence among all panel activities.

C. The control panel shall include the following capacities:

1. Support up to 64 analog/addressable points.

2. Support up to 8 fully supervised remote annunciators.

3. Support voice dialer (AD-20001F series or equal).

4. Support up to 1000 chronological events.

D. The control panel shall include the following features:

1. Ability to download or upload site applications and system diagnostics remotely through an Ethernet connection

2. Provide electronic addressing of analog/addressable devices. Rotary and dip switch addressing shall not be considered equal.
3. Provide an operator interface display that shall include functions required to annunciate, command and control system functions.

4. Provide an internal audible signal with different programmable patterns to distinguish between alarm, supervisory, trouble and monitor conditions.

5. Provide system reports that provide detailed description of the status of system parameters for corrective action or for preventative maintenance programs. Reports shall be displayed by the operator interface or capable of being printed on a printer.

6. Provide an authorized operator with the ability to operate or modify system functions like system time, date, passwords, holiday dates, restart the system and clear control panel event history file.

7. Provide an authorized operator to perform test functions within the installed system.

E. The control panel shall provide intelligent and intuitive diagnostic software tools.

F. Device Maintenance. It shall be possible to view and print a report of all detectors dirtiness levels to optimize cleaning schedules.

G. Main Operators Display Operations:
   1. Provide a discreet system control switch provided for reset, alarm silence, panel silence, remote disconnect, drill switch, and up/down/right/left switches.
   2. Backlit LCD display shall be 80 character display.
   3. Each point shall have a 40 character custom message.
   4. Service Detector LED: Provide indication when a detector needs servicing
   5. Programmable Switches: Provide minimum of 2 programmable switches with corresponding LED. The switches shall be programmed for disable/enable or activate restore functions.
   6. Alarm and Trouble Annunciator: Provide minimum of 16 zones of LED annunciation with red alarm and yellow trouble indicators; 4 zones may be utilized for supervisory zone annunciation. Devices on addressable loop circuits shall be identified by display or their address and by their condition (alarm, pre-alarm, monitor, supervisory, and trouble).

H. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions

I. Circuits Requirements:
   1. Signaling Line Circuits for Intelligent Analog Addressable Loop:
      a. Class B (style 4)
      b. Any combination of 64 detectors or modules.
   2. Notification Appliance Circuits:
      a. Class B (style Y)
      b. Maximum circuit loading to 2.5 amps for notification appliance circuits
   3. Activation of alarm notification appliances and other functions shall occur within 3 seconds after the activation of an initiating device.

J. Smoke-Alarm Verification:
1. Initiate an audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
2. Activate an NRTL-listed and -approved "alarm-verification" sequence at fire-alarm control unit and detector.
3. Record events by the system printer.
4. Sound general alarm if the alarm is verified.
5. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.

K. Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change to alternate settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.

L. Voice Dialer: The system shall have an off premise communications system capability of using voice message alarm communications for sending system messages to owner designated phone numbers.

M. Ethernet Port: Provide a standard 10/100 Base T Ethernet port for connecting to an intranet or a local network. This connection shall support the downloading of configuration programming to the panel over the network, and provide the capability of diagnostic information from a remote location.

N. Alpha-Numerical Pager Interface: The system shall transmit an alphanumeric system activity message, by event, by point descriptor to a commercial paging system of the owners choice, using TAP Pager protocol.

O. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, shall be powered by nominal 24-V dc source.
   1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

P. Secondary Power: Shall provide 24 hours supervisory and 5 minutes of alarm with batteries, automatic battery charger, and automatic transfer switch.

Q. NAC Power Supply: The NAC power supply shall be independent unit that will provide power to visual strobe notification appliances. It shall be possible to configure the NAC's to follow the main panel's NAC or activate from intelligent synchronized modules. The booster NAC's must be configurable to operate independently at any one of the following rates: continuous synchronized, or 3-3-3 temporal. Fault conditions on the power supply shall not impede alarm activation of host NAC circuits or other power supplies. The NAC power supply must be able to provide concurrent power for notification devices, security devices, access control equipment and auxiliary devices such as door holders. All the NAC Power Supplies shall be synchronized. The power supply shall support up to 24 amp hour batteries.

2.03 FIRE ALARM INITIATING DEVICES
   A. Manual Pull Stations
      1. Comply with UL38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation.
2. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.

3. The manual pull station will have an intelligent module integral of the unit.

4. Station Reset: key operated switch shall match the control panel key.

5. Manual pull stations that initiated an alarm condition by opening the unit are not acceptable.

B. Intelligent Analog System Smoke Detectors

1. Integral Microprocessor: All decisions are made at the detector determining if the device is in the alarm or trouble condition.

2. Non-Volatile Memory: Permanently stores serial number, and type of device. Automatically updates historic information including hours of operation, last maintenance date, number of alarms and troubles, time of last alarm and analog signal patterns for each sensing element just before last alarm.

3. Electronic Addressing: Permanently stores programmable system address. It shall be possible to address each intelligent module without the use of DIP or rotary switches. Devices using switches for addressing shall not be acceptable.

4. Automatic Device Mapping: Each detector transmits wiring information regarding its location with respect to other devices on the circuit, creating an As-Built wiring diagram. This will also provide enhanced supervision of the device physical location and the device message shall reside with the location and not the device address. Devices installed in the wrong location will always report the correct message of the physical location.

5. Sensitivity Range: Each analog addressable smoke detector's sensitivity shall be capable of being programmed individually as: most sensitive, more sensitive, normal, less sensitive or least sensitive. It shall be possible to automatically change the sensitivity of individual analog/addressable detectors for the day and night periods. It shall be possible to program control panel activity to each level.

6. Pre-Alarm: Detector stores 8 pre-alarm sensitivity values to alert local personnel prior to the sensor reaching a full evacuation sensitivity. Sensitivity values can be set in 5-10% increments.

7. Environmental Compensation: The detector's sensing element reference point shall automatically adjust, compensating for background environmental conditions such as dust, temperature, and pressure. Periodically, the sensing element real-time analog value shall be compared against its reference value. The detector shall provide a maintenance alert signal when the detector reaches 80% compensation has been used. The detector shall provide a dirty fault signal and illuminate Service Detector LED on control panel.

8. Twin Status LEDs: Flashing Green LED shows normal; flashing RED shows alarm state; steady RED and steady GREEN show alarm state in stand-alone mode, visible from any direction.

9. UL Sensitivity Testing: The detector shall utilize a supervised microprocessor that is capable of monitoring the sensitivity of the detector. If the detector sensitivity shifts outside of the UL limits, a trouble signal is sent to the panel.

10. Device Replacement: The system shall allow for changing of detector types for service replacement purposes without the need to reprogram the system. The replacement detector type shall automatically continue to operate with the same programmed sensitivity levels and...
functions as the detector it replaced. System shall display an off-normal condition until the proper detector type has been installed or change in the application program profile has been made.

C. Intelligent 4D Multi-sensor Detector (Photo/Ion/Thermal and Time)

1. Provide intelligent analog addressable 4D multi-sensor smoke detectors at the locations shown on the drawings. The 4D Intelligent detector gathers analog information from each of its three fire sensing elements and converts it into digital signals. The detectors on-board microprocessor measures and analyzes these signals separately with respect to a fourth element – Time. It compares the information to historical readings, time patterns and known fire characteristics to make an alarm decision. Digital filters remove signal patterns that are not typical of fires.

2. Separately mounted combinations of photoelectric detectors, ionization detectors and heat detectors in the same location, clustered at the manufacturer's listed spacing is an acceptable alternative.

D. Intelligent 3D Multi-sensor Detector (Photo/Thermal and Time)

1. Provide intelligent analog addressable 3D multi-sensor smoke detectors at the locations shown on the drawings. The 3D Intelligent detector gathers analog information from each of its two fire sensing elements and converts it into digital signals. The detectors on-board microprocessor measures and analyzes these signals separately with respect to a third element – Time. It compares the information to historical readings, time patterns and known fire characteristics to make an alarm decision. Digital filters remove signal patterns that are not typical of fires.

E. Intelligent Photoelectric Detector

1. Provide intelligent analog addressable photoelectric smoke detectors at the locations shown on the drawings.

F. Intelligent 135 Degree Fixed Temperature / Rate of Rise Heat Detector

1. Provide intelligent combination fixed temperature/rate-of-rise heat detectors at the locations shown on the drawings. The heat detector shall have a low mass thermistor heat sensor and operate at a fixed temperature and at a temperature rate-of-rise. It shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm. The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of the data. Systems using central intelligence for alarm decisions shall not be acceptable. The intelligent heat detector shall have a nominal fixed temperature alarm point rating of 135°F (57°C) and a rate-of-rise alarm point of 15°F (9°C) per minute. The heat detector shall be rated for ceiling installation at a minimum of 70 ft (21.3m) centers and be suitable for wall mount applications.

G. Fixed Temperature Heat Detector

1. Provide intelligent fixed temperature heat detectors at the locations shown on the drawings. The heat detector shall have a low mass thermistor heat sensor and operate at a fixed temperature. It shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm. The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of the data. Systems using central intelligence for alarm decisions shall not be acceptable. The heat
detector shall have a nominal alarm point rating of 135°F (57°C). The heat detector shall be rated for ceiling installation at a minimum of 70 ft (21.3m) centers and be suitable for wall mount applications.

H. Detector Base Types
1. Provide standard detector mounting bases suitable for mounting on 1-gang, or 4inch octagon box and 4 inch square box. The base shall, contain no electronics and support all series detector types. Bases with electronics or dip-switches are not acceptable.
2. Provide relay detector mounting bases suitable for mounting on 1-gang, or 4” octagon box and 4” square box. The relay base shall support all Signature Series detector types and have the following minimum requirements:
   a. The relay shall be a bi-stable type and selectable for normally open or normally closed operation.
   b. The position of the contact shall be supervised.
   c. The relay shall automatically de-energize when a detector is removed.
   d. The operation of the relay base shall be controlled by its respective detector processor or under program control as required by the application. Detector relays not capable of operational programming independent of the detector shall not be considered equal. Form “C” Relay contacts shall have a minimum rating of 1 amp @ 30 Vdc and be listed for “pilot duty”.
   e. Removal of the respective detector shall not affect communications with other detectors.
3. Provide audible detector mounting bases suitable for mounting on 4” x 4” octagonal concrete ring (mud box) and 4” square x 2-1/8” (54 mm) deep box.
   a. The base shall support all Signature Series detector types and be capable of single or group operation. The audible base shall emit a temporal alarm tone and be selectable for low or high output.
   b. The operation of the audible base shall be controlled by its respective detector processor or under program control as required by the application. Detector audible base not capable of operational programming independent of the detector shall not be considered equal.
   c. The audible bases shall be UL268 and UL464 Listed, and provide a reverberant room sound output per UL464 of 81 dBA at 10ft (3m), and an average anechoic sound output of 90 dBA at 10 ft.(3m).

I. Intelligent Duct Smoke Detector - Photoelectric
1. Provide intelligent photoelectric duct smoke detector at the locations shown on the drawings.
   a. One form C auxiliary alarm relay rated at 2amps @ 30Vdc.
   b. The operating range shall be 100ft/min to 4,000ft/min air velocity and temperature range of –20 to 158F.
   c. Sample tube can be installed with or without the cover place and be rotated in 45- degree increments to ensure proper alignment with duct airflow.
   d. Local magnet-activated test switch.
2. Provide remote test station with Alarm LED and Key Switch.

J. Intelligent Modules - General
1. It shall be possible to address each intelligent module without the use of DIP or rotary switches. Devices using switches for addressing shall not be acceptable. The personality of multifunction modules shall be programmable at site to suit conditions and may be changed at any time using a personality code downloaded from the Analog Loop Controller.
   a. Integral Microprocessor: All decisions are made at the module determining if the device is alarm or trouble condition. Each module provides its own ground fault detection.
   b. Non-Volatile Memory: Permanently stores serial number, and type of device. Automatically updates historic information including hours of operation, number of alarms and troubles, time of last alarm.
   c. Automatic Device Mapping: Each detector transmits wiring information regarding its location with respect to other devices on the circuit, creating an As-Built wiring diagram. This will also provide enhanced supervision of the device physical location. The device message shall reside with the location and not the device address. Devices installed in the wrong location will always report the correct message of the physical location.
   d. Twin Status LEDs: The modules shall have a minimum of 2 diagnostic LEDs mounted behind a finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status.
   e. Input and output circuit wiring shall be supervised for open and ground faults.
   f. Two styles of modules shall be available, those designed for gang box mounting, and where multiple modules are required in a single location, plug in modules shall be provided with a Universal Input/Output motherboard.

K. Intelligent Input Module. The Input Module shall provide one or two supervised Class B input circuit capable of a minimum of 4 personalities, each with a distinct operation. The module shall be suitable for mounting on North American 2 ¼” (64mm) deep 1-gang boxes and 1 ½” (38mm) deep 4” square boxes with 1-gang covers. The single input module shall support the following circuit types:
   • Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.)
   • Normally-Open Alarm Delayed Latching (Waterflow Switches)
   • Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.)
   • Normally-Open Active Latching (Supervisory, Tamper Switches)

L. Intelligent Relay Module. Provide addressable control relay circuit modules shall provide one (1) form C dry relay contacts rated at 24Vdc @ 2 amps (pilot duty) to control external appliances or equipment. The position of the relay contact shall be confirmed by the system firmware. The module shall be suitable for mounting on North American 2 ½” (64mm) deep 1-gang boxes and 1 ½” (38mm) deep 4” square boxes with 1-gang covers.

M. NAC Control Module: Provide intelligent NAC control module shall provide one (1) supervised Class B output circuit capable of a minimum of 2 personalities, each with a distinct operation. The gang box-mounted version shall be suitable for mounting in North American 2 ½” (64mm) deep 2-gang boxes and 1 ½” (38mm) deep 4” square boxes with 2-gang covers, or European 100mm square
boxes. The plug-in version shall plug into a universal multi-module motherboard. The NAC control module shall support the following operations:

- 24volt NAC circuit
- Audio notification circuit 25v or 70v
- Telephone Power Selector with Ring Tone (Firefighter’s Telephone)
- Visual Synchronized Output to Genesis appliances or to NAC Power Supply.

2.04 NOTIFICATION APPLIANCES

A. General

1. All appliances shall be UL Listed for Fire Protective Service.

2. All strobe appliances or combination appliances with strobes shall be capable of providing the “Equivalent Facilitation” which is allowed under the Americans with Disabilities Act Accessibilities Guidelines (ADA(AG)), and shall be UL 1971, and ULC S526 Listed.

3. All appliances shall be of the same manufacturer as the Fire Alarm Control Panel specified to insure absolute compatibility between the appliances and the control panels, and to insure that the application of the appliances are done in accordance with the single manufacturers’ instructions.

4. Any appliances which 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 which clearly states that their equipment (as submitted) are 100% compatible with each other for the purposes intended.

B. Horn/Strobes

1. Temporal Horn/Strobes. In - Out screw terminals shall be provided for wiring. The horn shall have a white plastic housing. Horn/strobes shall be selectable for high or low dBA output. Selection of low or high output shall be reversible. Horns shall be selectable for steady or temporal output. Selection of steady or temporal output shall be reversible. A synchronized temporal pattern sound output level shall be determined and selected for each device by the Delegated Engineer.

2. The strobe shall provide synchronized flash outputs levels as determined by the Delegated Engineer. The strobe shall have lens markings oriented for wall mounting. Ceiling mounted strobes shall have lens markings with correctly oriented lettering.

3. Horns/Strobes shall mount in a 4” electrical box with extension ring using the 2 screws provided with ring. It must not be necessary to completely remove the screws to facilitate mounting. Provide grey weatherproof wall boxes for outdoor mounting. Interior horn strobes shall be white.

C. Horn/ Strobe (Weatherproof)

1. The notification appliance shall be a Wheelock Series MT audible/visual appliance or equivalent.

2. Notification appliance shall be electronic and use solid state components. Electromechanical alternatives are not approved.

3. Combination audible/visual appliances shall incorporate a Xenon flashtube enclosed in a rugged Lexan® lens or equivalent with solid state circuitry.
4. Strobe shall produce a flash rate of one (1) flash per second minimum over the voltage range. The strobe intensity shall be rated per CAN/ULC-S526-M87 for Candela. The 15/75 candela strobe shall be specified when 15 candela with 75 candela intensity on-axis is required. All Listed strobe appliances shall incorporate low temperature compensation to insure the lowest possible current consumption. Strobe activation shall be via independent input or from the same input circuit as the audible.

5. The combination audible/visual appliances may be installed outdoors and surface mounted. They shall mount to standard electrical hardware requiring no additional trimplate or adapter. The aesthetic appearance shall not have any mounting holes or screw heads visible when the installation is completed.

6. The appliance shall be finished in a textured red color.

7. The audible appliance may be installed indoor or outdoor with the proper back box

2.05 ACCEPTABLE MANUFACTURERS

A. The equipment, including the fire alarm control panel, as manufactured by Edwards Systems Technology (EST) is used as the basis of this specification and design and constitutes the type and quality of equipment to be furnished.

B. If equipment of another manufacturer is to be submitted for approval as equal, the contractor shall, at the time of bid, list all exceptions taken to these Specifications, all variances from these Specification and all substitutions of operating capabilities or equipment called for in these Specifications and forward said list to the Engineer. Any such exceptions, variances or substitutions which were not listed at the time of bid and are identified in the submittal, shall be grounds for immediate disapproval without comment. Final determination of compliance with these Specification shall rest with the Owner and/or Engineer, who, at his discretion, may require proof of performance.

PART 3 EXECUTION

3.01 INSTALLATION

A. The entire system shall be installed in a workmanlike manner, in accordance with approved manufacturer's wiring diagram. The contractor shall furnish all conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for the complete installation. All wiring shall be of the type recommended by the manufacturer, approved by the local Fire Department, and shall be installed in conduit throughout.

B. All penetration of floor slabs and fire walls shall be fire stopped in accordance with all local fire codes and these specifications.

C. All wiring shall be color coded throughout, to National Electrical Code and NFPA standards.

D. The system shall be arranged to receive power from one three wire 120 Vac, 15 A supply. All low voltage operation shall be provided from the fire alarm control panel.

E. The calculated voltage drop on notification appliance circuits shall not exceed 10% for any device.

F. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
G. All fire detection and alarm system devices shall be surface mounted on concealed junction boxes with concealed cabling when located in finished areas and may be surface mounted on junction boxes with cabling protected from damage in conduit or metal clad cable when located in unfinished areas. The control panel shall be surface mounted.

H. At the final inspection a factory trained representative of the manufacturer of the major equipment shall perform the tests in Section 3.2 TEST.

I. Manual pull stations shall be suitable for semi-flush mounting on standard single gang box, and shall be installed not less than 42 inches (107 mm) or more than 48 inches (122 mm) above the finished floor. Manual Stations shall be UL listed.

3.02 TEST:

A. Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system.

B. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

C. Open initiating device circuits and verify that the trouble signal actuates.

D. Open and short notification appliance circuits and verify that trouble signal actuates.

E. Ground circuits and verify response of trouble signals.

F. Check presence and audibility of tone at all alarm notification devices.

G. Check installation, supervision, and operation.

H. Verify that each initiating device alarm is properly received and processed by the FACP (Walk Test).

I. Conduct tests from the FACP to verify trouble indications for common mode failures, such as alternating current power failure.

J. Reports of final field testing during installation shall be provided to the Owner.

3.03 FINAL INSPECTION:

A. At the final inspection a factory-trained representative of the manufacturer of the major equipment shall demonstrate that the systems function properly in every respect.

3.04 FIELD QUALITY CONTROL

A. The system shall be installed and fully tested under the supervision of a trained manufacturer's representative. The system shall be demonstrated to perform all of the function as specified.

3.05 DOCUMENTATION AND TRAINING

A. Division 1 – Contract Closeout

B. The contractor shall compile and provide to the owners four (4) complete manuals on the completed system to include operating and maintenance instruction, catalog cuts of all equipment and components, as-built wiring diagrams and a manufacturer's suggested spare parts list. In addition, provide four (4) complete set of field accurate as-built drawings.

C. In addition to the above manuals, the contractor shall provide the services of the manufacturer's trained representative for a period of a maximum of four (4) hours to instruct the owners' designated personnel on the operation and maintenance of the entire system. "Hands-on" demonstrations of the operation of all system components and the entire system shall be provided.

END OF SECTION
SECTION 16 6150
INTRUSION DETECTION SYSTEM

PART 1 GENERAL

1.01 SUMMARY
A. This document is intended to specify the requirements for the provision of all equipment, materials, labor, programming, documentation and services necessary to furnish and install a complete and operational Intrusion Detection system. It shall include, but not be limited to intrusion detection devices, alarm control panel, signaling devices, power supplies, keypads, communicator, alarm initiating and indicating devices, annunciation devices, and signal and control wiring as shown on the drawings, as specified herein and as needed for a complete and operational system.

B. The system equipment and installation shall comply too all provisions and requirements of this specification as well as any and all applicable national, state and local codes and standards.

C. Related Sections:
   1. Division 8 - Door Hardware.
   2. Section 16 0100 – Electrical General Provisions
   3. Section 16 0600 – Grounding and Bonding
   4. Section 16 0700 – Electrical Hangars and Supports
   5. Section 16 1200 - Building Wire and Cable.
   6. Section 16 1300 – Raceways and Boxes

1.02 REFERENCES
A. National Fire Protection Association:
   1. NFPA 70 - National Electrical Code.

B. Underwriters Laboratories Incorporated (UL):
   1. UL 609 – Local Burglar Alarm Units.
   2. UL 634 – Connectors and Switches for Use with Burglar Alarm Systems.
   3. UL 639 – Intrusion Detection Devices.
   4. UL 1076 – Proprietary Burglar Alarm Units and Systems.

1.03 TYPE OF SYSTEM
A. The system shall consist of an integrated alarm processor, digital communicator, telephone interface, keypad, modules, etc., and shall monitor alarm circuits specified herein. Alarms shall report over dial-up telephone lines to the owner's selected Central Station Agency or to numbers as provided by the owner.

B. These specifications are based on equipment from NAPCO Security Systems, Inc., to set a standard for design and quality.

C. Any model numbers listed that are outdated, not suitable for the installation, or otherwise incompatible with the other system components shall immediately be brought to the attention of the project manager with proposed substitute components suitable and appropriate for a complete and fully operational system, functioning as intended.
1.04 SUBMITTALS
A. Division 1 – Shop Drawings, Product Data, and Samples: Submittal procedures.
B. Shop Drawings: Indicate system wiring diagram showing each device and wiring connection.
C. Product Data: Submit catalog data showing electrical characteristics and connection requirements.
D. Test Reports: Indicate procedures and results for specified field testing and inspection.
E. Manufacturer’s Field Reports: Indicate activities on site, adverse findings, and recommendations.

1.05 CLOSEOUT SUBMITTALS
A. Division 1 – Contract Closeout Procedures: Closeout procedures.
B. Project Record Documents: Record actual locations of intrusion detection equipment.
C. Operation and Maintenance Data: Submit manufacturer’s standard operating and maintenance instructions.

1.06 WARRANTY AND SERVICE
A. Division 1 – Warranties and Bonds: Warranty requirements.
B. Warrant all components, parts and assemblies against defects in materials and workmanship for a period of 12 months. A trained specialist of the equipment manufacturer shall provide warranty service.
C. Warranty response time shall not exceed twenty-four (24) hours.

1.07 EXTRA MATERIALS
A. Division 1 – Spare Parts and Maintenance Materials: Spare parts and maintenance products.

PART 2 PRODUCTS
2.01 SEQUENCE OF OPERATION
A. Upon actuation of any automatic detection device, breaking of any magnetic contact, or other system initiated alarm, all alarm functions shall operate in appropriate fashion. Alarms shall continue to be actuated until manually reset on-site by authorized personnel.
B. The following additional functions shall be performed in the event of an alarm, as shown:
   1. Security alarms shall activate the remote signaling circuit of the security panel, which shall seize the first voice line and dial a coded alarm message to the remote Central Station (verify with owner). If the first voice line seized is not usable, the second voice line shall be seized. Security panel shall transmit to a second telephone number, a duplicate of all the information sent to the first telephone number.
   2. Building systems "trouble" signals shall be transmitted to the remote location as separate and distinct signals.
   3. Operate a Voice Dialer mounted in the Control Panel to initiate the transmission of a voice message alarm indication to designated contacts as determined by the owner via leased telephone lines.
   4. Authorized personnel shall accomplish shutdown of the system at the panel.
C. The arming procedure shall be as follows:
   1. Entering the arming code on the keypad shall cause the system to be armed.
2. System shall give visual and audible indication if it is armed while a non-auto-shunted zone is in trouble status. A low battery condition shall give an audible alarm upon arming.

3. System shall test standby battery and system on arming by briefly activating the system from the standby battery.

4. If required by the owner, system shall dial the Central Station number to give a closing system status report and shall give visual or audible indication of the Central Station verification signal (ring back).

5. After system has been successfully armed and ring back has been received, the exit delay period (user programmable) shall begin (if the delay has not been canceled by the operator), allowing the operator to exit the building without causing an alarm.

D. The disarming procedure shall be as follows:
   1. Entering the disarming code on the keypad shall cause the burglary zones to be disarmed. The other zones shall remain operational.
   2. If required by the owner, the system shall give visual or audible indication of the central station verification signal (ring back).

E. To enter the programming mode, the user shall be required to enter the correct keypad programming authorization code.

2.02 SECURITY PANEL CONTROL UNIT

A. Provide a UL listed, solid state, microprocessor-based, modular design security panel control unit with keypad and digital communicator, NAPCO “Magnum Alert 3000” or equal with H1518 enclosure and CB1518KIT commercial burglary kit and all necessary accessories for a complete and fully functional system as indicated in these specification, shown on the drawings and as required.

B. The control unit shall have the following features:
   1. Provide quantity of burglary zones as shown on the drawing, with at least one programmable as a dedicated exit/entry delay zone.
   2. At least two non-shunttable 24 hour auxiliary zones with 50 millisecond detection response.
   3. At least one non-shunttable supervisory zone capable of reporting both trouble and alarm conditions.
   4. At least one day zone activated only on circuit opening (trouble).
   5. All zones shall be end-of-line resistor supervised and each shall function with a combination of normally closed and normally open contacts.
   6. Integral siren driver, or relay(s) programmable for operation of annunciation devices specified.
   7. Automatic battery charger, and power supply sufficient to support all features and functions of the system, plus 25 percent spare capacity.
   8. The control panel shall monitor detection devices having normally open or normally closed contacts.
   9. Sealed lead-acid battery(s) integral with controller, of sufficient capacity for 8 hours of standby operation, followed by five minutes of alarm and reporting operation.
   10. Dynamic battery test for test under load.
   11. Capable of accepting up to two (2) four-wire keypads.
C. The following programmable zone options shall be available:
   1. Adjustable exit/entry delay times.
   2. Detection delay on burglary zones with devices in the exit/entry path during entry and exit periods.
   3. Automatic exit delay initiation after verification of central station response.
   4. Automatic shunting of burglary zones to allow control center to be armed even if trouble exists on those zones.
   5. Priority, individual and group manual shunt, 24 hour protection and auto-reset on burglary zones.

2.03 SECURITY KEY PAD
A. Provide security key pads with the following functions:
   1. English language LCD display, backlit
   2. LED and sounder annunciators.
   3. Provisions for medical emergency, fire, panic alarms at keypad
   4. Locate and Fault-Find Modes facilitate testing and trouble-shooting.
   5. Test for communicator’s ability to dial out.
   6. Audible indication of a faulted zone returning to normal condition.
   7. Sixteen (16) access/control codes and one electric door lock activation code of 4 digits each shall be user programmable from the keyboard.
   8. Single button reset of fire (supervisory) zone indicators, latched detectors and day zone indication.
   9. Separate supervisory zone indication.
   10. Capability of arming while power by the standby battery.
   11. Activation of a panic alarm on one 24 hour auxiliary zone
   12. Digital zone identification by pressing a digit key.
   13. Digital display of shunted zone numbers.
B. Keypad shall have the following user programmable options:
   1. Audible indication of dial tone detection success or failure.
   2. Manual zone shunting individually and/or by group.
   3. Ambush code disguised as disarming code shall transmit a silent alarm if an intruder forces the user to disarm.
   4. Fallback code shall set the system to either armed or disarmed status on power up. This code shall also allow arming/disarming if and only if no keypad programmed user codes are loaded.
C. Provide one keypad on face of Security System Control Panel enclosure.
D. Keypads shall be NAPCO #RP3000LCD or equal.
E. Quantity and location of key pads shall be as specified in contract documents and drawings.
2.04 COMMUNICATOR
   A. Communicator shall have the following factory supplied features:
      1. Compatible with all major receiver formats, including Silent Knight and Osborne Hoffman Quickalert.
      2. Rotary dial and TouchTone with Rotary backup.
      3. DPDT line seizure.
      4. Three 20 digit telephone numbers.
      5. Backup Reporting; Double Reporting; Split Reporting.
      6. 16 user codes with Opening/Closing Reporting by user.
      7. AC Failure Reporting with programmable report delay.
      8. Communicator Confidence test.
      9. Supervised dual line communication, complying with U.L Commercial fire Regulations.
   B. Communicator shall have the following user programmable options:
      1. A second telephone number, receiver and data formats shall be accessible.
      2. Alarm/restore reporting shall identify individual zones.
      3. Two digit event codes and 4 digit subscriber codes shall be programmable for receivers which accept these data formats.
      4. Opening/closing reports shall distinguish between arm/disarm codes. Auto shunted and latched alarm zones shall be identified on closing. Each of the sixteen users shall be independently identified upon an opening or closing.
      5. Low battery condition, AC failure, day supervision and supervisory zone trouble shall be reported.
      6. Delay before reporting zone violation.
      7. Sum check of data transmission.
      8. Dial tone detection.
     10. Extended format reporting, single digit event code format, or two digit event code format shall be user selectable.
   C. Provide to the owner one complete copy of the programming and downloading software (PC compatible) and one complete PC compatible interface kit.

2.05 DOOR CONTACT SWITCH
   A. Provide U.L. listed door contact switches with the following features:
      1. Recessed mounted (concealed) – for man doors, surface mounted – for overhead doors.
      2. Magnetically actuated switch with compatible magnetic target.
      5. Suitable for door mounting to monitor the status of each exterior door as noted on the contract drawings.
6. Provide gap for the following types of doors:
   a. Steel doors – 1 inch gap.
   b. Wood doors – 1.25” gap.
   c. Overhead doors – 3” gap.

B. Steel doors - GE Security #1078 Series or equal (as appropriate).
C. Wood doors – GE Security #1075 Series or equal (as appropriate).
D. Quantity and location of door contact switches shall be as specified in contract documents and drawings.

2.06 MOTION DETECTOR
A. Provide U.L. listed adaptive passive infrared type motion detector with the following characteristics:
   1. Standard Wide Angle Lens – 50’
   2. Microwave and PIR channels
   3. Wrap around shield technology
B. Powered from the security panel.
C. NAPCO M series or equal (as appropriate).
D. Quantity and location of motion detectors shall be as specified in contract documents and drawings.

2.07 MOTION DETECTOR WITH ROOM TEMPERATURE ALERT
A. Provide U.L. listed adaptive passive infrared type motion detector with temperature alert with the following characteristics:
   1. Standard Wide Angle Lens – 45’
   2. Temperature auto-alert (40°-90°F)
   3. Tamper Supervised
   4. Wall or corner mountable
B. Powered from the security panel.
C. NAPCO PIR Series or equal (as appropriate).
D. Quantity and location of temperature alert shall be as specified in contract documents and drawings.

2.08 SIREN
A. Provide U.L. listed indoor siren with the following features:
   1. Self contained.
   2. 2 tones – steady and warble.
   3. Wall mounted.
   4. 95db output at 12V.
B. Ademco #747 Series or equal.
C. Quantity and location of indoor sirens shall be as specified in contract documents and drawings.
D. Provide U.L. listed exterior siren, appropriate for the conditions.
2.09 WIRE AND CABLE
A. All conductors shall be solid or stranded copper, of a size and type recommended by the manufacturer for each input and output.
   1. Provide two four-pair cables (one pair is spare) between Security panel and telephone termination board, for transmission of signals via telephone lines to the Central Station.
   2. Terminate all four active pairs at both ends, and cap off the spares.
   3. Provide plugs, cords, and jacks as recommended by the manufacturer or required by Serving Telephone Utility.

2.10 SUBSCRIBER CODES AND SYSTEM PROGRAMMING
A. System programming will be performed by the Contractor. The Contracting Agency shall provide the contractor a list of codes prior to checkout. The Contracting Agency shall program final codes at the turnover of the project.

PART 3 EXECUTION
3.01 EXAMINATION
A. Division 1: Coordination and project conditions.
B. Verify surfaces to receive detection devices are ready for installation.

3.02 INSTALLATION
A. Install system according to NFPA 70, applicable codes, and manufacturer’s published instructions.
B. Mount Security Control Panel enclosure, keypads, etc. as shown on the drawings and as required for a fully operational system.
C. Install conductors in accordance with Section 16 1200 – Wire and Cable. Where installed concealed, such as within walls, cabling shall be installed in conduit. Where installed in accessible locations, such as above accessible ceiling, open cabling (plenum rated) may be used.
D. Make conduit and wiring connections to door hardware devices.
E. Install engraved plastic nameplates in accordance with Section 16 0750.
F. Ground and bond intrusion detection equipment and circuits in accordance with Section 16 0600.
G. Provide 8 ½ by 11 inch graphic zone map, neatly drafted CAD plan, showing the floor plan, final zoning, locations of all keypads, card readers, and with “you are here” locator symbol. Mount under a piece of beveled edge Plexiglas and securely fasten to the wall adjacent to security panel. Submit graphic for approval prior to fabrication.
H. Adjust sensitivity of system components in accordance with the manufacturer’s recommendations for the specific location.

3.03 SECURITY SYSTEM ZONES
A. Coordinate final security system zoning and programming with the Owner, prior to final test-out system.
B. Provide separate security zones as identified on the drawings. Abbreviate zone titles as required to allow entire zone description to be visible on one line of the keypad display. Coordinate abbreviation and zone description method with Owner prior to programming the system.

3.04 FIELD QUALITY CONTROL
A. Division 1 - Quality Control: Testing, adjusting, and balancing.
B. Inspection:
   1. Inspect equipment installation, interconnection with system devices, mounting locations, and mounting methods.
   2. Verify that units and controls are properly installed, connected, and labeled and that interconnecting wires and terminals are identified.
C. Test in accordance with NFPA 72 and manufacturer’s recommendations.

3.05 MANUFACTURER'S FIELD SERVICES
   A. Furnish services of technician to supervise installation, adjustments, final connections, system testing, and Owner training.

3.06 ADJUSTING
   A. Occupancy Adjustments: Prior to date of Final Acceptance, provide on-site assistance in adjusting and reprogramming to suit actual occupied conditions

3.07 DEMONSTRATION AND TRAINING
   A. After the system provided in this section is completely installed and operational, and at a time chosen by the Owner, provide the Owner’s identified personnel with a total of four (4) hours of instruction on the operation, maintenance, programming, and troubleshooting of all equipment provided under this Section of the Specifications. This instruction shall also include the operation of all equipment that the alarm controller monitors.
   B. Provide an additional two (2) hours of follow-up instruction for review and clarification at a later time mutually agreed on with the Owner if the Owner deems it necessary.

END OF SECTION
SECTION 16 7100
TELECOMUNICATION SYSTEM

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide the equipment, materials, and labor to install the systems shown on the drawings and specified herein. This shall include (but not be limited to) provision of all raceways, sleeves, boxes, line and low voltage wire and cable, patch cords, pull ropes (in unused conduits), panels, outlets, jacks, connections, cable management, labeling, testing and all other material, equipment, and labor required to make the systems fully operational.

1.02 COORDINATION

A. Necessity to coordinate this work with the Owner and the Contracting Agency is emphasized. The Contractor shall be responsible for any omissions, delays and additional cost due to lack of coordination or approval from the same in accordance with the latest Cat 6 proposed standards.

1.03 CODES AND STANDARDS

A. Where a Nationally Recognized Testing Laboratory (NRTL) listing or classification exists for a product and the product is suitable for the purpose specified and indicated, the product shall bear the appropriate marking indicating the listing or classification.

B. Where a UL Standard is in effect, equipment shall:
   1. Meet that Standard.
   2. Bear the UL Label.

1.04 SUBMITTALS

A. The following shall be submitted in accordance with Section 16 0100 and Division 1 in sufficient detail to show full compliance with the specification:
   1. Manufacturer's Catalog Data shall be submitted for the following items. Data shall include a complete list of parts, special tools, and supplies with current unit prices and source of supply.
      a. Copper Cable
      b. Copper Modular Jack
      c. Patch Panels
      d. Information Outlets
      e. J-hooks
      f. Racks
      g. Patch Cords
   2. Shop Drawings
      a. Work shall be laid out in advance. Shop drawings shall be submitted to the Project Manager for approval before work begins.
         1) Shop Drawings shall include:
            (i) Dimensioned layout of major pathways, including j-hooks, sleeves and large conduits (2” and larger.) and location of all fire wall penetrations.
(ii) Plan drawings indicating locations and identification of work area outlets, nodes, telecommunications closets (IDFs), and backbone (riser) cable runs.

(iii) Plan view of telecommunication zones denoting each outlet associated homerun destination.

(iv) Oneline diagram of the telecommunication grounding plan.

(v) Telecommunications Rooms (TRs) and equipment room (ER and/or MDF) termination detail sheets.

(vi) Patch panel schedules for each patch panel denoting room number, outlet ID, and port number.

(vii) Labeling and administration documentation.

(viii) Provide in AutoCad 14 or later electronic format with pen configuration file and hard copy for line weights.

1.05 LABELING SYSTEM

A. Labeling shall conform to ANSI/TIA/EIA-606 standards. In addition, provide the following:

1. Label each outlet with permanent self-adhesive label with minimum 3/16-in. high characters.

2. Use labels on face of data patch panels. Provide facility assignment records in a protective cover at each telecommunications closet location that is specific to the facilities terminated therein.

3. Labels shall be machine-printed. Hand-lettered labels shall not be acceptable.

4. Label outlets with closet number cable is run from (TCx), followed by room number in which outlet is located (xxxx), followed by a single number to indicate particular outlet within room (jx), i.e., T2-B103-J2.

5. Label patch panels with room number in which outlet is located (xxxx), followed by a single number to indicate particular outlet within room (jx), followed by a single number to indicate particular connector in the outlet. i.e., B103-J2.1.

6. Mark up floor plans showing outlet locations, type, and cable marking of cables. Turn these drawings over to the owner two (2) weeks prior to move in to allow the owner’s personnel to connect and test owner-provided equipment in a timely fashion.

1.06 QUALITY ASSURANCE PLAN

A. Contractor shall prepare a quality assurance plan which provides a detailed outline of all testing to be accomplished. Quality assurance plan shall include, as a minimum, a schedule of when tests will be performed relative to installation milestones, specific test procedures that will be used, a list of test equipment that will be used including manufacturer, model number, calibration certification, and range and resolution accuracy. Test plan shall be submitted to the Owner for approval at least 30 days prior to the start of testing.

B. Perform all Work in accordance with all regulatory rules and regulations as well as references in this specification.

C. Perform all Testing in accordance with ANSI/TIA/EIA-568-A and ANSI/TIA/EIA-TSB 67 specifications and submit all printed reports.

1.07 REFERENCE CODES AND STANDARDS
A. Design, manufacture, test, and install telecommunications cabling networks per manufacturer's requirements and in accordance with NFPA-70 (National Electrical Code), state codes, local codes, requirements of authorities having jurisdiction, and particularly the following standards:
   1. ANSI/TIA/EIA-568-B.1,2,3: Commercial Building Telecommunications Cabling Standard.
   4. ANSI/TIA/EIA-607 -- Commercial Building Grounding and Bonding Requirements for Telecommunications.
   5. Install cabling in accordance with the most recent edition of BICSI® publications:

1.08 WORKMANSHIP
A. Components of the system shall be installed in a neat, workmanlike manner. Wiring color codes shall be strictly observed and terminations shall be uniform throughout the system. Identification markings and systems shall be uniform. TIA/EIA 568A wiring codes as shown on the drawings shall standardize all wiring
B. Install materials and equipment in accordance with applicable standards, codes, requirements, and recommendations of national, state, and local authorities having jurisdiction, and National Electrical Code® (NEC) and with manufacturer's printed instructions

1.09 QUALIFICATIONS
A. The telecommunications work specified in this Section is acknowledged to require special skills mastered by education, experience, or both. Bidders for telecommunications work described in this Section shall be specialty telecommunications contractors, who may be a division or subcontract of the Division 16 Subcontractor.
B. Specialty Subcontractors bidding telecommunications work shall have a minimum of three years experience in the construction, testing, and servicing of systems of the type and magnitude specified herein. This Subcontractor shall have completed at least three projects equal or larger in size than this project within the past three years. The Subcontractor shall have direct access to all tools and test equipment required to complete the telecommunications work when the work is bid.

1.10 REGULATORY REQUIREMENTS
A. All Work shall conform to the requirements of NFPA 70.
B. All Work shall conform to the requirements of all Federal, State and Local Electrical and Telecommunications Regulations.

1.11 TERMINOLOGY
A. “TDS” shall refer to the Telecommunication Distribution System cabling and hardware infrastructure internal and external to a building or buildings used to transmit voice and data, etc.
B. "Stations" shall refer to individual telephone or computers, or remote peripherals of those systems (e.g., printers, facsimile machines, modems, etc.)
C. "Outlets" shall refer to the group of receptacles or jacks at the location where the stations connect.
D. "Jacks" or "Ports" shall refer to the individual receptacles where phones, computers, etc. connect.
E. "Station Cables" shall refer to the horizontal cables connecting patch panels or terminal blocks in the Telecommunications Closets to the stations.
F. "Pathways" shall refer to conduits, sleeves, cable trays, distribution rings, etc., which are employed to route backbone and stations cables between equipment rooms, telecommunications closets, stations, outlets, etc.
G. "Terminal Blocks" shall refer to multiple punch down cable terminations.
H. "Patch Panels" shall refer to rack or frame mounted multiple punch down cable terminations with RJ-45 style, 8-position jacks on the face for “plug and play” cross connect capability.
I. "Cable Management" shall refer to rings, troughs, gutters etc., mounted in conjunction with telecommunications distribution equipment and terminal blocks, for the orderly routing of cables, patch cords, etc.
J. “LEC” shall refer to the Local Exchange Carrier providing telephone service to the facility.

1.12 PROTECTION OF OWNER'S FACILITIES
A. Effectively protect the owner's facilities, equipment, and materials from dust, dirt, and damage during construction.
B. Remove protection at completion of the work.

1.13 AS-BUILTS
A. Three (3) sets of as-built drawing shall be delivered to the owner within four (4) weeks of acceptance of project by the owner. A set of as-built drawings shall be provided to the owner electronic media form, utilizing CAD software that is acceptable to the owner. The magnetic media shall be delivered to the owner within four (4) weeks of acceptance of project by owner.

PART 2 PRODUCTS

2.01 GENERAL
A. The Basis of Design for copper cabling, connecting hardware, and related hardware in this section is Ortronics and Berk-Tek to establish the standards for quality and performance. Manufacturers meeting all the system quality, performance and warranty requirements of this specification may also acceptable. It shall be the responsibility of the Contractor to demonstrate that all performance and warranty requirements are met.
   1. Provide color coding of all systems equipment in compliance with the Standards outlined in ANSI/EIA/TIA 606.
   B. Any item of equipment or material not specifically addressed on the drawings or in this document and required to provide a complete installation shall be provided in a level of quality consistent with other specified items.

2.02 TERMINATION BACKBOARDS
A. Material: Fire retardant Plywood
B. Size: As required, 5/8” inch thick minimum, Grade AC or better
C. Finish: Paint to match adjacent walls.

2.03 FREE STANDING TERMINATION RACKS
A. Where specified, provide full height 19 inch wide NEMA standard open rack frame designed with footprint not to exceed 24" width; with 6.5" deep side distribution cable troughs with included releasable Velcro straps for distribution cables; front mounted cable management rings for vertical cable management on face of rack; included top mount cable trough. Securely fasten to floor and ladder rack or ceiling to provide restraint adequate for seismic conditions.

B. Provide an electrically isolated chassis ground bus bar on the lower rear side of each rack as the isolated chassis ground system (CGS) busbar. Bond to the chassis with #6 braided bonding jumper and to closet ground bus with #6 AWG copper.

2.04 CABLE MANAGEMENT:
A. Backboard mounted cable management:
   1. Distribution rings installed in communication rooms shall be “D” ring type.
   2. Distribution rings shall be sized according to the number and size of cables to be supported plus 50% spare capacity.

B. Rack mounted cable management:
   1. Distribution rings shall be sized according the number and size of cables to be supported plus 50 % spare capacity.
   2. Distribution rings installed in communication rooms shall be “D” ring type.

2.05 PATCH CORDS
A. Category 6 patch cable shall be included in the project. The quantity shall be equal to the number of terminated patch panel ports. Half the patch cable shall be 7’ in length the other half shall be 5’ in length. Patch cables shall be delivered to the project manager at completion of project.

2.06 PATCH PANEL
A. Product Description: EIA/TIA 568, Modular jack panels shall be 48 port configurations (unless specifically noted otherwise), quantity as shown on the drawings. Modular jack panel installations shall contain a retaining trough between every panel. Modular Jack Panels shall be wired for T568B configuration
   1. Electrical Specifications:
      a. Category 6 compliant.
      b. UL Listed.

B. Designation labels for each jack shall be provided for front/rear labeling of each patch panel. All cables shall be terminated in numerical sequence and labeled as to outlet number and jacks position (A, B, C, D).

2.07 TELECOMMUNICATION OUTLETS
A. Faceplates
   1. All Faceplates shall be modular in design, with the capacity to hold up to four jacks with labeling positions. White finish, verify with architect.

B. Outlets for Voice and Data:
   1. Communications outlets shall consist of one, 4"x4"x2 1/8 " deep minimum size outlet box with appropriate depth device cover and plates equipped with 8-pin modular (8P8C) jacks. All jack cabling shall be terminated at the respective closet.
2. Unless otherwise noted on the floor plans or within this document, all wall outlets shall be provided with blank module inserts for all unused module locations. Jack module arrangement is shown on the drawings. Provide color-coding at each outlet and patch panels.

C. Category 6 Jacks
   1. Electrical Specifications: Jacks shall meet or exceed performance specifications for the Channel as defined by ANSI/TIA/EIA-568-A-5.
   2. Category 6 jacks shall be manufactured by the same manufacturer as the modular patch panels.
   3. ISO 9001 Certified Manufacturer.
   4. White finish, verify with architect.

D. Wall Outlets shall be a single or double gang faceplate as required.

2.08 UNSHIELDED HORIZONTAL CABLE
   A. Data cables shall be extended between the outlet location and the associated rack and shall consist of 4 pair, 24 gauge, UTP, and shall be terminated on the 8 pin modular jacks provided at each outlet. Cable jacket shall comply with Article 800 of the NEC for use as a plenum cable. The 4 pair UTP cable shall be UL Listed Type CMP (plenum).
   B. All 4 pair Category 6 cables shall conform to the proposed ANSI/TIA/EIA 568-A-5 Commercial Building Telecommunications Cabling Standard, Horizontal Cable Section, and be part of the UL LAN Certification and Follow-up Program.

2.09 COPPER BACKBONE CABLE (VOICE BACKBONE)
   A. Copper Voice Backbone Cable: Plenum rated, Category 3 compliant, copper 24 AWG, multi-pair cable units. Pair count, as indicated on the drawings.

2.10 EXTRA MATERIALS:
   A. Furnish to the Owner the following spares.
      1. Five (5) percent of each type of UTP telecommunications jacks.
      2. Five (5) percent of each type of telecommunications faceplates.
      3. If number icons are utilized provide ten (10) percent of each identification icon for each number designation (1 thru 4) on the faceplate.

PART 3 - EXECUTION

3.02 GENERAL
   A. PRE-INSTALLATION SITE SURVEY
      1. Prior to start of systems installation, meet at the project site with the owner's representative and representatives of trades performing related work to coordinate efforts. Review areas of potential interference and resolve conflicts before proceeding with the work. Facilitation with the General Contractor will be necessary to plan the crucial scheduled completions of the equipment room and telecommunications closets.
   B. Examine areas and conditions under which the system is to be installed. Do not proceed with the work until satisfactory conditions have been achieved.
   C. Provide, connect and test all equipment and materials for the systems herein specified and shown on the drawings. All wiring shall be run in pathway or raceway and shall be neatly tied or
laced in cabinets and terminated on appropriate terminating hardware provided for the purpose. Each cable shall be identified by an approved marking system at each end.

D. Outlet/Jacks shall be identified with machine printed labels. Hand lettered labels shall not be used.

E. Wherever materials, methods or placements of materials and equipment for the communications work is provided by other Subcontractors or the Owner, it shall be the responsibility of this specialty Subcontractor to coordinate that work and assure that it is provided in such a manner as to enhance the final system operation.

F. Test the systems, demonstrate operation to the Contracting Agency and provide training as specified.

G. Work under this section shall be closely coordinated with work under other sections of the project.

H. Tie wraps shall not deform the cable insulation when tightened.

3.03 DELIVERY AND STORAGE

A. Receive, check, unload, handle, store, and adequately protect equipment and materials to be installed as part of the contract. Include delivery, unloading, setting in place, fastening to walls, floors, ceilings, or other structures where required, interconnecting wiring of system components, equipment alignment and adjustment, and other related work whether or not expressly defined herein.

B. The contractor is responsible for safekeeping of all equipment and materials, on the job site. The owner assumes no responsibility for protection of above named property against fire, theft, and environmental conditions.

C. Cables shall be tested immediately upon receipt and received or rejected and returned based upon testing or visual inspection.

D. Report and record all serial numbers received and/or rejected.

E. All inspection and testing shall be performed under the observation of the Contracting Agency at the Contracting Agency's option. Provide three (3) working days advance notice of tests.

3.04 CABLE INSTALLATION

A. Follow cable manufacturer's specification regarding handling methods, retaining/support methods, bending radius and maximum pulling tension limitations.

B. Telecommunication cables shall not be installed in the same raceway as power cables.

3.05 SUPPORT AND ROUTING OF CABLES

A. Station cables and tie cables installed within ceiling spaces shall be routed through these spaces at right angles to electrical power circuits and supported only from the structure. Riser and tie cables shall be extended between TC's utilizing the interfloor conduit sleeves

B. Use of ceiling tiles, grid or hanger wires for support of cables shall be prohibited

C. Install a complete set of supporting rings, hoods and other supporting hardware for this system as part of the contract. All supporting hardware shall be submitted to the engineer for approval prior to installation.

D. Support cable installed above removable ceilings every four- (4) feet with J- hooks or equivalent attached to permanent structures from the outlet stub to the Telecommunication closet. Cable is not to be attached to or lay on other cables, pipes or conduit.
E. Use 3/8 inch threaded rods with c-hangers for supporting raceway
F. Maintain a minimum clearance of:
   1. 5 inches from unshielded power lines or electrical equipment (lights, motors, etc) for circuits of less than 2kVA
   2. 12 inches for 2 - 5 kVA circuits
   3. 24 inches for circuits greater than 5Kva.
   4. 4 feet from transformers and motors over ½ HP.

3.06 HORIZONTAL CABLES
A. Install station cabling to the nearest communications closet, unless otherwise noted
B. Install cables in one continuous piece. Splices will not be allowed
C. Do not exceed 90 meters cable length for any connection
D. Adhere to manufacturer’s published specifications for pulling tension, minimum bend radii, and sidewall pressure when installing cables
E. Where manufacturer does not provide bending radii information, minimum bending radius shall be 10 times cable diameter
F. Installation shall conform to the following basic guidelines:
   G. Use of approved wire, cable, and wiring devices
   H. Neat and uncluttered wire termination
   I. When terminating cable, only remove as much cable jacket as needed to terminate properly to the connecting hardware
   J. Cable pairs shall not be untwisted more the .5 inch at the point of termination
   K. Install 1-foot cable service loop for all horizontal cable at or near the workstation outlet.

3.07 RACEWAY INSTALLATION
A. Provide raceway of required size and type where indicated on job drawings; Provide accessories required for a complete installation
B. Route raceway to avoid interferences, using standard sections and a minimum number of field-cut sections.
C. Route raceway to avoid interference with removal and installation of lighting fixtures and devices of other systems which require servicing or operation
D. Remove any sharp burrs or edges from raceway
E. Completed raceway runs shall have no cracks or openings at coupled sections
F. Strict adherence to the National Electrical Code is required for any raceway penetrations of fire-rated walls or penetrations.
G. Data-Power poles are provided to extend voice, data and electrical capabilities from an overhead modular system to the work area level

3.08 DISTRIBUTION PATHWAYS
A. Layout distribution pathways in accordance with the contract drawings and cable spacing requirements. Set j-hooks so that taps or changes in direction do not exceed 45 degrees.
B. Mount Cat 6 rated J-hooks on 12-inch nominal lengths of metal strut. Mount strut securely to the building structure. Maximum spacing shall be 4 feet on center.

C. Coordinate the layout of pathways with all other trades. Report conflicts to Contracting Agency for resolution by the Contracting Agency.

3.09 INTERCONNECTIONS

A. Interconnections at all terminal hardware shall be provided to form a complete and functioning system.

B. Equipment cables shall be interconnected to horizontal cabling on Termination Modules color-coded Blue.

3.10 DAMAGE AND DEFECTS

A. 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.

3.11 LAYOUT

A. All work shall be laid out in advance. Cables shall be racked and supported in a workmanlike fashion. All work shall be labeled according to ANSI/TIA/EIA 606, and color-coded according to BICSI Standards.

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.

C. Keep up to date "As-built" record drawings at each job site detailing the layout of all data racks and telephone, data and trunk terminal blocks on terminal boards, including a typed listing of cables/rooms served by each terminal block. Refer to Section 16 0100 for other Record Document requirements.

D. Layout Shop Drawings shall be prepared using CAD. Final approved Shop Drawings shall be updated with precise "as-built" conditions and shall be submitted with the Operations and Maintenance Manuals. File format shall be AutoCAD "DWG" or "DXF".

3.12 TERMINATIONS

A. Cables shall be marked with wire markers at both ends, and terminals on terminal blocks shall bear the cable number.

B. Wire twist shall be maintained to within 0.5" of the terminal block fingers.

3.13 GROUNDING

A. Grounding shall conform to ANSI/TIA/EIA 607 - Commercial Building Grounding and Bonding Requirements for Telecommunications, National Electrical Code® and manufacturer's grounding requirements as minimum.

B. Ground equipment racks, housings, messenger cables, and raceways.
C. Connect cabinets, racks, and frames to single-point ground which is connected to building ground system via #2 AWG green insulated copper grounding conductor.

3.14 COMPLETION AND TESTING

A. Telecommunications System test reports shall be submitted to and approved by the Contracting Agency. The test reports shall certify that the Telecommunication system is complete, passes all test criteria, is fully operational, and that all work has been witnessed as specified.

B. After installation and test of each system is complete, each system and the entire system shall be demonstrated and tested for proper operation. The Contractor shall schedule a demonstration with the following representatives present:
   1. Contractor's representative.
   2. Manufacturer's representative for each major communications subsystem.
   3. Contracting Agency's representative.

C. The Contractor shall provide all forms, instrumentation and test equipment, loads, and other consumables required to demonstrate the systems to the Contracting Agency's satisfaction.

D. Final Inspection Test Criteria:
   1. Perform test on every horizontal cable from patch panel to station outlet or other cables installed.
   2. ANSI/TIA/EIA-568-B.1,2,3: Commercial Building Telecommunications Cabling Standard.
   3. Test to be Link Test.
   4. Configure test instrument for TIA 568-A TSB95 Link, NVP and cable criteria to match manufacturer’s data for tested cable.
   5. Provide detailed test results and full spectrum plot data saved in native electronic instrument format to 350 MHZ for future analysis of test results in the O&M Manual.
   6. Test to record all available tests and analyze the following criteria for each cable and pairs:
      a. Cable Identification Number to match plans.
      b. Wiremap.
      c. Length.
      d. Propagation Delay.
      e. Delay Skew.
      f. NEXT.
      g. Return Loss.
      h. Attenuation.
      i. ACR.
      j. ELFEXT.
      k. Power Sum NEXT.
      l. Power Sum ACR.
      m. Power Sum ELFEXT.
      n. Impedance.
7. Propagation Delay and Delay Skew Specification for 100 ohm 4-pair cable.

3.15 OPERATING AND MAINTENANCE MANUALS

A. Prepare manuals describing the servicing and maintenance requirements for the equipment being provided as required in this Section of these specifications.

B. Information contained in the manuals shall consist of catalog data on each item, together with parts lists, wiring diagrams, test reports, description of routine maintenance required, suggested frequency of maintenance and recommended practices, and shall be 8-1/2 inches by 11 inches in size. Catalog pages and data in manuals shall be neat, clean copies. Drawings shall be accordion folded to above size. An index shall be provided which shall list all contents in an orderly manner. Include corrected shop drawings in the maintenance manuals. Each copy of the instruction manual shall be adequately labeled for identification and shall include plastic tabs coordinated with the index.

C. Refer to "Submittals" requirements of this Section for additional O&M requirements.

1. Submit project record drawings in both paper and electronic (electronic format shall be AutoCAD, Ms Word, and Excel) format at conclusion of the project and include:
   a. Cat 6 test results for each cable installed in electronic and hard copy format.
   b. Approved shop drawings,
   c. Plan drawings indicating locations and identification of work area outlets, nodes, telecommunications closets (IDFs), and backbone (riser) cable runs.
   d. Telecommunications closets (TCs) and equipment room (ER and/or MDF) termination detail sheets.
   e. Cross-connect schedules including entrance point, main cross-connects, intermediate cross-connects, and horizontal cross-connects
   f. Labeling and administration documentation
   g. Warranty documents for equipment
   h. Copper certification test result printouts and diskettes

END OF SECTION
SECTION 16 95 00
ELECTRICAL TESTING

PART 1 GENERAL

1.01 SUMMARY
A. Section includes:
   1. Feeder Megohm Testing.
   5. Electrical Service and Separately Derived System Ground Testing.

1.02 REFERENCES
E. ANSI/TIA/EIA – TSB95 Additional Transmission Performance Guidelines for 4-Pair 100 Ohm Category 5 Cabling.
F. ANSI/TIA/EIA-526-14 Method B Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant.

1.03 SUBMITTALS
A. Division 1 - Submittal Procedures: Requirements for submittals and Section 16 0100.
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 16 0100.

1.05 COORDINATION
A. Division 1 - Administrative Requirements: Requirements for coordination.
B. Provide written 72 hours advance notice of all tests to be performed to allow the Project Manager to witness.

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.
   3. Equipment Accuracy:
      a. Accuracy 1% full scale ± 1 digit True RMS.

C. TELECOMMUNICATION UNSHIELDED TWISTED PAIR TEST METER
   1. Product Description: Hand-Held Cat 6 Level III Telecommunication Cable Analyzer to 350 MHZ.
   2. Manufacturer:
      a. HP WireScope Model: 350.
      b. Fluke Model: DSP 4000.
   3. Equipment Accuracy: Per TIA/EIA TSB95.

D. GROUND RESISTANCE CLAMP-ON METER
   1. Product Description: Digital, direct reading clamp-on resistance ground tester.
   2. Manufacturer: AEMC. Model: 3711 or 3731.
   3. Equipment Accuracy:
      a. 1.0 to 50.0 Ohms ± (1.5% + 0.1 Ohm)
      b. 50.0 to 100.0 Ohms ± (2.0% + 0.1 Ohm)
      c. 100 to 200 ± (1.5% + 0.1 Ohm)
      d. 200 to 400 Ohms ± (1.5% + 0.1 Ohm).
      e. 400 to 600 Ohms ± (1.5% + 0.1 Ohm).

E. MULTIMETER
   1. Product Description: Digital True RMS Multimeter.
   2. Equipment Accuracy:
      a. AC Voltage Range: 0.75% ± 3 last single digits at 60 Hz.
      b. AC Current Range: 0.90% ± 3 last single digits at 60 Hz.
      c. DC Voltage Range: 0.25% ± 1 last single digit.
      d. DC Current Range: 0.75% ± 1 last single digit.
      e. Resistance Ranges: 0.50% ± 1 last single digit.
      f. Frequency Range: 0.10% ± 1 last single digit @ 60 Hz.

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 Project Manager. Include information on the 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 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.

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 the Project Manager 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 the Project manager's satisfaction.
G. Perform all testing prior to substantial completion or 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. Test Criteria:
   1. Use Megohm meter to test all feeder cables.
   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.
B. Test Values:
   1. Minimum insulation-resistance value: 50 megohms.
   2. Investigate deviations between adjacent phases.

3.02 RECEPTACLE BRANCH CIRCUIT TEST
A. Test Criteria:
   1. Use Branch Circuit Analyzer to perform the tests.
   2. Test minimum 10% of installed receptacles of which at least one will be on each circuit. Select receptacles to test to be at the end of the string or branch of the circuits. Test each receptacle located adjacent to telecommunication equipment.
   3. Record Line Volts.
      Record Line Voltage Drop % at 15 Amp Load.
   4. Record Resistance of Hot in Ohms.
   5. Record Resistance of Neutral in Ohms.
B. Test Values:
   1. Maximum Resistance of Hot: 0.5 Ohms.
   2. Maximum Resistance of Neutral: 0.5 Ohms.
   3. Maximum Resistance of Ground: 0.5 Ohms.

3.03 RECEPTACLE GROUND FAULT CIRCUIT INTERRUPTER TEST
A. Test Criteria:
   1. Use Branch Circuit Analyzer to perform test of each GFCI protected receptacle.
   2. Record ma of trip.
B. Test Values:
   1. Trip Range: Between 4-6 ma within 6.5 seconds.

3.04 TELECOMMUNICATION UNSHIELDED TWISTED PAIR TEST
A. Refer to 16 7100 for testing requirements.

3.05 ELECTRICAL SERVICE GROUND TESTING

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.

B. Test Values:
   1. Ground resistance: 25 Ohms maximum or provide additional grounding as required by NEC.

END OF SECTION
SECTION 31 1000
CLEARING AND GRUBBING

PART 1  GENERAL

1.01  SECTION INCLUDES
   A. This item consists of furnishing all labor, equipment, supplies, and material in
      performance of all operations required for site clearing, grubbing and clean-up operations.

1.02  REGULATORY REQUIREMENTS
   A. Contractor shall conform to applicable codes and regulations for removal and disposal of
      debris. Burning debris on site is not permitted.
   B. Contractor shall notify all utility companies that have easements through the site and
      obtain their approval to proceed with the work

PART 2  PRODUCTS -- NOT USED

PART 3  EXECUTION

3.01  CLEARING AND GRUBBING
   A. Contractor shall perform all clearing and grubbing operations where designated on the
      Drawings and as specified herein or as directed by the Engineer. Clearing shall consist of
      cutting brush and stumps to within 6 inches of natural ground. Grubbing shall include
      removal and disposal of all stumps, roots, organics, buried logs, brush and other
      objectionable material or debris not otherwise indicated to remain.
   B. Locate, identify and protect utilities from damage during installation of the residential
      wells and septic systems.
   C. All cleared brush, root balls, tree limbs, branches, and vegetation shall be removed from
      the property. Downed trees trunks shall be bucked into 5-6’ sections and neatly stacked
      for the homeowner’s use.
   D. Any request by the owner to leave grubbed vegetation must be in writing

3.02  PROTECTION
   A. Provide protection as necessary to prevent damage to existing improvements and utilities
      indicated to remain.
      1. Protect improvements on adjoining properties and on project site.
      2. Protect trees, flowers, plant growth and features designated to remain. Protect survey
         benchmarks, property corners, survey monuments and existing work from damage
         or displacement.
      3. All property corners, benchmarks or other permanent survey marker disturbed
         during construction shall be removed and recorded. Resurvey and resetting of any
         disturbed property corners, benchmarks or other permanent survey markers shall be
         under the direction of a professional surveyor, licensed by the State of Alaska.
3.03 DISPOSAL OF CLEARED AND GRUBBED MATERIAL

A. If the disposal is located on private land, written permission shall be obtained from the property owner(s) for such disposal sites and the Contractor shall furnish the South Central Foundation with a copy of this permission. The written permission shall specifically provide that the property owner will not hold the South Central Foundation, its employees, agents, or consultants liable for use of or damage to this property.

END OF SECTION
SECTION 31 2000
EARTHWORK

PART 1 GENERAL

1.01 SECTION INCLUDES
A. The Work under this Section consists of performance of all operations pertaining to the placement of classified fill and backfill.

1.02 RELATED SECTIONS
A. Section 01 30 00 - Administrative Requirements
B. Section 31 2316 - Trenching
C. Section 32 9219 - Landscaping & Seeding

1.03 REFERENCES
A. The latest revision of the following standards of the American Society for Testing and Materials (ASTM) and the American Association for State Highway and Transportation Officials AASHTO) are hereby made part of this Specification. The publications may be referred to in the text by basic designation only.
1. AASHTO T-85 Test for Specific Gravity of Soils
2. AASHTO T 180 Standard Method of Test for Moisture–Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
3. ASTM D2216 Test for Water Content of Soils
4. ASTM D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3))
5. ASTM D 2487 Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)
6. ASTM D-4254 Test Methods for Minimum Index Density of Soils and Calculation of Relative Density
7. ASTM D 4253 Test Methods for Minimum Index Density of Soils and calculation of Relative Density

1.04 SUBMITTALS
A. See Specification Section 01 33 00 – Submittal Procedures for requirements for details of the submittal process.

1.05 QUALITY ASSURANCE
A. Existing in place soils meeting the requirements for classified fill may be used for fill and backfill subject to the approval of the Engineer.
B. Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction. The Contractor’s attention is directed to the latest provisions of Subpart P, Section 1926 of the OSHA Safety and Health Standards for Construction.
1.06 PROJECT CONDITIONS

A. Existing Utilities
   1. Field locate all existing utilities as required to prevent damage to existing utilities.
   2. Note existing underground utilities in areas of work, and provide adequate means of protection during earthwork operations.
   3. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, contact the Engineer immediately. Cooperate in keeping respective services and facilities in operation.
   4. Use of Explosives is not permitted.

B. Protection of persons and property:
   1. Barricade open excavations occurring as part of this work and post with warning lights.
   2. Operate warning lights as recommended by authorities having jurisdiction.
   3. Protect bench marks, structures, utilities, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
   4. Protect above and below grade utilities which are to remain.
   5. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation.
   6. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.
   7. No excavations may be exposed at the end of the day.

C. Contaminated Soils
   1. In the event contaminated soils are encountered in the excavation, as evidenced by staining or odor, stop work and notify Engineer immediately.

PART 2 PRODUCTS

2.01 GEOSYNTHETICS

A. Stabilization Geotextile
   1. Stabilization Geotextile, also referred to as Geotextile Fabric, shall be a woven product meeting the requirements for a Class 1 geotextile in AASHTO M 288-00, Table 1, and functional requirements for stabilization geotextile in AASHTO M 288-00, Table 4.
   2. Stabilization Geotextile shall be placed per Section 3.03.
   3. Stabilization Geotextile shall be Propex Geotex 200ST or equal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Identify required lines, levels, contours, and datum locations.
B. Verify that survey benchmark and intended elevations for the work are as indicated on the Drawings.
C. Verify areas to be filled are not compromised with surface or ground water.
3.02 PREPARATION
A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.
B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with classified fill.
C. Compact subgrade by proof rolling with no less than three passes with pneumatic - tired rolling equipment.
D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 STABILIZATION GEOTEXTILE PLACEMENT
A. The Stabilization Geotextile shall be delivered, stored, handled, and installed in accordance with the manufacturer's recommendations, unless otherwise modified by these specifications.
B. The Stabilization Geotextile shall be placed as shown on the plans or as directed. Place the Stabilization Geotextile in continuous longitudinal strips in the direction perpendicular to the face of the slope. Joints parallel to the face of the slope shall not be permitted. Horizontal coverage of less than 100% shall not be allowed unless specifically detailed in the construction drawings. In the case of 100% coverage in plan view adjacent strips need not be overlapped.
C. Adjacent rolls of Stabilization Geotextile shall be overlapped or mechanically connected where exposed in a wrap-around face system, as applicable. Geotextile fabric shall be overlapped by a minimum 3 feet or mechanically connected to adjacent existing geotextile fabric from Phase 1 construction, where applicable. Where such conditions occur, contractor shall expose a minimum 3 feet of existing geotextile fabric and replace gravel and compact per the specifications.
D. Place only that amount of Stabilization Geotextile required for immediately-pending work to prevent undue exposure and/or damage.
E. Stabilization Geotextile shall be placed to lay flat and pulled tight prior to covering with soil fill. After a layer of Stabilization Geotextile has been placed, suitable means, such as pins or small piles of soil, shall be used to hold it in position until the subsequent soil fill can be placed. Under no circumstances shall a track-type vehicle be allowed on the Stabilization Geotextile before at least 8 inches of Classified Fill has been placed. Braking and turning, sufficient to displace the soil fill, shall be avoided.
F. Each layer of Stabilization Geotextile shall be placed as shown in the Plans, unless otherwise directed by the Engineer. Correct orientation of the Stabilization Geotextile shall be verified by the Contractor.

3.04 CLASSIFIED FILL PLACEMENT
A. Fill to contours and elevations indicated using specified materials in unfrozen condition.
B. Employ a placement method that does not disturb or damage other work.
C. Systematically fill to ensure uniform lifts. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
D. Maintain optimum moisture content of fill materials to attain required compaction density.
E. Unless otherwise specified, the soil fill shall be placed in lifts up to 12 inches maximum thickness, loose, where heavy compaction equipment is to be used, and 6 inches maximum thickness, loose, where hand operated equipment is used.
   1. Each lift of soil fill shall be spread in a uniform thickness before compacting.
   2. The soil fill shall be placed, spread, and compacted in such a manner to minimize the development of wrinkles and/or displacement of the Stabilization Geotextile.
   3. The initial lift of soil fill placed on saturated or swampy ground can be up to 24 inches (24") thick, if necessary to support the hauling equipment.

F. The soil fill shall be compacted to at least 95% of the maximum density determined in accordance with ASTM D1557. Route compaction equipment uniformly over the entire surface of each layer of soil fill.

G. All finished slope surface greater than 1.5' shall be track walked. All other finished slope surfaces shall be back-dragged.

### 3.05 SURFACE COURSE PLACEMENT

A. The underlying course shall be checked and accepted by the Engineer before placing and spreading operation are started. Any ruts or soft areas shall be corrected and compacted to the required density before placing aggregate surface course.

B. The aggregate surface course shall be placed to the lines and grades shown on the drawings. The aggregate surface course shall be constructed without segregation of the aggregate. The aggregate surface course shall be placed in lifts (uncompacted) not to exceed 6" and compacted to 95% of maximum dry unit weight, as determined by ASTM D1557. Testing personnel shall be given reasonable time to make field density determinations prior to placement of successive layers of material.

C. The aggregate surface course shall be finished by blading or with automated equipment specifically designed for this purpose. In no case shall thin layers of material be added to the top of surface course to meet grade. If the compacted elevation of the top layer is 0.1 feet or more below grade, it shall be scarified to a depth of at least 3 inches, new material added, and the layer shall be blended and compacted to bring it to grade.

D. After the aggregate surface course has been completely compacted, the surface will be tested by the Engineer for smoothness and accuracy of grade and crown. The finished grade elevation shall not vary more than 0.1 feet from the design elevation. The finished grade surface shall not vary more than 0.05 feet from a 16-foot straightedge when applied to the surface parallel with, and at right angles to, the centerline. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be corrected to within the specified tolerances.

E. Hauling equipment may be routed over completed portions of the aggregate surface course, provided no damage results and provided that such equipment is routed over the full width of the surface course to avoid rutting or uneven compaction. The Engineer will have full and specific authority to stop all hauling over completed or partially completed surface course when, in his/her opinion, such hauling is causing damage. Any damage resulting to the surface course from routing equipment over the surface course shall be repaired by the Contractor at no additional cost to the Owner.

F. Maintenance
1. Following the completion of the aggregate surface course, and until final acceptance of the work, the Contractor shall remove all weak or loose spots, fill and compact the voids, and perform all maintenance work.

2. The aggregate surface course shall be properly drained at all times.

3.06 CLASSIFIED BEDDING PLACEMENT
   A. Place classified bedding per section 3.05, Aggregate Surface Course Placement.

3.07 FIELD QUALITY CONTROL
   A. Notify the Engineer at least 48 hours in advance of trench backfilling operations to allow for inspection.
   B. Particle-Size Analysis
      1. Particle-size analysis of bedding, sand liner, and sewer rock material
      2. At least one (1) particle-size analysis shall be provided for each classified material borrow source.
   C. Compaction
      1. Maximum density shall be determined in accordance with ASTM D1557.

3.08 TOLERANCES
   A. Plus or minus 0.10 feet from required elevations.

END OF SECTION
SECTION 31 2316
TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. The Work under this section includes furnishing all labor, materials, and equipment to perform all operations pertaining to trenching for utilities.

1.02 RELATED SECTIONS
   A. Section 01 33 00 - Submittal Procedures
   B. Section 07 21 13 - Board Insulation
   C. Section 31 11 00 - Clearing and Grubbing
   D. Section 31 2000 - Earthwork
   E. Section 31 2323 - Fill

1.03 REFERENCES
   A. American Association of State Highway and Transportation Officials
   B. ASTM International
      1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN·m/m³)).
      2. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
      3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN·m/m³)).
      4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
      5. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

1.04 DEFINITIONS
   A. Utility: Any buried pipe, duct, conduit or cable.

1.05 SUBMITTALS
   A. Daily field photographs depicting the project practices that meet OSHA trenching practices.

1.06 QUALITY ASSURANCES
   A. Field inspections and other quality assurance requirements shall be the responsibility of the Contractor.
1.07 PROTECTION
   A. Protect equipment and vehicular traffic from trenches and excavations by providing adequate barricades and signage.
   B. Protect excavation side-slopes or adjacent structures by providing adequate back-slopes shoring, bracing, or other methods required to prevent failure of the excavation or existing soils.
   C. Protect above and belowground utilities.
   D. Notify the Engineer, Project Manager, and Contract Officer of unexpected subsurface and discontinue work in affected areas until notification is given to resume work.
   E. Grade top perimeter of the excavation to prevent surface water runoff from entering the excavation.
   F. Provide for dewatering of the trench where ground water is encountered.

1.08 COORDINATION
   A. Verify work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 PRODUCTS
2.01 FILL MATERIALS
   A. Refer to Section 31 0000 Earthwork and Section 31 2323 Fill for requirements.

PART 3 EXECUTION
3.01 LINES AND GRADES
   A. Lay pipes to lines and grades indicated on drawings.
      1. Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.
      2. Use laser-beam instrument with qualified operator to establish lines and grades.

3.02 PREPARATION
   A. Call Alaska Digline (ADI) information service at 1-800-478-3121 not less than 15 working days before performing Work. Given the volatile Alaskan weather, ADI recommends you call not more than 7 working days* prior to excavation. *Remote or un-staffed areas require a minimum of 15 working days’ notice.
      1. Request underground utilities to be located and marked within and surrounding construction areas. Identify all underground utilities. Stake and flag their locations. Maintain the existing utilities that may pass through the work area. The superintendent shall coordinate with the local electrical utility company before excavating near utility poles. Temporary bracing of poles and the relocation of or guy-anchors shall be as directed by the utility company.
   B. Identify required lines, levels, contours, and datum locations.
   C. Protect plant life and other features remaining as portion of final landscaping.
   D. Protect bench marks, existing structures, fences, from excavating equipment and vehicular traffic.
   E. Maintain and protect above and below grade utilities indicated to remain.
F. Establish temporary traffic control when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.03 TRENCHING

A. Excavate subsoil required for the installation of utilities.
   1. Remove lumped subsoil, boulders, and rock larger than 1/6 cubic yard, measured by volume.
   2. Cut trenches sufficiently wide to enable installation and allow inspection. The minimum trench width for pipes with outside diameters (OD) ranging between 3 inches and 16 inches shall be the actual pipe OD plus 12 inches. Remove water or materials that interfere with Work.
   3. Excavate bottom of trenches maximum 2 feet wider than outside diameter of pipe.
   4. Excavate trenches to depth of 6 inches beyond the bottom of pipe. Provide uniform and continuous bearing and support for bedding material and pipe.
   5. Do not interfere with 45 degree bearing splay of foundations.
   6. When Project conditions permit, slope side walls of excavation starting 2 feet above top of pipe. When side walls cannot be sloped, provide sheeting and shoring to protect excavation as specified in this section.
   7. Where an unstable trench bottom exists such as in mucky or sandy soils with poor bearing strength, trench bottom stabilization is required by excavating the trench below the pipe bottom grade, and installing a foundation and bedding to the pipe bottom grade. When required, the minimum foundation thickness is 6-inches. When bedding and foundation are both required, the minimum bedding thickness is 4-inches. Without a foundation, the minimum bedding thickness is 6-inches.
   8. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Fill Type A3 and compact to density equal to or greater than requirements for subsequent backfill material.
  10. Correct areas over excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by the Owner.
  11. Remove excess subsoil not intended for reuse from site.

3.04 SHEETING AND SHORING

A. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.
B. Support trenches more than 5-feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.
C. Design sheeting and shoring to be removed at completion of excavation work.
D. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.
E. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.
3.05 FIELD QUALITY CONTROL
   A. Perform laboratory material tests in accordance with AASHTO T180.

3.06 PROTECTION OF FINISHED WORK
   A. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION
SECTION 31 2323
FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Filling, backfilling, and compacting for building volume below grade.
B. Backfilling and compacting for utilities outside the building to utility main connections.
C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

A. Section 01 5713 - Temporary Erosion and Sedimentation Control
B. Section 31 2316 - Trenching
C. Section 32 9219 - Landscaping and Seeding

1.03 REFERENCE STANDARDS

G. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012, with Editorial Revision (2015).
H. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2017.
J. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2017a.
K. ASTM D4718 - Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles; 2007

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Submit the following data that verify the products fully conform to the specifications and plans before delivery of the product:
1. One sieve analysis (ASTM D422) for each type of fill / surface course product.
2. One modified proctor (ASTM D1557 and ASTM D4718) per material source of Classified Fill.
3. One modified proctor (ASTM D1557 and ASTM D4718) per material source of Aggregate Surface Course.
4. Material data submittals shall not be more than 30 days old.
5. Stabilization Geotextile.

C. Submit a Soil Testing - Quality Control Plan for Owner Approval which provides:
   1. Independent testing agency qualifications for testing required in paragraphs 1.04B.1 through 1.04.B.3.
   2. Methods of placement and soil compaction for each material type and location.

1.05 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Type IV Classified Borrow Fill
   1. Type IV classified fill shall be locally available granular borrow fill material consisting of sand or gravel material with a maximum of 25% passing the #200 sieve.

B. Surface Course Material
   1. Aggregate Surface Course shall be placed on the entire gravel pad. Aggregate Surface Course shall conform with the aggregate quality and gradation E-1 in Section 703 of Alaska DOT&PF Standard Specifications for Highway Construction (2015). Aggregate Surface Course shall be completely unfrozen and drained at the time it is placed and compacted.

<table>
<thead>
<tr>
<th>U.S. Standard Sieve Size</th>
<th>Percent Passing by Dry Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot;</td>
<td>100</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>70-100</td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>50-85</td>
</tr>
<tr>
<td>No. 4</td>
<td>35-65</td>
</tr>
<tr>
<td>No. 8</td>
<td>20-50</td>
</tr>
<tr>
<td>No. 50</td>
<td>15-30</td>
</tr>
<tr>
<td>No. 200</td>
<td>8-15</td>
</tr>
</tbody>
</table>

C. Bedding Material
   1. The adequacy of all pipe bedding and initial backfill material shall be subject to review and approval by the Engineer. Should the native trench materials be found inadequate, the Contractor shall import bedding materials, as detailed below. Where native material is suitable, subject to Engineer’s evaluation and acceptance, the pipe may be bedded directly on native soil.
2. Materials furnished by the Contractor for use as bedding material shall be 2 inch minus, classified fill, free of clay, friable material and debris, graded in accordance with ASTM C-136, within the following limits:

<table>
<thead>
<tr>
<th>U.S. Standard Sieve Size</th>
<th>Percent Passing by Dry Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>2&quot;</td>
<td>100</td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>40-100</td>
</tr>
<tr>
<td>No. 4</td>
<td>20-75</td>
</tr>
<tr>
<td>No. 10</td>
<td>12-60</td>
</tr>
<tr>
<td>No. 40</td>
<td>2-30</td>
</tr>
<tr>
<td>No. 200</td>
<td>0-6</td>
</tr>
</tbody>
</table>

In addition to the bedding limits listed above, the fraction of material passing the No. 200 sieve shall not be greater than 20% of that fraction passing the No. 4 sieve.

D. Filter Sand Liner: The filter sand liner must meet one of the following standards, as established in the State of Alaska, Onsite Wastewater System Installation Manual.

1. Standard 1: In addition to the grading limits listed above, the sand may not have more than 45% (of the total) passing any one sieve retained on the next consecutive sieve of those shown below.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 10</td>
<td>85-100</td>
</tr>
<tr>
<td>No. 20</td>
<td>60-90</td>
</tr>
<tr>
<td>No. 40</td>
<td>25-50</td>
</tr>
<tr>
<td>No. 60</td>
<td>0-15</td>
</tr>
<tr>
<td>No. 200</td>
<td>0-5</td>
</tr>
</tbody>
</table>

2. Standard 2: The coefficient of uniformity (Cu) must be less than 4, the coefficient of curvature (Cc) must be equal to or less than 1, the amount passing the No. 10 sieve must be greater than or equal to 85% of the total. The amount passing the No. 200 sieve must be less than 5% of the total, and the sand may not have more than 45% of the total passing any one sieve and retained on the next consecutive sieve shown in Standard 1 above.

3. Also approved, are products approved by the Municipality of Anchorage, Onsite Water and Wastewater Program – AMC15.65 Wastewater Disposal

a. Quality Sand and Gravel, Wasilla – 3/16” washed filter sand

<table>
<thead>
<tr>
<th>Sieve size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8</td>
<td>100</td>
</tr>
<tr>
<td>#4</td>
<td>95-100</td>
</tr>
<tr>
<td>#100</td>
<td>0-4</td>
</tr>
</tbody>
</table>
b. Anchorage Sand and Gravel, Anchorage - AS&G FAA Airfield Sand – Ted Stevens Airport Product # 132130

<table>
<thead>
<tr>
<th>Sieve size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 8</td>
<td>100</td>
</tr>
<tr>
<td>No. 30</td>
<td>20-50</td>
</tr>
<tr>
<td>No. 80</td>
<td>0-2</td>
</tr>
</tbody>
</table>

E. Sewer Rock: Materials furnished for use as clean course graded sewer rock shall be graded within the limitations of the table below.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 inch</td>
<td>100</td>
</tr>
<tr>
<td>2 inch</td>
<td>0-100</td>
</tr>
<tr>
<td>1 1/2 inch</td>
<td>0-71</td>
</tr>
<tr>
<td>1 inch</td>
<td>0-30</td>
</tr>
<tr>
<td>3/4 inch</td>
<td>0-10</td>
</tr>
<tr>
<td>1/2 inch</td>
<td>0-5</td>
</tr>
<tr>
<td>No. 200</td>
<td>0-1</td>
</tr>
</tbody>
</table>

2.02 GEOSYNTHETICS
A. Stabilization Geotextile
   1. Stabilization Geotextile, also referred to as Geotextile Fabric, shall be a woven product meeting the requirements for a Class 1 geotextile in AASHTO M 288-00, Table 1, and functional requirements for stabilization geotextile in AASHTO M 288-00, Table 4.
   2. Stabilization Geotextile shall be placed per Section 3.03.
   3. Stabilization Geotextile shall be Propex Geotex 200ST or equal.

2.03 SOURCE QUALITY CONTROL
A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of soil material.
B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.
C. If tests indicate materials do not meet specified requirements, change material, retest, and resubmit.
D. Compaction testing shall be provided by the Contractor.

PART 3 EXECUTION
3.01 EXAMINATION
A. Identify required lines, levels, contours, and datum locations.
B. Verify areas to be filled are not compromised with surface or ground water.

3.02 PREPARATION
A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.
B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with classified fill.
C. Compact subgrade by proof rolling with no less than three passes with pneumatic - tired rolling equipment.
D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen fill materials.
B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
C. Place geotextile fabric over Fill prior to placing subsequent fill materials.
D. Place material in continuous layers as follows:
   1. Subsoil and Granular Fill: Maximum 8 inches compacted depth.
E. Employ placement method that does not disturb or damage utilities in trench. Caution shall be exercised when compacting above pipes to ensure that the pipes and coatings are not damaged by compaction and backfilling operations. All pipes or coatings damaged during backfill or compaction operations shall be replaced.
F. Maintain optimum moisture content of fill materials to attain required compaction density.
G. Protect open trench to prevent danger to the public.

3.04 STABILIZATION GEOTEXTILE PLACEMENT

A. The Stabilization Geotextile shall be delivered, stored, handled, and installed in accordance with the manufacturer's recommendations, unless otherwise modified by these specifications.
B. The Stabilization Geotextile shall be placed as shown on the plans or as directed. Place the Stabilization Geotextile in continuous longitudinal strips in the direction perpendicular to the face of the slope. Joints parallel to the face of the slope shall not be permitted. Horizontal coverage of less than 100% shall not be allowed unless specifically detailed in the construction drawings. In the case of 100% coverage in plan view adjacent strips need not be overlapped.
C. Adjacent rolls of Stabilization Geotextile shall be overlapped or mechanically connected where exposed in a wrap-around face system, as applicable. Geotextile fabric shall be overlapped by a minimum 3 feet or mechanically connected to adjacent existing geotextile fabric from Phase 1 construction, where applicable. Where such conditions occur, contractor shall expose a minimum 3 feet of existing geotextile fabric and replace gravel and compact per the specifications.
D. Place only that amount of Stabilization Geotextile required for immediately-pending work to prevent undue exposure and/or damage.
E. Stabilization Geotextile shall be placed to lay flat and pulled tight prior to covering with soil fill. After a layer of Stabilization Geotextile has been placed, suitable means, such as pins or small piles of soil, shall be used to hold it in position until the subsequent soil fill can be placed. Under no circumstances shall a track-type vehicle be allowed on the Stabilization Geotextile before at least 8 inches of Classified Fill has been placed. Braking and turning, sufficient to displace the soil fill, shall be avoided.
F. Each layer of Stabilization Geotextile shall be placed as shown in the Plans, unless otherwise directed by the Engineer. Correct orientation of the Stabilization Geotextile shall be verified by the Contractor.

### 3.05 CLASSIFIED FILL PLACEMENT

A. Fill to contours and elevations indicated using specified materials in unfrozen condition.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to ensure uniform lifts. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Unless otherwise specified, the soil fill shall be placed in lifts up to 8 inches maximum thickness, loose, where heavy compaction equipment is to be used, and 6 inches maximum thickness, loose, where hand operated equipment is used.

1. Each lift of soil fill shall be spread in a uniform thickness before compacting.

2. The soil fill shall be placed, spread, and compacted in such a manner to minimize the development of wrinkles and/or displacement of the Stabilization Geotextile.

3. The initial lift of soil fill placed on saturated or swampy ground can be up to 12 inches (12") thick if necessary to support the hauling equipment.

F. The soil fill shall be compacted to at least 95% of the maximum density determined in accordance with ASTM D1557. Route compaction equipment uniformly over the entire surface of each layer of soil fill.

G. All finished slope surface greater than 2' in height shall be track walked. All other finished slope surfaces shall be back-dragged.

### 3.06 FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Structural Fill:

1. Maximum depth per lift: 6-8 inches, compacted.

2. Compact to minimum 95 percent of maximum dry density.

### 3.07 SURFACE COURSE PLACEMENT

A. The underlying course shall be checked and accepted by the Engineer before placing and spreading operation are started. Any ruts or soft areas shall be corrected and compacted to the required density before placing aggregate surface course.

B. The aggregate surface course shall be placed to the lines and grades shown on the drawings. The aggregate surface course shall be constructed without segregation of the aggregate. The aggregate surface course shall be placed in lifts (uncompacted) not to exceed 6" and compacted to 95% of maximum dry unit weight, as determined by ASTM D1557. Testing personnel shall be given reasonable time to make field density determinations prior to placement of successive layers of material.

C. The aggregate surface course shall be finished by blading or with automated equipment specifically designed for this purpose. In no case shall thin layers of material be added to the top of surface course to meet grade. If the compacted elevation of the top layer is 0.1
feet or more below grade, it shall be scarified to a depth of at least 3 inches, new material added, and the layer shall be blended and compacted to bring it to grade.

D. After the aggregate surface course has been completely compacted, the surface will be tested by the Engineer for smoothness and accuracy of grade and crown. The finished grade elevation shall not vary more than 0.1 feet from the design elevation. The finished grade surface shall not vary more than 0.05 feet from a 16-foot straightedge when applied to the surface parallel with, and at right angles to, the centerline. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be corrected to within the specified tolerances.

E. Hauling equipment may be routed over completed portions of the aggregate surface course, provided no damage results and provided that such equipment is routed over the full width of the surface course to avoid rutting or uneven compaction. The Engineer will have full and specific authority to stop all hauling over completed or partially completed surface course when, in his/her opinion, such hauling is causing damage. Any damage resulting to the surface course from routing equipment over the surface course shall be repaired by the Contractor at no additional cost to the Owner.

F. Maintenance
   1. Following the completion of the aggregate surface course, and until final acceptance of the work, the Contractor shall remove all weak or loose spots, fill and compact the voids, and perform all maintenance work.
   2. The aggregate surface course shall be properly drained at all times.

3.08 CLASSIFIED BEDDING PLACEMENT
   A. Place classified bedding per section 3.05, Aggregate Surface Course Placement.

3.09 TOLERANCES
   A. Top Surface of General Backfilling: Plus or minus 2 inches from required elevations.
   B. Plus or minus 0.10 feet from required elevations.
C. The aggregate surface course shall be finished by blading or with automated equipment specifically designed for this purpose. In no case shall thin layers of material be added to the top of surface course to meet grade. If the compacted elevation of the top layer is 0.1 feet or more below grade, it shall be scarified to a depth of at least 3 inches, new material added, and the layer shall be blended and compacted to bring it to grade.

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   B. Plus or minus 0.10 feet from required elevations.

END OF SECTION
SECTION 32 9219
LANDSCAPING AND SEEDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The Work shall consist of seeding the on-site wastewater system drain fields per 01 5719 Temporary Environmental Controls. The seed shall be furnished by the Contractor and spread in reasonably close conformity with these specifications.

B. All areas that are disturbed by utility or site excavation on adjacent public or private properties shall be seeded. New fill slopes over 3 feet in height, or where required by Engineer, shall be seeded.

1.02 PRODUCTS

A. MATERIALS

1. Contact State of Alaska Department of Natural Resources Revegetation and Erosion Control to determine the appropriate seeding mixture for the site.

2. Fertilizer shall be of standard commercial types supplied separately, or in mixtures, and furnished in moisture-proof containers. Each container shall be marked with the weight and with the manufacturer's guaranteed analysis of the contents showing the percentage for each ingredient contained therein.

3. The proportion of chemical ingredients furnished shall be a mixture such as to provide the total available nitrogen, phosphoric acid, and potassium as specified above. The fertilizer shall contain slow release nitrogen and shall be supplied in the form of inorganic chemicals to the amount of at least 75% of the nitrogen-carrying agents. Tolerances of the chemical ingredients shall be plus or minus 2%. No cyanamide compounds or hydrated lime will be permitted in mixed fertilizers.

PART 2 EXECUTION

2.01 SOILS PREPARATION

A. Before beginning seeding operation, the areas to be seeded shall be cultivated by providing a reasonably firm but friable applied fertilizer seedbed. Cultivation shall be carried to a depth of two inches (2”). On slopes steeper than 3:1, depth of cultivation may be reduced. All cultivated areas shall be raked or cleared of stones two inches in diameter and larger, and all weeds, plant growth, sticks, stumps, and other debris or irregularities which might interfere with the seeding operation, growth of grass, or subsequent maintenance of the grass-covered areas shall be removed.

2.02 SEEDING SEASONS

A. All seeding shall be performed between May 15, and September 1. Seeding at other than the specified dates will only be allowed upon written permission of the Engineer.

2.03 APPLICATION METHODS

A. Apply seeding mixture specified under these specifications. Seed and fertilizer mixtures shall conform to the latest guidelines of the local offices of the Soil Conservation Services or Cooperative Extension Services. Seed, fertilizer, and mulch materials may be placed by the dry method: Mechanical spreaders, seed drills, landscape seeders, cultipacker seeders,
fertilizer spreaders, or broadcast seeders or other approved mechanical spreading equipment may be used. Application methods must not damage the underlying sandbags.

B. Fertilizer shall be spread separately at the specified rates and then incorporated in one operation to a minimum depth of two inches. Seeded areas shall be compacted within twenty-four hours from the time the seeding is completed, weather and soil conditions permitting, by cultipacker, roller or other equipment satisfactory to the Contractor. Compacting equipment shall be operated at right angles to the slope.

C. Compaction shall not be performed when the soil is in such a condition that it will be picked up by the roller.

D. The Contractor shall be responsible for maintenance of seeded areas until project closeout is complete.

E. Final landscaping – All disturbed areas shall be graded, leveled, compacted, and hand or equipment raked. All construction debris, brush, root balls, and limbed tree branches shall be removed from the site. Bucked tree trucks are to be left with homeowner for firewood. Dirt and markings will be cleaned off any observation ports, lids, septic tank access risers, and above grade components. The sites will be grass seeded and fertilizes according to this specification. The finished site should show professionalism, pride in workmanship, attention to detail, and presentation quality.

END OF SECTION
SECTION 33 0533  
HIGH DENSITY POLYETHYLENE (HDPE) PIPE AND FITTINGS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. This section includes high density polyethylene (HDPE) pipe and fittings, installation and products.

1.02 RELATED SECTIONS AND PLANS
A. Section 01 3300 - Submittal Procedures
B. Section 31 2316 - Trenching
C. Section 33 3130 Insulated Polyethylene Gravity Pipe

1.03 REFERENCES
A. Latest version of the American Society for Testing and Materials (ASTM) standards:
   ASTM D-1248 - Polyethylene Extrusion Material – wire and plastic
   ASTM D2122 - Method for Determining Dimensions of Thermoplastic Pipes and Fittings
   ASTM D2657 - Heat Joining Polyolefin Pipe and Fittings
   ASTM D2837 - Obtaining Pressure Design basis for Thermoplastic Pipe Products
   ASTM D3350 - Specification for Polyethylene Plastics Pipe and Fittings materials
   ASTM F714 - Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter
   ASTM F1055 - Electrofusion type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing
C. AWWA C906 - Polyethylene (PE) Pipe and Fittings, 4-inch through 63-inch for water distribution and transmission
D. NSF/ANSI-61 - Drinking Water System Components-Health Effects

1.04 SUBMITTALS
A. Submit product data under provisions of Section 01 33 00 Submittal Procedures.
B. Product technical data including:
   1. Manufacturer's product data for HDPE pipe, fittings, and coupling materials 3). Provide test specification data listing resin type, cell classification, stock density, melt flow, flexural modulus, tensile strength, and coloration.

PART 2 PRODUCTS

2.01 GENERAL
A. Design and proportion all parts to have adequate strength and stiffness and to be adapted for the purposes shown on the Drawings.

2.02 HDPE COMPOUND
A. Polyethylene pipe shall be made from a HDPE material having a minimum material designation code of PE 4710. The material shall meet the requirements of ASTM D3350
and shall have a minimum cell classification of 445574. Polyethylene pipe and fitting material compound shall contain color and ultraviolet (UV) stabilizer meeting or exceeding the requirements of Code C per ASTM D3350. The pipe shall meet the requirements of AWWA C906 and be listed in PPI TR-4. Pipe and fittings for potable water service shall be evaluated, tested and certified for conformance with NSF Standard 61 (NSF 61).

2.03 HDPE PIPES AND FITTINGS
   A. Unless otherwise shown on the Drawings, furnish HDPE pipe and fittings that have a SDR of 11 and conform to ASTM F 714.
   B. Furnish HDPE pipes in standard roll stock lengths to avoid or minimize joints
   C. Furnish HDPE pipes and fittings that are homogeneous throughout and free of visible cracks, holes (other than intentional manufactured perforations), foreign inclusions, or other deleterious effects, and are uniform in color, density, melt index, and other physical properties.
   D. Furnish electrofusion couplings meeting the requirements of ASTM F 1055 and as recommended by the electrofusion coupling manufacturer.

2.04 IDENTIFICATION
   A. Continuously indent print on the HDPE pipe, or space at intervals not exceeding 5 feet the following:
      1. Name and/or trademark of the HDPE pipe manufacturer.
      2. Nominal HDPE pipe size.
      3. Standard dimension ratio (e.g., SDR-11).
      4. The letters PE followed by the polyethylene grade followed by the Hydrostatic Design Stress in 100's of psi (e.g., PE 4710).
      5. Manufacturing Standard Reference (e.g., ASTM F 714)
      6. A production code from which the date and place of manufacture can be determined.

2.05 PIPE BEDDING AND BACKFILL MATERIALS
   A. Furnish pipe bedding/embedment fill materials in accordance with Section 31 0000: Earthwork

PART 3 EXECUTION
3.01 HDPE PIPE JOINING
   A. Perform HDPE pipe joining operations with trained and certified personnel.

3.02 HDPE PIPE, FITTINGS, AND APPURTENANCES
   A. Deliver HDPE pipe, fittings, and appurtenances to the site at least 10 calendar days prior to the planned installation date.
   B. Provide proper handling and storage of the HDPE pipe, fittings, and appurtenances at the site. Protect materials from excessive heat or cold, dirt, moisture, cutting, or other damaging or deleterious conditions. Provide any additional storage procedures required by the Manufacturer.
   C. Exercise care when transporting, handling, and placing HDPE pipe and fittings. Use rope, fabric, or nylon slings and straps when handling HDPE pipe. Do not position slings, straps, at joints or at fittings.
D. The maximum allowable depth of cuts, gouges or scratches on the exterior surface of HDPE pipe, fittings, or appurtenances is ten (10) percent (%) of the wall thickness. The interior of the pipe and fittings shall be free of cuts, gouges and scratches. Replace any HDPE pipe and fittings that become gouged, twisted, or crimped. Remove from the work area damaged pipes and fittings.

E. Whenever pipe laying is not actively in progress, close the open ends of all installed pipes using watertight plugs.

F. Perform trenching and backfilling of all installed pipe, fittings, and appurtenances in accordance with Section 31 0000 Earthwork.

G. Perform testing of all installed pipe, fittings, and appurtenances in accordance with this section.

3.03 HDPE PIPE AND FITTINGS INSTALLATION

A. Carefully examine HDPE pipe and fittings for cracks, damage or defects before installation. Do not use cracked, damaged, or defective material.

B. Inspect the interior of all pipe and fittings and remove any foreign material from the pipe interior before the pipe is moved into final position.

C. Perform field-cutting of pipes, where required, with a machine specifically designed for cutting pipe. Make cuts carefully without damage to pipe, so as to leave a smooth end at right angles to the axis of pipe. Taper cut ends and smooth sharp edges. Flame cutting is not allowed.

D. Install HDPE pipe and fittings in accordance with the Manufacturer's recommendations and the requirements of this Section.

E. Install pipe and fittings to the lines and grades shown on the Drawings.

F. Place and compact pipe bedding/embedment fill and trench backfill material as shown on the Drawings and in accordance with Section 31 0000 Earthwork.

G. Provide all necessary adapters and/or fittings required when connecting different types and sizes of pipe or when connecting pipe made by different manufacturers.

3.04 HDPE PIPE, FITTINGS, AND APPURTENANCES CONNECTIONS

A. Weather Conditions for Joining:
   1. Do not join HDPE pipes and fittings at ambient temperatures below 40F or above 104F, unless authorized in writing by the Project Officer. For cold (<40F) or hot (>104F) weather joining, use the additional procedures authorized in writing by the Project Officer.
   2. Measure ambient temperatures at the fusion machine.
   3. Do not join HDPE pipe and fittings during any precipitation, in the presence of heavy fog or dew, or in areas of ponded water.
   4. Prior to joining, clean the joint area to be free of moisture, dust, dirt, debris of any kind, and foreign material.
   5. Joining equipment shall be approved for the applicable field joining processes. Fusion-welding apparatus shall be an automated device equipped with gauges giving the applicable temperatures and pressures.
6. Join HDPE pipe with electrofusion adapters. Fabricate joints in compliance with ASTM D 2657, the manufacturer’s recommendations, and the requirements of this section.

7. Install flanged connections of HDPE pipe and fittings as shown on the Drawings.

8. Use Type 316 stainless steel or polypropylene encapsulated ductile iron back-up rings. Outside diameter and drillings shall comply with American National Standards Institute (ANSI) B16.1.

9. Use Type 316 stainless steel flange bolts, nuts and washers that meet the requirements of ANSI B16.1. Lubricate bolt threads prior to attaching nuts. Tighten bolts to a torque of 100 ±5 foot-pounds.

10. Bolt HDPE flange adapter and lap joint flanges at the ambient temperature of the surrounding soil to prevent relaxation of the flange bolts and loosening of the joint due to thermal contraction of the polyethylene. Draw bolts up evenly and in line. Retighten bolts 1 and 4 hours after initial tightening.

3.05 FIELD INSPECTION

A. HDPE Pipe Inspection
   1. Inspect fusion joints for evidence of excess or insufficient bead size, contamination, offset, or any other evidence of inadequate joining. The surface of the HDPE pipe shall be clean at the time of inspection. Wipe or wash the HDPE pipe surface if surface contamination inhibits inspection.
   2. Repair any pipe sections where greater than 4 percent pipe diameter deflection from vertical is observed.

B. Defects and Repairs:
   1. Repair Procedures:
   2. Repair any portion of the HDPE pipe exhibiting a flaw, or poor quality joint by removing bad joint or pipe section and replacing with a new pipe section.
   3. When making repairs, satisfy the following:
      a. Clean and dry all pipe surfaces immediately prior to repair
      b. Only use approved fusion equipment or electrofusion fitting.

C. Repair Verification:
   1. Inspect each repair using the methods described in this Section. Repair areas that fail the inspection.

D. Hydrostatic Pressure Test
   1. Hydrostatic pressure testing for HDPE piping shall be in accordance with ASTM F2164 for HDPE Pressure Pipe.
   2. The ANTHC shall be notified prior to the performance of the pressure test.
   3. All air shall be expelled from the pipe prior to beginning the test.

3.06 TOLERANCES

A. Install all HDPE pipes to within ±0.1 feet of bottom of pipe elevations as indicated on the Construction Drawings.

END OF SECTION
SECTION 33 3130
INSULATED POLYETHYLENE GRAVITY PIPE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Section includes supply of insulated pipe and fittings with heat trace channels for use in gravity sewer or carrier pipe utility service applications. The minimum service temperature range of all individual components and final products shall be -60 to 100°F unless otherwise specified. The pipe and fittings shall consist of an HDPE SDR 17 core pipe insulated with polyurethane insulation and protected with an outer aluminum jacket.

1.02 RELATED SECTIONS

A. Section 01 3300 Submittal Procedures

1.03 DEFINITIONS

AWWA: American Water Works Association

Drawings: Those documents that comprise the construction contract, the Contracting Officer - insulated pipe manufacturer agreement, conditions of the contract (general, supplementary, and other conditions), plans and/or drawings, specifications, all addenda, modifications, and changes thereto, together with any other items stipulated as being specifically included.

Core Pipe: Inner pipe for transmitting product.

Pipe Jacket: Outer pipe that protects insulation.

Heat Trace Channel: Conduit(s) placed adjacent to the core pipe for heat addition.

HDPE: High Density Polyethylene

IPS: Iron Pipe Size

NPS: Nominal Pipe Size

NSF: National Sanitation Foundation

PE: Polyethylene

PPI: Plastic Pipe Institute

PSI: Pounds per square inch

SDR: Standard Dimension Ratio

1.04 SUBMITTALS

A. Required submittals described in this specification include:

1. Manufacturer's shop drawings for each size of composite pipe and each size/style of fitting indicating compliance with this Section. Shop drawings shall include the following minimum information:

   a. Overall length of arctic pipe in feet and inches measured from end to end along the longitudinal axis.

   b. Overall fitting dimensions in feet and inches measured from carrier pipe centerline. Fittings require a minimum of two linear measurements and one angular measurement.
c. Composite pipe cross section with dimensions showing locations relative to the centroid of the composite pipe for the core pipe, heat trace channel, and metal outer jacket.

d. HDPE carrier pipe nominal size, SDR, and resin type.

e. HDPE electric heat trace channel pipe nominal size, SDR, and resin type.

f. Metal outer jacket alloy material, thickness, corrugation spacing, and corrugation depth.

g. HDPE core pipe stub-out length past end of insulation and jacket.

h. HDPE heat trace channel stub-out length past end of insulation and jacket.

i. Dry film thickness of the coating to be applied to the insulation faces.

2. Manufacturer's literature for

a. HDPE core pipe, electric heat trace channel.

b. Aluminum outer jacket materials and method of fabrication.

c. Urethane insulation – product data must clearly show the proposed insulation meets the requirements of this Section.

d. Embedded fittings.

e. Insulation sealants.

3. Test Reports: Provide the following test reports at the frequencies required in the Delivery Order. Third party reports are required for Destructive Test samples:


b. K Factor.

c. Minimum Compressive Strength.

d. Insulation adhesion bond.

e. Fusion logs for all fitting fusion joints

   1) Fusion machine model

   2) Pressure

   3) Temperature

   4) Duration (hold time and cool-down time)

   5) Project location/station number

   6) Date

   7) Time

   8) Staff conducting the work

1.05 REFERENCES

A. Referenced Standards: To the extent referenced in this specification section, the standards and documents listed below are included, and made a part of this Section. In the event of a conflict, the requirements of this Section prevail. Unless otherwise specified, references to documents shall mean the latest published edition of the referenced document in effect at the bid date of the project.
1. **American Water Works Association (AWWA):**
   - AWWA C901 - Polyethylene Pressure Pipe and Tubing, 1/2-inch through 3-inch for Water Service.
   - AWWA C906 - Polyethylene Pressure Pipe and Fittings, 4-inch through 63-inch for Water Distribution and Transmission.

2. **ASTM International (ASTM):**
   - D1599 – Standard Test Method for Resistance to Short Term Hydraulic Pressure of Plastic Pipe, Tubing and Fittings
   - D1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics
   - D2657 - Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings
   - F477 – Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
   - F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (SDR- PR) Based on Outside Diameter.
   - F1417 - Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low Pressure Air

3. **ANSI/National Sanitation Foundation (NSF)**
   - NSF Standard 61 - Testing and certification for drinking water system components.

4. **Plastic Pipe Institute (PPI)**
   - PPI Handbook of Polyethylene Pipe.
   - PPI TR-3 - Policies and Procedures for Developing Hydrostatic Design Basis (HDB), Hydrostatic Design Stresses (HDS), Pressure Design Basis (PDB), Strength Design Basis (SDB), Minimum Required Strength (MRS) Ratings, and Categorized Required Strength (CRS) for Thermoplastic Piping Materials or Pipe
   - PPI TR-4 - HDB/HDS/SDB/PDB/MRS Listed Materials.
PPI TR-33 - Generic Butt Fusion Joining Procedure for Field Joining Polyethylene Pipe.

1.06 QUALIFICATIONS AND QUALITY ASSURANCE

A. Insulated Pipe and Fitting Manufacturer:

1. Company specializing in manufacturing products specified in this section shall have a minimum ten years of experience fabricating comparable insulated pipe and fittings.

2. HDPE fusion procedures and qualifications: Insulated Pipe Manufacturer's weld procedures shall be provided for review; and shall be in strict accordance with pipe manufacturer's requirements for butt fusion welding of HDPE pipe. The individual who performs the butt-fusion shall have written certification from an HDPE pipe manufacturer stating he/she has successfully completed an 8-hour (minimum) certification class on butt-fusion techniques and procedures. In addition, this individual shall have fused a combined total of more than 5,000 feet of HDPE piping in diameters 4-inches and larger.

B. HDPE Pipe Manufacturer:

1. The HDPE manufacturer shall have an established quality control program responsible for inspecting incoming and out-going materials. Incoming polyethylene materials shall be inspected for density, melt flow rate, and contamination. The Manufacturer shall certify the cell classification properties of incoming material and certify the inspection and testing of materials. Incoming materials shall be approved by Quality Control before processing into finished goods.

2. Manufacturer shall be ISO 9001 certified.

3. PE materials: All incoming lots of PE materials shall be sampled and tested for melt-flow index and density by the pipe manufacturer.

4. Manufacturer shall demonstrate their manufacturing facility is third party certified in accordance with NSF Standard 61.

1.07 DELIVERY, STORAGE, AND HANDLING

A. The core pipe spigot ends of all pipe and fittings shall be capped with PE pipe caps (Caplugs, or approved equal) and the plugs taped to the pipe with black electrical tape (such as 3M #33+) or other approved tape after final inspection and prior to shipment. Duct tape shall not be used to secure the PE pipe caps to the pipe spigot ends.

B. Insulated pipe shall be packed in bundles with a maximum gross weight of 4,000 pounds per bundle unless otherwise specified by the Owner. The end geometry of each bundle shall be rectangular. Each layer of pipe within the bundle including the bottom layer shall rest upon a minimum of 3 each 4-inch x 4-inch cross cleats banded to that individual layer using 1-1/4-inch steel strapping. All cleats shall feature a 45-degree stop block at least nominal 4-inches high by 4-inches long fastened securely to both ends of the cleats to prevent the pipe from rolling off the cleat when the banding is cut. The outer cross cleats shall be installed between 1 to 2-feet from the insulation face of the pipe ends with the middle cleat centered on the bundle. In addition, 1-1/4-inch steel straps shall securely fasten all the layers together to form a complete bundle. Bundles 5 pipes wide by 5 pipes high are recommended.
C. All fittings and couplings shall be packaged in crates sheathed with minimum 1/2-inch sheathing not to exceed 4 ft x 4 ft x 8 ft. Minimum nominal 2-inch x 3-inch framing members shall be installed in all corners of the crate and fastened securely to the sheathing. On crates longer than 6-feet, framing members shall be installed along the shorter centerline of all 4 long panels. The framing members shall be securely fastened to each other and to the sheathing. For crates 4-feet long or less, 2 each 4-inch x 4-inch cleats shall be installed on the bottom edges of the crate to provide for forklift handling. For crates longer than 4-feet, 3 cleats shall be installed, with the middle cleat centered on the crate. These cleats shall be fastened through the bottom sheathing and also banded to the crate with 1-1/4-inch wide steel bands that wrap around the entire crate. The crates shall be designed to stack 3 crates high, provide protection of the contents during rough ocean shipment, air freight transport, and on-site handling without damage.

PART 2 PRODUCTS

2.01 MATERIALS

A. All pipe, fittings, valves and appurtenances in contact with potable water shall be lead-free and certified for use in potable water systems per the current version of ANSI/NSF Standard 61.

B. The minimum service temperature range of all individual components and final manufactured products shall be -60 to 100°F unless otherwise specified. The pipe and fittings shall consist of an HDPE SDR 17 core pipe insulated with polyurethane insulation and protected with an outer aluminum jacket.

2.02 CORE PIPE

A. Core HDPE pipe shall be made from material having a minimum material designation code of PE4710. The material shall meet the requirements of ASTM D3350 and shall have a minimum cell classification of 445574. Polyethylene pipe and fitting material compound shall contain color and ultraviolet (UV) stabilizer meeting or exceeding the requirements of Code C per ASTM D3350. All PE4710 pipe shall be manufactured from a bimodal resin. The pipe shall meet the requirements of AWWA C901 and C906 and be listed in PPI TR-4. Core HDPE pipe shall be marked in accordance with the standards to which it is manufactured.

B. Unless otherwise noted herein or on the drawings, all fittings shall be constructed utilizing core pipe of the same manufacturer, material, resin, and dimensions as that used for the core pipe of the straight lengths.

C. All core HDPE pipe and fittings shall conform to standard iron pipe size outside dimensions (IPS), have a wall thickness meeting SDR 17, and have a minimum pressure rating of 125 psi per AWWA C901 at 80 °F.

D. All HDPE pipe shall be from straight sticks of pipe. Under no circumstances shall any coiled HDPE pipe be used to manufacture products furnished under this specification. All core pipe shall be black and stamped with the appropriate SDR and ASTM designations.

E. All core HDPE pipe and fittings shall be homogeneous throughout, free of visible cracks, holes, foreign inclusions, blisters, dents, or other injurious defects, and shall be made of materials having the same chemical and physical characteristics. All HDPE pipe ends shall be free from chips, gouges, and other damage.

F. All core HDPE fittings shall be manufactured to be as strong as or stronger than the pipe the fittings will be joined to, and shall maintain identical IPS outside-dimension on
stub-outs, and shall conform to the minimum pressure rating listed in Section 2.2. Tees may be fabricated using branch saddle sidewall fusion or molded fittings. All wyes shall be constructed using a prefabricated reinforced fitting constructed with thickened sidewalls and an inside diameter that matches SDR 17 pipe.

G. All core sewer elbows shall be fabricated using sweep bends. Sweep bends shall be seamless, manufactured in one continuous piece of SDR 17 HDPE pipe, with an angular tolerance of + 2 degrees without reversion and shall have a bend radius as specified on the drawings with a tolerance of + 1.0 inch. The elbows shall not be mitered and fused. All elbows must maintain normal outside diameters along their entire length within tolerance as per ASTM-F714 and be suitable for butt-welding or electrofusion. The outside surface of the elbows shall exhibit all the specified characteristics of the straight pipe and shall not have any blisters or other surface defects from the manufacturing process.

H. The manufacturer of fabricated fittings supplied under this specification shall establish and qualify heat fusion procedures conforming to PPI TR-33 and ASTM D2657 and all fusion must be performed by a qualified operator factory-certified in the use of the specific equipment employed to construct the fittings.

I. Bell ends of all core pipe and fittings shall be fabricated with identical PVC push-on type sewer couplings. All PVC sewer couplings shall be manufactured in one piece of injection molded PVC compound meeting ASTM D1784. Couplings shall be Class 200 and conform to requirements of DR 21. Fittings shall be designed to withstand a minimum of 630 psi quick burst pressure at 73°F, tested in accordance with ASTM D1599. Bells shall be gasketed joints conforming to ASTM D3139 with gaskets conforming to ASTM F477.

J. All gaskets on push-on couplings shall be elastomeric, non-circular in cross-section, tapered on the inlet edge to prevent rollout when the pipe is coupled, and not less than 1/4-inch square in the cross-sectional area. The groove in which the gasket is retained shall have sides that are perpendicular to the centerline of the pipe.

K. The spigot end of the core pipe shall be smoothly beveled to a 15-degree angle as shown in the drawings. The bevel shall reduce the wall thickness at the end of the pipe by 50 percent. The bell and spigot ends shall be free from chips, gouges, and other damage. The bell couplings shall not be ground, chipped, gouged, or damaged in any manner.

L. The manufacturer of fabricated fittings supplied under this specification shall establish and qualify heat fusion procedures conforming to PPI TR-33 and ASTM D2657 and all fusion must be performed by a qualified operator factory-certified in the use of the specific equipment employed to construct the fittings.

M. Acceptable Manufacturers: Subject to compliance with requirements of this Section and Contract Documents acceptable manufacturers include the following:

1. Dura-Line.
2. JM Eagle.
3. ISCO Industries.
4. Performance Pipe.
5. Industrial Pipe Fittings (IPF-Plasson).
6. Or approved equal.
2.03 INSULATION

A. Insulation between core pipe and outer jacket of all pipe and fittings shall be low-density rigid closed-cell urethane insulation with the specified thickness shown on the drawings. It shall be applied and cured in strict accordance with the manufacturer's recommendations and good commercial practices such that the resulting insulation completely fills the annular space between core pipe and outer jacket and is free of defects affecting its intended purpose.

B. Urethane insulation shall exhibit the following properties and characteristics specified by the referenced ASTM tests below.

- ASTM C518 Maximum K-factor, as produced: 0.155 btu-in/hr-ft²-°F or C177
- ASTM C518 Maximum K-factor, aged 7 days: 0.170 btu-in/hr-ft²-°F or C177
- ASTM D1622 Density: >2.0 lbs/ft³
- ASTM D1621 Minimum Compressive Strength: 35 psi
- ASTM D2842 Maximum Water Absorption: 0.05% PSF by volume
- ASTM D2126 Dimensional Stability: 1% at -40°F, (Maximum Linear Change) 3% at +100°F

C. Exposed urethane insulation faces at pipe and fitting ends shall be coated to protect against physical abuse, UV exposure during shipping and storage, and against water intrusion in service.

1. The coating shall be suitable for direct application over urethane insulation with no deleterious effects to the insulation or coating.
2. The coating shall be formulated for long-term service and retained flexibility over extended periods of exposure to sunlight, harsh weather, and saltwater spray.
3. The strength of the adhesive bond of the coating to the insulation shall be greater than the tensile strength of the coating. In the event the coating is nicked or an edge is rolled up in handling, the coating that has been dislodged shall tear free from the coating still adhering to the insulation rather than pull the balance of the coating off as a sheet.
4. The coating shall be applied and cured in strict accordance with the manufacturer's recommendations and good commercial practice such that the finished product is free of defects affecting its intended purpose.
5. The coating material shall exhibit the following properties and characteristics:
   - ASTM E398 or E96 Maximum Water Vapor Permeance: 1.0 perm
   - Dry Film Thickness Range: 50 to 75 mils

D. Acceptable Manufacturers: Subject to compliance with requirements of this Section and Contract Documents acceptable manufacturers/products include the following:

1. BASF Corporation, Elastopor R7318-17.
3. Or approved equal.
2.04 METAL OUTER JACKET

A. Metal outer jackets for pipe and fittings shall be spiral-wound, aluminum pipe or 2-2/3-inch x 1/2-inch corrugated aluminum pipe. The metal outer jacket shall be spiral-wound aluminum (0.063 inch thick) corrugated aluminum as required by the delivery order. Aluminum alloy material shall be 5052-H32 marine grade. All seams for spiral-wound pipe shall be 4-ply lock seam, continuous, tightly locked and folded, have a width greater than 3/8 of an inch, and be internal. The outer jacket of all pipe and fittings shall be air and watertight under a five-foot head of water and the outside of the jacket shall present a relatively smooth, flat overall appearance.

B. The outer jacket corrugations for spiral-wound pipe shall be between 3/16-inch and 3/8-inch deep as measured from the flat area between corrugations to the bottom of the corrugation. The corrugations shall be internal and the measurement shall be from the outside of the jacket. Corrugations shall be spaced no more than 2-2/3 inches apart and formed diagonally around the pipe, resulting in not less than 2 nor more than 10 complete corrugations crossing the pipe's circumference at a given cross-section.

C. All joints in the corrugated-aluminum outer jacket that is fabricated around fittings shall be welded with a continuous bead, resulting in a finished jacket that is watertight. The same corrugated-aluminum jacket used for the straight sections of pipe shall be used to fabricate the jackets for the fittings.

D. All surfaces of the outer jacket, including end-cuts and welds, shall be finished such that no jagged edges exist that could cause personal injury.

E. The interior of the jacket shall be free of oils, grease, or other residue that could interfere with the adhesion of insulation to the outer jacket.

F. Acceptable Manufacturers: Subject to compliance with requirements of this Section and Contract Documents acceptable manufacturers include the following:
   1. Spiraltec Inc.;
   2. Contech Engineered Solutions;
   3. Or approved equal.

2.05 ELECTRIC HEAT TRACE CHANNEL

A. Electric heat trace channels shall be fully enclosed, in direct contact with the core pipe for its entire length, and there shall be no intrusion of insulation between the outside edge of the heat trace channel and the core pipe unless otherwise specified.

B. Electric heat trace channels for all straight lengths of pipe shall be 1-1/2 inch HDPE, PE4710, SDR11 pipe. The heat trace channel shall extend 12 inches past the insulation face of each end of the pipe or fitting, with ends cleanly cut, square, smooth, and free from burrs or other protrusions that could interfere with installing the electric heat trace in the field.

C. Electric heat trace channels installed along angular bends of fittings shall be constructed with 1-1/2 inch HDPE, PE4710, SDR11 pipe. The heat trace channel shall have a smooth interior surface that maintains its internal diameter in tight radius bends. The heat trace channel shall extend 12 inches past the insulation face of each end of the pipe or fitting, with ends cleanly cut, square, smooth, and free from burrs or other protrusions that could interfere with installing the electric heat trace in the field.
D. Electric heat trace channels shall be taped to the core pipe with aluminum tape. The channels shall be taped to the core pipe continuously throughout the insulated portion of the pipe. The tape shall make contact with at least one inch of the core pipe on either side of the electric heat trace channel. Tape shall be 3M #3311 aluminum foil tape or approved equal.

E. Acceptable Manufacturers: Subject to compliance with requirements of this Section and Contract Documents acceptable manufacturers include the following:
   1. Dura-Line.
   2. JM Eagle.
   3. ISCO Industries.
   4. Performance Pipe.
   5. Industrial Pipe Fittings (IPF-Plasson).
   6. Or approved equal.

PART 3 EXECUTION

3.01 MANUFACTURING AND DIMENSIONAL TOLERANCES

A. Allowable offset of the outer jacket centerline and core pipe shall be not more than 1/4-inch at the pipe ends. Elsewhere along pipe lengths the centerline offset shall not be greater than 3/8-inch. Allowable offset of the electric heat trace channel and core pipe shall be not more than 3/8-inches. Deviations greater than these tolerances will result in the pipe being rejected and payment withheld.

B. The minimum temperature of all components used to manufacture pipe and fittings shall be 50 °F at the start of fabrication. The fabricated pipe shall be placed in a facility maintained at a temperature of 50 °F or greater for a minimum of 12 hours after fabrication.

C. All elbows shall have a radius as specified in the drawings with a tolerance of + 2 degrees.

D. All branches of fabricated fittings must lie in a single plane with a maximum deviation of + 2 degrees.

E. The spigot end of the core pipe shall extend beyond the face the insulation a distance of 1-3/4-inches plus the insertion depth of the push-on coupling + 1/4-inch. The insertion depth shall be defined as the distance between the outside edge of the coupling and the coupling center stop.

F. The outer jacket shall be cut in one pass perpendicular to the length of the jacket + 1 degree. The coupling on bell ends shall be perpendicular to the length of the jacket + 1 degree and flush with the jacket end with a tolerance of -1/8-inch. No part of the coupling shall protrude beyond the end of the jacket as determined by placing a straight-edge across the jacket at any two points. The bell end of the coupling shall be flush with the insulation and outer jacket. Before coating, the plane of the exposed insulation face at bell and spigot ends shall be perpendicular to the centerline axis of the outer jacket + 1/8-inch. The insulation profile of the coated ends shall not exceed a relief deviance of + 1/4-inch across the face.

G. The specified maximum K-factor has a tolerance of +/-0.0049 btu-in/hr-ft² -°F.
3.02 LABELING
   A. The manufacturer’s name and production date (day/month/year) shall be embossed on
      the outer jacket of each pipe and fitting.

3.03 FABRICATED FITTINGS
   A. All fusion joints used in fabricated fittings shall be documented by a computer that records
      pressure and temperature applied at each fused joint. Computer printouts and electronic
      data for each fitting shall be made available to the owner upon request. The contractor
      shall ensure that each joint is fused at the temperature and pressure recommended by
      the pipe manufacturer in order to achieve the maximum pressure rating for that joint.
   B. All fittings for each project shall be labeled with a unique identifier that corresponds with
      the fusion computer printouts for each fitting.
   C. All fabricated fittings shall have all inside fusion beads removed in such a manner as to
      result in a continuously smooth flow path inside the pipe per the requirements of the
      International Plumbing Code Section 704.2 and 706.2, and the Alaska Department of
      Environmental Conservation 18 AAC 72.040(b)(4)(C).

3.04 INSULATING
   A. All Federal and State regulations applicable to the type of insulation and its use shall be
      strictly adhered to.
   B. Fittings may be manufactured using one insulation injection for each open end of the
      fitting. In no case shall the jacket be drilled to perform, monitor, or inspect the injection.
   C. The maximum allowable void size is 0.05 in-cubed (3/8-inch cube is 0.05 in-cubed)
   D. Insulation and chemicals shall be prevented from coming in contact with the end or inside
      of the exposed core pipe.
   E. The electric heat trace channel shall be secured to the outside of the core pipe, parallel to
      the pipe axis, prior to insulating. The pipe channel shall extend 12-inches past the
      insulation face on either end of the pipe or fitting, be free of insulation residue and foreign
      substances, and open to the minimum cross section specified throughout.

3.05 CORE PIPE/INSULATION BOND
   A. The core pipe shall be prepared as necessary to achieve a minimum shear bond strength
      to the insulation of 15 psi, or in such a manner as to produce insulation-to- insulation
      separation when a sample is tested in shear.
   B. The core pipe surface preparation will be performed in a manner that does not leave
      foreign material imbedded in the pipe. Gouges or scratches in the pipe surface that
      exceed the tolerance specified by the pipe manufacturer for the pipe pressure rating shall
      be cause for rejection.

3.06 PRODUCTION TESTING AND INSPECTION
   A. Only finished pipe lengths and fittings that meet the requirements of these specifications
      and drawings shall be used for destructive testing. Should any product fail to meet the
      visual quality control specifications listed below, that product shall be either re-built to
      meet the specifications or rejected. Only those products that meet all visual quality
      control specifications shall be considered final products suitable for receipt by the Owner
      or for laboratory or other destructive testing.
B. Each embedded core pipe fusion joint shall be pressure tested to 125 psi in accordance with the following standard:

ASTM F1417 – Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low Pressure Air

C. The urethane insulation will be tested for compliance with the maximum aged value as outlined in Section 2.3B of this document. Samples will be selected at random and taken approximately 12-inches from the end of the pipe or fitting insulation face and sent to a local laboratory for immediate testing.

D. Visual Quality Control

1. Fusion Joints: All fusion joints on elbow and fitting extensions shall be examined before the core pipe assembly is installed into the outer jacket. Elbow and fitting extension fusion joints shall meet all the requirements of the pipe manufacturer and the following minimum requirements:
   a. On both sides, the double bead shall be rolled over to the surface and be uniformly rounded and consistent in size throughout the entire circumference of the joint.
   b. The gap between the two beads must not be below the fusion surface throughout the entire circumference of the joint.
   c. The displacement (perpendicular to the pipe centerline) between the fused ends must not exceed 10% of the pipe minimum wall thickness.
   d. The width of the combined two beads for SDR 17 pipe shall be as follows:

<table>
<thead>
<tr>
<th>Pipe Dia</th>
<th>Minimum Bead Width</th>
<th>Maximum Bead Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot; pipe</td>
<td>3/16-inch to 3/8-inch</td>
<td></td>
</tr>
<tr>
<td>6&quot; pipe</td>
<td>1/4-inch to 1/2-inch</td>
<td></td>
</tr>
<tr>
<td>8&quot; pipe</td>
<td>5/16-inch to 9/16-inch</td>
<td></td>
</tr>
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   e. Both beads of each fusion joint shall be of a uniform size and shape. The ratio of the difference in individual bead widths divided by the total width of both beads shall not exceed 10%.

2. Dimensional Tolerance: Each length of pipe and each fitting will be examined for off-set tolerances, insulation cut-back distances, exposed insulation face alignment and relief profile, and alignment and smoothness of core pipe ends.

3. Insulation Integrity: Completed pipe and fitting ends shall be inspected for voids in excess of 0.05 in or discontinuities prior to coating. Any glazing left on the uncoated pipe end from the forms used during the insulating operation shall be removed before coating.

4. HDPE Core Pipe: The surface of the HDPE core pipe shall be free of nicks, cuts, or gouges as outlined in Section 2.2 of this Section.

E. Testing

1. Any required destructive testing shall be carried out by an independent testing laboratory which is fully certified to conduct the required testing. Contractor shall
advise the proposed laboratory for ANTHC review and approval prior to the start of work.

2. Samples for destructive testing shall be taken from product arctic pipe which is representative of the normal production procedures and which is part of the production for this contract.

3. Samples shall be cut from the pipe selected for testing and the remaining pipe cleaned, trimmed and finished to provide useful, though shorter, product for shipment. Unless advised otherwise, the test section may be from the end of the pipe.

4. Procedures for destructive testing shall follow the procedures listed on the Test Setup Drawing which are included as an addendum to these specifications.

5. Testing frequency shall be as shown in the Testing Frequency Table which is listed in the Delivery Order.

3.07 FINAL INSPECTION

A. After completion of the quantity of pipe and fittings contracted for, the Owner may perform a final inspection at the fabrication point. The certified results of all required laboratory tests made during production by the Contractor shall be made available in report form at this time. During the final inspection, the product packing will be inspected to see that all specifications listed in Section 1.6 have been met. Should any of the packing fail to meet the specifications, the Contractor shall re-pack the pipe to meet the specifications.

B. The Contractor shall notify the Owner when all the pipe and fittings for each separate contract will be available for inspection at the Contractor's manufacturing facility as follows:

1. Within 5 working days of approval of submittals, the Contractor shall notify the Owner of the estimated range of inspection dates, up to a maximum 10 working day “window”.

2. At least 10 working days before the inspection date, the Contractor shall notify the Owner of the inspection date.

3. All insulated pipe and fittings must be fully visible and available for inspection; pipe may be stacked, but not covered, and fittings may be in crates with open tops. The inspector may require that fittings be randomly removed from crates to facilitate the inspection.

END OF SECTION
SECTION 33 3451
SEPTIC SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. The Work covered by this Section consists of providing all labor, equipment, supplies, material, transportation, handling and storage, and performing all operations necessary to complete the construction for on-site wastewater systems including gravity piping, septic tanks with watertight manhole frames and covers, distribution boxes, drain fields, and sewer cleanouts.

1.02 RELATED SECTIONS
   A. Section 01 33 00 - Submittal Procedures
   B. Section 07 21 13 - Board Insulation
   C. Section 31 20 00 - Earthwork
   D. Section 32 92 19 - Landscaping & Seeding
   E. Section 33 31 30 - Insulated Polyethylene Gravity Pip

1.03 REFERENCES
   A. The latest revision of the following standards of the American Society for Testing and Materials (ASTM), the Canadian Standards Association (CSA) and the International Association of Plumbing and Mechanical Officials (IAPMO) are hereby made part of this Specification. The publications may be referred to in the text by basic designation only.
      1. ASTM D1248 Polyethylene Plastics Extrusion Materials for Wire and Cable
      2. ASTM D1785 Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and
      3. ASTM D2729 PVC Sewer Pipe and Fittings
      4. ASTM D3034 Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
      5. ASTM D3212 Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals Permittivity
      6. ASTM D4491 Standard Test Methods for Water Permeability of Geotextiles by
      8. ASTM D-579 Surface Site Characterization for On-site Septic Systems
      10. IAPMO PS 1-98 Material and Property Standard for Prefabricated Septic Tanks
      11. IAPMO IGC 262-2013 Corrugated Thermoplastic Tanks

1.04 REQUIRED CLEARANCES
   A. Where the location of the on-site sewer system is not clearly defined by the dimensions on the drawings, the system shall not be closer horizontally than 10 feet to a water supply main.
B. Where gravity flow sewer lines cross above or below water lines, the sewer pipe shall have a minimum vertical separation of eighteen (18) inches and the sewer pipe shall be fully encased in HDPE pipe for a distance of ten (10) feet on each side of the crossing.

C. The septic tank and drain field shall maintain horizontal separation distances of:
   1. 100 ft to the annual mean high water level of rivers, lakes, streams and springs
   2. 10 ft to the house foundation and water lines (see above)

1.05 SURVEYS

A. The Surveyor shall lay out the alignment and grade of the work to be completed in the field. The Contractor shall preserve all line stakes, grade stakes, and hubs.

B. The Surveyor shall use uniform, hard-backed, "write in rain" type survey field books to record field notes. All observations shall be recorded directly into the project field books in pencil.

C. The ground line profile refers to the elevation of the ground directly above the centerline of the pipe and the grade line refers to the elevation of the invert of the pipe, except where otherwise noted.

D. The Surveyor will furnish the Contractor with a list of all pertinent bench marks necessary for control of the Work. Prior to utilizing information such as bench marks, it shall be the Contractor's responsibility to verify bench mark elevations by checking between at least two bench marks. The Contractor shall protect the bench marks and control points and properly reference them.

E. The Surveyor shall stake the on-site wastewater system alignment and grade. Two offset hubs and lath shall be set or three swing ties to existing stable objects shall be measured and recorded for each clean out, septic tank corner, and drain field corner. The lath shall identify the feature being staked and state the elevation of the hub, the offset distance to the center of the feature and the station of the feature as shown on the Drawings. The offsets shall be set at a reasonable distance to protect them from disturbance.

F. At the time the on-site wastewater systems are staked, control points shall be set or three swing ties to existing stable objects shall be measured and recorded so that it can be readily re-established when required. Each control point shall be visible to at least one other control point. Control points shall be placed in locations at which they are unlikely to be disturbed during construction. Measurements and sketches of the control points shall be kept in the field book.

G. As-built measurements shall be done by the Contractor prior to final acceptance of the work by the Engineer.

1.06 SUBMITTALS

A. See Specification Section 01 33 00, Submittal Procedures for requirements for the mechanics and administration of the submittal process.

B. See Specifications Section 07 21 13, Board Insulation for submittal requirements

C. See Specifications Section 31 20 00, Earthwork for bedding, sand liner, and sewer rock submittal requirements

D. Product technical data including:
   1. Manufacturer's product data (cut sheet and installation recommendations):
a. Pipe and Fittings
b. Septic Tank
c. Drainfield Chambers
d. Distribution Box
e. Geotextile Fabric

2. Test Reports:
   a. Sewer pipe pressure test results

E. Closeout Submittals:
   1. Identify and describe unexpected variations to subsoil conditions or discovery of
      uncharted utilities.
   2. Maintain and submit as-built drawings of the on-site wastewater system installation in
      accordance with Section 01 7800 Closeout Submittals, of these Specifications.

PART 2 PRODUCTS

2.01 BEDDING MATERIAL
   A. Bedding material shall be in conformance with Section 31 20 00 Earthwork.

2.02 RIGID BOARD INSULATION
   A. Insulation shall be in conformance with Section 07 21 13 Board Insulation

2.03 INSULATED PIPE AND FITTINGS
   A. Insulated pipe and fittings shall be in conformance with Section 33 31 30 Insulated
      Polyethylene Gravity Pipe

2.04 PIPE AND FITTINGS
   A. All piping shall be in accordance with the Construction Documents conforming to the size
      and class shown and specified herein.
   B. Polyvinyl-Chloride (PVC) Sewer Pipe shall conform to ASTM D-3034 (Type PSM Poly Vinyl
      Chloride (PVC) Sewer Pipe and Fittings, Spec for), SDR-35. Filled PVC or styrene rubber pipe
      will not be allowed. Joints for PVC sewer pipe shall conform to ASTM D-3212 (Joints for
      Drain and Sewer Pipes Using Flexible Elastomeric Seals). Schedule 40 and Schedule 80 PVC
      shall conform to the requirements of ASTM DI785.
   C. Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe shall conform to ASTM F628, Schedule
      40.

2.05 SEPTIC TANKS
   A. Septic tanks shall be HDPE plus fittings and fixtures as necessary. The tanks shall be of
      1000, 1250, and 1500 gallons’ capacity as indicated on the Drawings and shall meet all
      requirement of the Alaska Department of Environmental Conservation (ADEC). As such,
      the tank shall have two compartments with 24” diameter manhole openings, and water
      tight riser systems. Acceptable manufactures are listed below.
   1. Infiltrator
   2. Greer
   3. Or, approved equal
4. All tanks shall have sufficient structural integrity to withstand being pumped dry without incurring structural deformation (i.e. rib collapse).

5. All risers shall be watertight, available in 6-inch or 12-inch increments and be able to extend to grade from the maximum burial depth. A gasket shall be used in tank-to-riser and riser-to-riser connections. Riser covers shall be lockable.

6. Effluent filter shall be Tuf-Tite or equal. The effluent filter shall remove solids down to 1/16-inch and be included with a T-baffle.

7. The inlet invert elevation to the first compartment shall be at least 2 inches above the liquid surface. In each septic tank compartment, the inlet tee, elbow, or baffle shall extend a minimum of 20-25% of the liquid depth in inches below the liquid surface, while the outlet tee, elbow, or baffle from each compartment shall extend below the liquid level to a depth equivalent to approximately 35% of the liquid depth. Inlet and outlet tees or baffles and connections provided with the polyethylene tanks shall be 4-inch diameter pipe. Inlet invert shall be at least 2 inches above the outlet invert. The inlet and outlets of the tanks shall be gasketed to provide a leak-proof seal between the tank and 4-inch inlet and outlet piping.

2.06 SEPTIC EFFLUENT PUMP AND CONTROLS

A. Septic effluent pump shall be capable of providing a minimum of 22 gpm with a residual head loss of 10 ft. Pump shall be a Liberty FL32M, 1/3 HP, 208/230V, 1-Phase 5.5 A Manual with 1-1/2” discharge, vortex impeller or approved equal.

B. Pump control shall be Simplex, 120/208V single phase control panel with NEMA 4x enclosure, 0-14.9 full load amps with 50' of cord. Control panel shall be Liberty SXL24=3 1-phase, 120/208-230 V, 0-14.9 A, with 50' of cord or approved equal.

C. Guide rail for pump shall be Liberty Campbell guide rail system for 1-1/2” discharge, LIBPU4808000 or approved equal.

2.07 DRAINFIELD INFILTRATORS

A. Drainfield chamber sections shall be constructed of HDPE plastic, and be Infiltrator Quick-4 Standard models or approved equal. The density of the polyethylene raw material shall be a minimum of 0.95 g/cm3 (ASTM D1248, DI505). Chambers shall be provided in 4-feet construction sections. Chamber sections must be able to support an AASHTO load rating H-10 (16,000 lbs./axle) with 12-inches of compacted fill or H-20 (34,000 lbs./axle), when properly installed per manufacturers recommendations. Standard end caps, splash pads and self-drilling screws shall be provided with the chamber sections.

2.08 GEOTEXTILE FABRIC

A. Geotechnical fabric products shall conform to AASHTO M288 Class 3 and have the following characteristics:

1. Minimum Permittivity (ASTM D4491) - 0.5 sec-1
2. Maximum Apparent Opening Size (ASTM D4751) – 0.20 to 0.21 mm (US Sieve #70)

B. Acceptable Manufacturers: Subject to compliance with requirements of this Section and Contract Documents acceptable manufacturers include the following:

1. Propex Geotex 801 or equal.
EXECUTION

3.01 SEWER SERVICE LINE CONNECTIONS

A. Excavation and Backfill: Excavation and backfill for furnishing and installation of sanitary sewer pipe shall be in accordance with Section 31 0000, Earthwork.

B. Pipe Grade and Alignment: Variance of individual pipe sections from established line and grade shall not be greater than those listed in the table below, providing that such variance does not result in a level or reverse sloping invert.

<table>
<thead>
<tr>
<th>PIPE DIAM. (inches)</th>
<th>ALLOWANCE (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5 - 4</td>
<td>0.03</td>
</tr>
</tbody>
</table>

1. During the progress of the Work, the Contractor shall provide instruments such as transits, levels, laser devices, and other facilities for other construction guides from the control points and bench marks provided to the Contractor by the Surveyor.

2. The practice of pushing in uncompacted backfill over a section of pipe to provide a platform for transit and level alignment and grade observations shall be subject to the approval of the Engineer. If intermittent backfilling is allowed backfilling shall be accomplished in accordance with Section 31 2323, Fill.

C. Pipe Laying: All pipe shall be laid with bedding conforming to the requirements of Section 31 2323 Fill unless otherwise required by the Construction Documents or directed by the Engineer.

1. Pipe laying shall in all cases proceed upgrade with the spigot ends of the pipe pointing in the direction of the flow. Each pipe shall be laid true to line and grade and in such a manner as to form a close concentric joint with the adjoining pipe. The alignment of the installed pipe shall appear straight to visual observation. Each section of pipe shall be handled carefully and placed accurately; the spigot end shall be fully inserted. Care shall be exercised to avoid over-insertion.

2. Each section of pipe shall be properly supported to ensure true alignment and an invert which is smooth and free from roughness or irregularity.

3. At all times, when Work is not in progress, open ends of pipe and fittings shall be securely and satisfactorily closed so that no undesirable substance will enter the pipe or fittings.

4. Minimum slopes shall be as follows:

| 4" | 2.08% | .0208 feet per foot (1/4" per foot) |

5. If the service line is found to be either plugged or have reverse grade, the Contractor is required to notify the Engineer immediately.

D. Bedding of Polyvinyl-Chloride (PVC) Sewer Pipe: The bottom of the trench shall be shaped; or bedding material shall be hand placed and hand tamped to give substantially uniform circumferential support to the lower fourth of each pipe. Bedding material shall conform to the requirements of ½ Inch Minus Bedding in conformance with Section 31 2323 Fill.
The bedding shall be laid the full extent of ditch and up to the spring line of the service connects.

E. The Engineer will not approve any installation which is not in accordance with the Uniform Plumbing Code.

F. Testing: Contractor shall perform water or air testing of all piping per pipe manufacturer's recommendations. A log of this testing shall be provided to the Engineer of Record.

### 3.02 INSULATION

A. The insulation shall be two feet (2') minimum in width or full width of trench, whichever is greater, and shall be placed no further than six inches (6") above the pipe. The board shall be centered over the centerline of the pipe.

B. All fittings and connections exposed to external environmental conditions shall be fully insulated with insulation. The insulation on fittings and connections shall be absolutely impervious to infiltration of groundwater. Where cracks are suspected or could open if the pipe settles after inspection heat shrink tape should be applied.

### 3.03 SEWER CLEANOUT

A. Sewer cleanout shall be installed on the sewer service line. The top of the cleanout shall terminate a minimum of 24" above existing grade and be fitted with a flexible (JM) cap or a threaded plug. The cleanout wye, riser and plug type shall be of the same size and material as the sewer service line and constructed as shown in the Drawings. If a two-way cleanout is required, the Contractor shall install two (2) one-way cleanout out fittings in opposing directions.

### 3.04 SEPTIC TANKS

A. Establish tank subgrade elevation and excavate to the bottom of the tank. If bedding is required, over excavate to a minimum of 4-inches below bottom of tank. Consult the manufacturer's instructions and the Drawings to determine if bedding is required. Excavate to provide 2-feet of horizontal clearance between outer surface of structure and trench wall to allow for proper backfilling. If bedding is required, place a minimum of 4 inches of crushed stone (maximum 1/2-inch diameter) or coarse sand over subgrade and rake smooth. Where rock is encountered such that the structure would bear on rock, remove the rock to a minimum of 8 inches below the structure and place an 8-inch cushion of clean stone over the exposed rock. Create a uniform, compacted, level surface to ensure that the bottom of the tank is evenly supported.

B. Fastening of internal walls or partitions shall be done using a corrosion resistant fastening system. Under no circumstances shall any fastening system penetrate the tank walls.

C. All pipe connections shall be watertight. Tanks shall be capable of accommodating pipe penetrations on each end and on either side as determined by the Drawings.

D. The effluent filter shall be installed on the outlet of the tank.

E. Backfill in an alternating method around tank in 8 to 12-inch lifts. Backfill material may be native soils provided soil is free of debris, organic matter, sharp stones, and stones greater than 2-inches in diameter.

F. The Contractor shall not backfill with muddy, frozen soil, or organic peat materials.

G. Rigid insulation shall be installed over the entire tank for all sites. Insulation shall be in accordance with Section 07 21 13 Board Insulation.
H. Existing septic tanks and drainfields shall be abandoned in place in accordance with ADEC regulations. The tanks shall be pumped, crushed in-place or completely fill with compacted soil, concrete, or other approved material. If the space occupied by the tank or drainfield is needed for the proposed system, the components shall be excavated and disposed of properly at an ADEC approved facility. The tank shall be pumped prior to excavation.

3.05 SEPTIC EFFLUENT AND CONTROLS

A. Contractor shall install septic effluent pump, simplex control panel, and guide rail system in accordance with the manufacturer's recommendations.

B. Installation, testing, and startup operation shall be in accordance with all manufacturer and warranty requirements.

C. Contractor shall prepare an Operation and Maintenance manual for the onsite septic system and provide the Owner with at least 3 copies of the manual. Contractor shall provide clinic maintenance staff and key users with instruction on control panel and pump general operations and safety procedures in accordance with manufacturer's recommendations.

3.06 DRAINFIELD INFILTRATORS

A. The Contractor shall excavate to the length, depth, and in the direction specified for the drain field on the Drawings. If unanticipated conditions are encountered in the field which will adversely affect the performance of the drain field system (clay, bedrock, hard pan, groundwater, permafrost, etc.) the Engineer shall be notified immediately. No modifications to the design or site layout shall be made without prior approval of the Engineer.

B. Excavation or construction of drain fields will not be allowed when the moisture content of the soil is greater than the plastic limit or when the occurrence of rain, snow or frost is such that the quality of construction may be impaired. If a representative sample of soil forms a "wire" instead of crumbling when attempting to roll it between the hands, the moisture content is above the soil's plastic limit. The bottom and sidewalls of the excavation shall be raked to expose the natural texture of the soil. All loose material shall be removed from the trench/bed. Open excavations shall be protected from surface runoff by diversion ditches or other methods.

C. A sand liner, if required on Drawings, shall meet the requirements of Sand Liner, in Section 31 00 00 Earthwork. Place sand liner material to the appropriate depth, as indicated in the Drawings.

D. Place 3/4" sewer rock material to the appropriate depth, as indicated in the Drawings.

E. The bottom of the trench/bed lifts and drain field chamber sections shall be laid level to within plus or minus 1”. Drain field chambers are placed with open side down in the bottom of the trench. Backfill shall be with non-organic native material. The beds shall be carefully backfilled in a manner that will not damage the pipe, distribution boxes or chamber sections. Excavation in excess of backfill requirements shall be spread over the drain field area.

F. Geotextile fabric shall be installed over the drainfield chambers. Overlaps, where necessary, shall be 24 inches minimum.
G. Rigid insulation shall be installed over the entire drainfield. The Contractor shall coordinate with the details located in the Drawings and Section 07 21 13 Board Insulation.

H. Drain field inspection ports shall be installed per the details in the Drawings. Drainfield inspection ports shall be 4" SCH 80 PVC pipe with `A" holes drilled every 4" from the bottom of the drain field to the top of the chamber.

I. When soil conditions, site topography, or Drawings make it necessary to keep the drain field and related appurtenance elevated, and when authorized by the Engineer, it may be necessary to import soil to provide the required minimum cover. The imported soil shall be reasonably clean and shall be approved by the Engineer.

J. If the Drawings call for mounding drainfield above existing grade, the entire mound shall be covered with a 6-inch layer of topsoil. Seed and fertilizer shall be uniformly applied over the mound area per Section 32 92 19 Seeding. Appropriate erosion control measures shall be taken to stabilize the soil on the mound. This may include the use of geotextile materials. The Contractor shall inspect the mound once a week during construction of the project and after each storm event to ensure soil erosion measures are working properly. The mounded drain field shall be graded at a 3:1 slope to allow for a gentle grade due to safety concerns.

K. Drainfield surfaces shall be seeded following construction per Section 32 92 19 Seeding.

END OF SECTION
SECTION 40 4100
HEAT TRACE

PART 1 GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE
A. Section 26 05 01, General Provisions for Electrical

1.02 DESCRIPTION
A. This section describes general provisions, products, and methods of execution relating to heat traces approved for use on this project. Furnish all such heat traces as shown.

1.03 QUALITY ASSURANCES
A. Heat traces shall conform to UL or FM standards and labeling shall constitute proof of acceptable quality.

PART 2 PRODUCTS

2.01 PIPELINE HEAT TRACE - SELF LIMITING FOR CLASS 1, DIVISION 2 LOCATIONS
A. Rated at 8 w/ft., nominal, at 240 VAC,
B. Operate at voltages of 208-277 VAC,
C. Heat trace construction shall consist of:
   1. 16 GA nickel-plated copper bus,
   2. Self-regulating irradiation cross-linked conductive polymer heat core,
   3. Inner thermoplastic jacket extruded over and bonded to the core,
   4. Thermoplastic elastomer outer jacket
   5. Stranded tinned copper braid, and
   6. Fluoropolymer overjacket over shield.
D. Heat trace maximum maintenance temperature = 150°F with a maximum intermittent to 185°F.
E. Heat trace shall be suitable for use on HDPE pipe and shall have a T-rating of T6.
F. Heat trace shall be Class I, Division 2 rated.
G. Heat trace shall be capable of being custom fitted in the field.
H. Service line heat trace for length less than 140 feet shall be Nelson CLT8-JT 120VAC 8w/ft or approved equal. For lengths greater than 140 feet provide Nelson CLT28-JT 240VAC 8w/ft or approved equal.

2.02 HEAT TRACE COMPONENTS
A. Heat trace power connection kits, end kits, and accessories shall all be from the same manufacturer as the heat trace.

PART 3 EXECUTION

A. Perform continuity and insulation resistance ('megger') test on all heat trace cables prior to installation in accordance with the manufacturer's instructions. Megger tests shall be performed between the bus wires and the braid. The cable shall be rejected and not
installed if it fails the continuity test or if the resistance measured is less than 1,000 megohms. Submit a typed copy of the test results with each cable clearly and uniquely identified by its intended installation location. This is necessary so that its measured value can be compared with test results after installation and after future maintenance and troubleshooting tests.

B. Heat trace installation shall be in accordance with Article 427 of the NEC and the manufacturer's instructions.

C. All heat trace splices, end and power connections shall be installed as shown and per the manufacturer's recommendations. No below grade splices or power connections are allowed. End connections shall be accessible above grade or utilize a heat-shrinkable style termination.

D. After installation, perform a continuity test on each heat trace cable. Replace any cable that fails this test.

E. After installation perform an insulation resistance (‘megger’) test on all heat trace cables in accordance with the manufacturer’s instructions. Megger tests shall be performed between the bus wires and the braid, and between the braid and ground if the cable has a jacket over the braid. The cable shall be rejected and replaced if any resistance measured is less than 1,000 megohms. Submit a typed copy of the test results with each cable clearly and uniquely identified by its installation location.

F. After installation perform a power test on each heat trace cable. Energize each cable and after 10 minutes record the voltage, current and total length of each cable. Submit a typed report of the test results.

G. Test the operation of the ground fault interrupting device on each heat trace circuit. Replace any device that does not operate properly

**END OF SECTION**