PROJECT MANUAL

Homer Harbormaster's Office

City of Homer, Alaska

May 12, 2014

SET NUMBER

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PART 1 - GENERAL

1.01 DESCRIPTION

A. Work required under this Contract is described in the subsequent specifications and in the Drawings, and includes the providing of all labor, equipment, tools, and materials required for the completion of this project. The project consists of:

1. Basic Bid-Schedule : All work Indicated by the Contract Documents.

2. Additive Alternates:
    a. AA-1: Fire Alarm System
    b. AA-2: Security System

B. The Contract Documents do not purport to describe in detail, absolute and complete information. In some instances drawings will be diagrammatic and not necessarily to exact scale or portray exact conditions at any particular location or situation.

C. It shall be the responsibility of the Contractor to determine conditions and requirements at each particular situation, and provide all items necessary for the completion of the Work, according to the parameters established by the Contract Documents.

D. The language employed in the Contract Documents is addressed directly to the Contractor. Imperative or indicative language is generally employed throughout and requirements so expressed are the mandatory responsibility of the Contractor, even though specialty subcontractors hired, retained or otherwise engaged by the Contractor actually may accomplish the work specified. References to third parties in this regard shall not be interpreted in any way as to relieve the Contractor of any of his responsibilities under the Contract.

E. Payment for all work at each specific site shall be included in the Basic Bid for that specific site's respective Bid Schedule, except work that is specifically described as an Additive Alternate. Payment for Additive Alternates shall be included under each respective additive alternate bid schedule.

C. Bid Items

1. Basic Bid:
    Payment for all work shall be included in the lump sum Basic Bid.

2. Additive Alternates will be paid under their respective bid items.

1.02 CONTRACTORS DUTIES

A. Contractors duties shall include, but are not limited to, the following:

Except as otherwise specifically required, provide and pay for labor, materials, tools, machinery, equipment, and all transportation necessary to accomplish the Work as specified in the Contract Documents.

Comply with codes, ordinances, rules, regulations, orders, and other legal requirements of public authorities that bear on the performance of the work.

In the event of any observed variation between the Contract Documents and legal requirements, or any discrepancy or ambiguity in or among any of the requirements of the Contract Documents or any referenced standards, promptly notify the Owner's Representative in writing in which eventuality, appropriate changes and modifications to the Contract Documents will be initiated by the Owner and furnished to the Contractor. Contractor shall assume responsibility for work performed without proper notice to Owner, when such work was known by Contractor to be contrary to such requirements. Do not proceed in questioned areas until resolution or clarification has been obtained.

1.03 WORK BY OWNER

A. If the Owner has ongoing work under separate contracts which may require Contractor to coordinate work around other activities, Contractor shall coordinate with all other contractors, and protect other work while performing his own Work.

1.04 CONTRACTOR USE OF SITE

A. Contractors access to the site shall be limited to the areas within the street right of ways, and within the harbor area as shown on the Plans. Contractor shall have reasonable access to the areas where Work will be performed. Any areas shown on the plans as off limits to the Contractor shall not be used for any equipment storage, staging areas, detours, travel or other uses while the Contract is in effect. Contractor shall not have access to private property for any reason whatever with out written consent from the property owner.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

PART I GENERAL

1.01 SECTION INCLUDES

A. Schedule of Values

1.02 SCHEDULE OF VALUES

A. Submit typed schedule on 81/2 inch X 11 inch sheets.

B. Submit Schedule of Values in duplicate within (15) days after date of Notice to Proceed.

C. Format: Utilize the Section Numbers of this Project Manual. Identify each line item with number and title of the major specification Section. Identify site mobilization, bonds and insurance.

D. Include in each line item, the amount of allowances specified in this Section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.

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

F. Revise schedule to list approved Change Orders, with each Application For Payment.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

PART 1 GENERAL

1.01 COORDINATION

A. Contractor shall be responsible for coordinating between his operation and any other work being done on the same site, by the Owner or the Owner's representatives, or other contractors or agencies, including utility companies. Contractor coordination shall include developing a plan for protecting other work, and sharing the existing facilities to optimize the efficiency of Contractor's Work and any other work being done on the site.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 MEETING SCHEDULE

A. Except as noted below for Preconstruction Meeting, project meetings will be held weekly.

B. Coordinate as necessary to establish mutually acceptable schedule for meetings.

3.02 MEETING LOCATION

A. Owner’s Representative will establish meeting locations.

3.03 PRECONSTRUCTION MEETING

A. Engineer will schedule a preconstruction conference prior to any work beginning. Conference shall be attended by Contractor, Owner and Engineer.

B. Minimum Agenda

1. Organizational arrangement of Contractor’s forces and personnel, those of subcontractors, materials suppliers, Owner, and Owner’s Representative.

2. Channels and procedures for communication.

3. Construction Schedule, including sequence of critical work. Review materials that might require long lead times, etc.

4. Contract Documents, including distribution of required copies of original documents and revisions.

5. Processing of shop drawings and other data submitted to Owner's Representative for review.

6. Processing of Design Clarification Requests, field decisions, and Change Orders.

7. Rules and regulations governing performance of Work.

8. Contractor's procedures for safety and first aid, security, quality control, housekeeping, and related matters.

9. Processing of payment requests.

10. Preliminary discussions of future project close-out procedures.

3.04 PROJECT MEETINGS

A. Attendance:

1. As much as possible, assign the same person or persons to represent the Contractor at project meetings throughout the progress for the Work.

2. Subcontractor, materials suppliers, and others may be invited to attend those project meetings in which their aspect of the Work is involved.

B. Minimum Agenda:

1. Work completed to date.
2. Scheduled work (compliance with approved schedule).
3. Submittals (long lead time items, compliance with approved submittals)
4. Document Clarification Requests and Non-Compliance Requests.
5. Change Orders.
6. Coordination with Owner.
7. Comments.

3.05 CONTRACTOR'S MEETINGS

A. Conduct meetings with own forces as required.

B. Notify Owner's Representative in writing of any impending meetings for which the Owner's Representative's input is needed. Provide minimum one week prior notification of meeting and include meeting topic, agenda, time location, and list of expected attendees.

C. Take minutes of meeting and provide copies to Owner's Representative within 3 calendar days after meeting.

3.05 CLOSE-OUT MEETINGS

A. Approximately two weeks prior to Substantial Completion, weekly Project Meetings will include discussion of closet procedures.

B. Contractor is responsible to invite subcontractors as necessary to review related close-out work.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittal procedures.

B. Construction progress schedules.

C. Proposed products list.

D. Shop drawings.

E. Product data.

F. Samples.

G. Manufacturer's instructions.

H. Manufacturer's certificates.

I. Construction photographs.

1.02 RELATED SECTIONS

A. Section 01020 - Contract Considerations: Schedule of Values.

B. Section 01400 - Quality Control: Manufacturers' field services and reports.

C. Section 01700 - Contract Closeout: Contract warranty and manufacturer's certificates, closeout submittals.

1.03 SUBMITTAL PROCEDURES

A. Transmit each submittal with Engineer accepted form.

B. Sequentially number the transmittal forms. Resubmittals to have original number with an alphabetic suffix.

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

D. Apply Contractor's stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.

E. Schedule submittals to expedite the Project, and deliver to Owner's Representative. Coordinate submission of related items.

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

G. Provide space for Contractor and Owner's Representative review stamps.

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

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

1.04 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial progress schedule in duplicate within 15 days after date of Notice to Proceed for review by Owner's Representative.

B. Revise and resubmit as required.

C. Submit revised schedules with each Application for Payment, identifying changes since previous version.

D. Submit a horizontal bar chart with separate line for each major section of Work or operation identifying first work day of each week.

E. Submit construction schedule in either Microsoft Project or Primavera scheduling format.

1.05 PROPOSED PRODUCTS LIST

A. Within 20 days after date of Notice to Proceed, submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.06 SHOP DRAWINGS

A. Submit in the form of one reproducible transparency and one (1) opaque reproduction.

B. After review, reproduce and distribute in accordance with Article on Procedures above and for Record Documents described in Section 01700 - Contract Closeout.

1.07 PRODUCT DATA

A. Submit the number of copies which the Contractor requires, plus two copies which will be retained by the Owner's Representative.

B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.

C. After review, distribute in accordance with Article on Procedures above and provide copies for Record Documents described in Section 01700 - Contract Closeout.

1.08 SAMPLES

A. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

B. Submit samples of finishes from the full range of manufacturers' standard colors, textures, and patterns for Owner's Representatives selection.

C. Include identification on each sample, with full Project information.

D. Submit the number or samples specified in individual specification Sections; one of which will be retained by Owner's Representative.

E. Reviewed samples which may be used in the Work are indicated in individual specification Sections.

1.09 MANUFACTURER'S INSTRUCTIONS

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

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

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

D. Certificates may be recent or previous test results on material or Product, but must be acceptable to Owner's Representative.

1.10 SUBMITTAL SCHEDULES

A. Division 6 Sections.
Color samples for solid surfacing material, and veneer faced panel products specified in Division 06 Section "Interior Architectural Woodwork shall be submitted simultaneously.

B. Division 09 Sections.
Submittals for Division 09 Sections including: "Resilient Base Accessories"; "Resilient Flooring”; "Carpet Tile"; "Toilet Compartments"; "Metal Lockers" and Horizontal Louver Blinds" shall be made within thirty days after Notice to Proceed.

Veneer faced panel products shall be finished as specified in Division 09 Section "Transparent Finishes.""

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Quality assurance and control of installation.

B. References.

C. Field samples.

D. Inspection and testing laboratory services.

E. Manufacturers' field services and reports.

1.02 RELATED SECTION

A. Section 013000 - Submittals: Submission of Manufacturers' Instructions and Certificates.

B. Section 016000 - Material and Equipment: Requirements for material and product quality.

1.03 QUALITY ASSURANCE/CONTROL OF INSTALLATION

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

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

C. Should manufacturers' instructions con conflict with Contract Documents, request clarification from Owner's Representative before proceeding.

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

E. Perform work by persons qualified to produce workmanship of specified quality.

F. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.04 REFERENCES

A. Conform to reference standard by date of issue current on date of Contract Documents.

B. Should specified reference standards conflict with Contract Documents, request clarification for Owner's Representative.

C. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.05 FIELD SAMPLES

A. Install field samples at the site as required by individual specifications Section for review.

B. Acceptable samples represent a quality level for the Work.

C. Where field sample is specified in individual Sections to be removed, clear area after field sample has been accepted by Owner's Representative.

1.06 INSPECTION AND TESTING LABORATORY SERVICES FOR COMPACTION AND CONCRETE

A. Owner will appoint, employ, and pay for services of an independent firm to perform inspection and testing for compaction of fill and backfill, foundations subgrade and asphalt pavement.

B. The independent firm will perform inspections, test, and other services specified in individual specification Sections and as required by the Owner's Representative.

C. Reports will be submitted by the independent firm to the Owner's Representative, indicating results of tests and indicating compliance or non-compliance with Contract Documents.

D. Contractor shall cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, and assistance as requested.

1. Notify Owner's Representative 48 hours prior to expected time for operations requiring services.

2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.

E. Retesting required because of non-conformance to specified requirements shall be performed by the independent firm on instructions by the Owner's Representative. Payment for retesting will be charged to the Contractor by deducting inspection or testing charges from the Contract Sum/Price.

1.07 INSPECTION BY OWNER

A. Owner will appoint, employ, and pay for Owner Inspections of the Work that are not included in part 1.06 of this section.

B. Contractor shall schedule all required inspections to be performed by Owner's Representative.

1. Owner's representative will be available to perform inspections between the hours of 8:00 AM and 4:00PM, Monday through Friday. Inspections will not be available on weekends.

2. Contractor shall notify Owner at least 24 hours in advance of required Inspections.

3. A Contractor's representative shall be present onsite for all scheduled inspections.

4. Owner will provide Contractor with an Inspection Card listing all required inspections. Contractor shall maintain Owner-furnished Inspection Record onsite.

5. All work that is covered up/poured before inspector has signed off will be subject to being rejected . Contractor may be required to uncover or remove the work at Contractor's expense and will be required to re-schedule another inspection.

D. Required Inspections for City-Owned Utility Connections.

1. Water service connection to Main.
2. Sewer service connection to Main.

E. Required Site/Building Inspections

1. Pad certification.
2. Foundation and Footings.
3. Ufer/Building Ground.
4. Underground Electrical.
5. Underground Mechanical
6. Slab Electrical.
7. Underground Plumbing.
8. Concrete Slab On Grade.
9. Masonry Pre-grout.
10. Concrete Walls Pre-Pour.
11. Rough Framing Exterior.
12. Rough Framing Interior.
13. Rough Plumbing.
14. Rough Electrical.
15. Roof Mechanical.
16. Roof Sheathing.
17. Roof Underlayment.
18. Exterior Lath/Siding.
19. Insulation (wall).
20. Insulation (attic).
21. Drywall.
22. Final Electrical.
23. Final Plumbing.
24. Final Mechanical.

25. Final Building.

PART 2-PRODUCTS

Not Used

PART 3-EXECUTION

Not Used

END OF SECTION

PART 1 - GENERAL

1.01 TEMPORARY SANITARY FACILITIES

A. Contractor shall provide and maintain temporary sanitary facilities and appurtenances for use by Contractor's personnel, Owner's personnel and Owner' representatives. Sanitary facilities shall be of the "Port-A-Potty" type, and shall meet all local health codes. Contractor shall maintain facilities per OSHA standards in a clean and sanitary condition.

1.02 BARRIERS

A. Provide, erect, and maintain temporary barriers and security devices around Work, per specifications, for protection until all Work in the area is complete. Contractor will be informed by the Engineer of any condition judged to be hazardous, and Contractor shall immediately protect the hazardous area, per this section.

1.03 CONTRACTOR WORK AND STORAGE AREAS

A. The Contractor shall make his/her own arrangements for areas and facilities needed by him/her for the storage of materials, supplies and equipment, parking, and other activities. Contractor may store materials onsite however, security for such areas shall be the sole responsibility of the Contractor. The Contractor shall hold the Owner harmless from all claims or complaints arising from the use of such areas. Public streets in or outside this project shall not be used for any storage activities (equipment and materials) and/or vehicle parking, without prior written approval from the Engineer.

1.04 EXISTING SURVEY MONUMENTS

A. Survey monuments and rebars marking property corners shall be carefully preserved from damage or disturbance by the Contractor. If monuments are disturbed by the Contractor, Contractor shall pay all costs for proper replacement of the monument.

Upon completion of construction the Contractor shall have the survey monuments and property corners reinstalled in their original location under the supervision of an Alaska Registered Land Surveyor, who shall provide a written certification verifying that all such monuments and property corners have been reinstalled in their original location.

1.05 WATER FOR COMPACTION

A. The Contractor shall provide water to be used for construction activities within this project.

1.06 EXISTING UTILITIES IN CONSTRUCTION ZONE

A. The Contractor shall provide all labor, materials, equipment, supervision and other means necessary to work around, protect, and preserve in place, existing utilities including natural gas, telephone, electrical power, and cable television.

B. The following utilities are know to exist within the project site.

1. Buried water mains and service lines for the building, water tank and water treatment plant.
2. Buried sewer line for building.
3. Buried telephone lines.
4. Electrical transformers, electric service, overhead and buried electrical power cables.

C. The Contractor shall contact utility companies prior to construction to obtain field location of existing utilities and additional information regarding requirements of the utility company pertaining to the Contractor's work in the vicinity of the utility, including methods of exposing, shoring and protecting utilities.

D. Field location marks are intended to show the approximate horizontal location of the utility within 3 feet either side of the field location mark. The depth of located utilities is not known. The Contractor is responsible for all damages and/or delays resulting from damage to utilities located within 3 feet horizontally of field marks, no matter what depth the utility is located. Care shall be taken by the Contractor to avoid damage to utilities outside of the field locate also. Plan locations of utilities are diagrammatic only and shall not be scaled to determine actual locations in the field.

E. The Contractor shall protect and preserve all utilities in a manner acceptable to the utility company and shall exercise all possible care to avoid damaging existing utilities unless otherwise approved by the Utility.

F. Contractor shall pay for repairs to all utilities damaged by the Contractor, at no cost to the Owner.

1.07 CONSTRUCTION SURVEYING

A. It shall be the Contractor's responsibility to provide all necessary surveying to layout and define limits of work, and to protect all survey control and provide for its replacement in the event of its loss prior to required work. All in field work requiring surveying, i.e. grade check, pipe alignment, etc., will be the responsibility of the Contractor.

1.08 DISPOSAL AREAS

A. The contractor shall provide a disposal area for unusable excavation, unsuitable materials and other waste materials from this project. The Contractor shall hold the Owner harmless from all claims and complaints arising from the use of any disposal area.

1.09 TRAFFIC MAINTENANCE

A. The Contractor shall maintain traffic control during construction and until the work is accepted. The Contractor shall be liable for all damage or injuries suffered due to the Contractor's failure to provide adequate traffic safety, maintenance or restoration services.

B. Unless otherwise provided, the roadway undergoing improvements shall be kept open to all traffic by the Contractor. All locations requiring redirection or stopping of the traveling public shall be properly signed and/or flagged by the Contractor.

The Contractor's equipment shall stop at all points of intersection with the traveling public unless satisfactory traffic control measures, approved in writing, are installed and maintained at the Contractor's expense.

C. Open trenches, ditches, pavement edge drop-offs and other excavations and hazardous areas shall be protected with barricades and shall be delineated.

D. The Contractor shall furnish and erect, move and remove, as required and directed, series C construction signs, construction barricades and/or temporary guide markers and pavement marking required to adequately and safely inform and direct the traveling public and to satisfy legal requirements.

1.10 SIGNS, MARKERS AND MAILBOXES

A. Existing commercial signs, valve markers, manhole markers, or underground utility markers which lie within areas of excavation shall be carefully removed, protected, saved and reinstalled in their original position by the Contractor, unless directed otherwise, in writing, by the Engineer. All damage to such items

resulting from the Contractor's operations shall be repaired at the Contractor's expense.

1.11 TEMPORARY UTILITIES

A. Electric Power

1. The Contractor shall make arrangements for and shall provide temporary power for Contractor's use.

2. The Contractor shall connect to temporary service and provide all equipment necessary for temporary power and lighting

B. Telephone

1. Contractor shall provide telephone for Contractor's use.

C. Heating and Ventilation

1. Contractor shall provide, at his own expense, sufficient temporary heat for proper installation of work; and to protect all work and materials; and shall keep humidity down to extent required to prevent corrosion, dampness, and mildew that may be potentially damaging to materials, equipment, or finishes. Fuel, equipment, and method of temporary heat shall be reviewed by Owner's Representative for appropriateness. Do not overheat spaces or materials. All such heating, ventilation, and services shall be provided and maintained until final acceptance of the Work.

1.12 FIELD OFFICES

A. Contractor. Contractor shall provide a field office for Contractor's use, with heat and electricity. Minimum 10' x 10' with 8' ceiling height.

1.13 MOBILIZATION AND DEMOBILIZATION

A. Work Included. Mobilization and Demobilization includes preparatory work and operations, including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; ; for the purchase of bonding; for the establishment of all offices, buildings, and other facilities necessary for the work on the project; and for all other work and operations which must be performed or costs incurred prior to beginning and completing work on the

various items on the project site, and for incidental items of work noted on the drawings.

B. Maximum Allowable Bid.

The amount bid for Mobilization and Demobilization may not exceed ten (10) percent of the total amount of the Basic Bid.

PART 2-PRODUCTS

NOT USED

PART 3-EXECUTION

3.01 MAINTENANCE

A. Maintain temporary facilities and controls as along as needed for safe and proper completion of work and to the owners satisfaction.

B. Remove such temporary facilities and controls as rapidly as progress of Work will permit, or as directed by Owner's Representative.

3.02 USE OF TEMPORARY FACILITIES

A. Temporary facilities shall be made available for use by workmen and subcontractors employed on the Project, and Owner's Representative, subject to reasonable direction by Contractor as to their proper and most efficient utilization.

3.03 WELL RESERVE PROTECTION

A. No fueling, oiling, oil storage, or fuel storage may occur within 150 feet of water wells or surface water supply. No oil fired heaters may be used within 150 feet of water wells. All fuel storage areas shall be within a fuel containment facility provided by the contractor that meets all OSHA standards

B. Do not locate temporary sanitary facilities within 150 feet of water wells and water treatment ponds.

C. Do not store or discharge hazardous or toxic materials on the Site.

3.04 CONSTRUCTION AIDS

A. Provide and operate drainage and pumping equipment, including trench dewatering equipment if necessary.

B. Maintain excavations and Site free of standing water.

3.05 SECURITY

A. Provide temporary security and protection, including but not limited to; barricades, warning signs/lights, personnel security program (theft prevention), environmental protection, and similar provisions intended to minimize property losses, personal injuries, and claims for damages at Site.

B. Unauthorized Entry:

1. Maintain provision for closing and locking building during non-working hours.

3.06 CLEANING

A. Maintain the public road and Site in a clean condition. Remove mud, dirt, rocks, etc. from the tires of vehicles before they exit the site.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Products.

B. Transportation and handling.

C. Storage and protection.

D. Product options.

E. Substitutions.

1.02 RELATED SECTIONS

A. Instructions to Bidders: Product options and substitution procedures.

B. Section 01400 - Quality Control: Product quality monitoring.

1.03 PRODUCTS

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

B. All products, including all materials for unit price items are to be provided by the Contractor. Payment for materials shall be included under the materials respective bid item.

1.04 TRANSPORTATION AND HANDLING

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

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

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

1.05 STORAGE AND PROTECTION

A. Store and protect products in accordance with manufacturer’s instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate controlled enclosures.

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

C. Provide off-site storage and protection when site does not permit on-site storage or protection.

D. Cover products subject to deterioration with impervious sheet covering and provide ventilation to avoid condensation.

E. Store loose granular materials on solid flat surfaces in a well-drained area.

F. Keep all reinforcing steel and lumber from coming into contact with the ground by placing dunnage or cribbing under the material.

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

H. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

1.06. PRODUCT OPTIONS

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

B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

1.07. SUBSTITUTIONS

A. Substitutions may only be made as allowed in the Instructions to Bidders.

PART 2 ——PRODUCTS

Not Used

PART 3 ——EXECUTION

Not Used

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. Work Includes:

1. Contractor's options in selection of products.
2. Products List
3. Requests for substitution of products.

B. Related Work Described Elsewhere:

1.	Instructions to Bidders:	
2.	Substitution Request Form	
3.	General Conditions:	
4.	Summary of Work:	Section 010000
5.	Submittals	Section 013000
6.	Material and Equipment	Section 016000

1.02 OPTIONS

A. Products Specified by Reference Standard or by Description Only: Any product meeting those standards.

B. Products Specified by Naming One or More Manufacturers.

1. Substitution requests prior to Bid Opening: Submit a request for approval of substitution at least 14 days prior to bid opening date for any manufacturer or product not specifically named. Only bid substitution if approval of substitution is received prior to bid opening.

2. No substitutions after Bid Opening: Only products of named manufacturers meeting specifications will be allowed; no substitution allowed.

C. Products Specified by Naming Only One or More Manufacturers with "No Substitution" statement: Products of named manufacture's meeting specifications; no substitution allowed.

1.03 PRODUCTS LIST

A. Within 15 days after date of Notice to Proceed, transmit three copies of list of major products which are proposed for installation, including name of manufacturer.

B. Tabulate products by Specifications Section number, Title and Article number.

C. For Products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

D. Owner's Representative will reply in writing within 10 days stating whether there is reasonable objection to listed items. Failure to object to listed items shall not constitute waiver of requirements of Contract Documents.

1.04. LIMITATIONS ON SUBSTITUTIONS

A. Instructions to Bidder govern terms for submitting request for substitutions under requirements specified in this Section.

B. Substitutions will not be considered when acceptance will require substantial revision of Bidding or Contract Documents.

C. Do not order or install substitute products without written acceptance.

D. Only one request for substitution for each product will be considered. When substitution is not accepted, provide specified product.

E. Owner's Representative and Engineer will determine acceptability of substitutions.

1.05 REQUESTS FOR SUBSTITUTIONS

A. Submit substitution requests using Substitution Request Form provided. Substitution requests will not be reviewed without an accompanying fully executed Substitution Request Form.

B. Submit separate request for each substitution. Document each request with complete data substantiating compliance of proposed substitution with requirements of Contract Documents.

Submit samples, shop drawings from prior jobs, product data, manufacturer's installation instruction, and certified test results attesting to proposed product equivalence.

C. Identify product by Specification Section and Article numbers. Provide manufacturer's name and address, trade name of product, and model or catalog number. List fabricators and suppliers as appropriate.

D. Attach product data as specified in Section 01300.

E. List similar project using product, dates of installation, and names with numbers of Owner and Engineer.

F. Give itemized quality and performance comparison between proposed substitution with specified product, listing variations, and reference to Specification Section and Article numbers. Base comparison on tests and criteria

specified, and with specified manufacturer's performance criteria when tests and criteria are not otherwise specified.

G. List availability of maintenance services and replacement materials.

H. State effect of substitution on construction schedule, and changes required in other work or products.

I. Forms that are incomplete or incorrectly filled out will be rejected.

1.06 BIDDER REPRESENTATION

A. Request for substitution constitutes representation that Bidder:

1. Has investigated proposed product and has determined that it meets or exceed the quality level of specified product.

2. Will provide same warranty for substitution as for specified product.

3. Will coordinate installation and make changes to other Work which may be required for work to be complete with no additional costs to Owner.

4. Waives claims for additional costs or time extension which may subsequently become apparent.

5. Will reimburse Owner for review or redesign service associated with re-approval by authorities.

1.07 SUBMITTAL PROCEDURES

A. Submit five copies of the Request for Substitution Form with attachments. Limit each request to one proposed substitution.

B. Owner's Representative and Architect will review Contractor's request for substitutions with reasonable promptness.

C. During bidding period, Owner will record acceptable substitutions in Addenda.

D. For accepted products, submit shop drawings, product data, and samples under provisions of Section 01300.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Starting systems.

B. Demonstration and instructions.

C. Testing, adjusting, and balancing.

1.02 RELATED SECTIONS

A. Section 01400 - Quality Control: Manufacturers field reports.

B. Section 01700 - Contract Closeout: System operation and maintenance data and extra materials.

1.03 STARTING SYSTEMS

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

B. Notify Owner's Representative seven (7) 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, or other conditions which may cause damage.

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

E. Verify wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of responsible Contractors' personnel 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 of system in operation.

H. Submit a written report in accordance with Section 01400 that equipment or system has been properly installed and is functioning correctly.

1.04 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of Products to Owner's personnel two weeks prior to date of Substantial Completion.

B. For equipment or system requiring seasonal operation, perform demonstration for other season within six months.

C. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owners' personnel in detail to explain all aspects of operation and maintenance.

D. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times, at equipment location.

E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

PART 4 PAYMENT

A. Payment for work in this section will be included as part of the Lump Sum Basic Bid for each respective bid schedule.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Closeout procedures.

B. Final cleaning.

C. Adjusting.

D. Project record documents.

E. Operation and maintenance data.

F. Warranties.

G. Spare parts and maintenance materials.

1.02 RELATED SECTIONS

A. Section 01500 - Construction Facilities and Temporary Controls: Progress cleaning.

B. Section 01650 - Starting of Systems: System start-up, testing, adjusting, and balancing.

1.03 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for inspection by Owner's Representative.

B. Provide submittals to Owner's Representative that are required by governing or other authorities.

C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.04 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

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

C. Clean equipment and fixtures to a sanitary condition.

D. Replace filters of operating equipment.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

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

G. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.05 ADJUSTING

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

1.06 PROJECT RECORD DOCUMENTS

A. Maintain on site, one set of the following record documents; record actual revisions to the Work:

1. Contract Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other Modifications to the Contract.
5. Reviewed shop drawings, product data, and samples.

B. Store Record Documents separate from documents used for construction.

C. Record information concurrent with construction progress.

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

E. Record Documents 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.

F. Submit documents to Owner’s Representative with claim for final Application for Payment.

1.07 OPERATION AND MAINTENANCE DATA

A. Submit two sets prior to final inspection, bound in 8-1/2 inch X 11 inch text pages, three D side ring capacity expansion binders with durable plastic covers.

B. Prepare binder covers with printed title “OPERATION AND MAINTENANCE INSTRUCTIONS”, title of project, and subject matter of binder when multiple binders are required.

C. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

D. Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, type on 30 pound white paper.

E. Part 1: Directory, listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers.

F. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
1. Significant design criteria.
2. List of equipment.
3. Part Certificates.
4. Photocopies of warranties.

H. Submit one copy of completed volumes in final form 15 days prior to final inspection. This copy will be returned after final inspection with Owner’s Representative comments. Revise content of documents as required prior to final submittal.

I. Submit final volumes revised, within ten days after final inspection.

1.08 WARRANTIES

A. Provide duplicate notarized copies.

B. Execute and assemble documents from Subcontractors, suppliers, and manufacturers.

C. Provide Table of Contents and assemble in three D side ring binder with durable plastic cover.

D. Submit prior to final Application for Payment.

E. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

1.09 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification Sections.

B. Deliver to Owner's Representative obtain receipt prior to final payment.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. The Contractor shall provide all surveying and staking essential for completion of the project in conformance with the plans and specifications and shall perform the necessary calculations required to accomplish the work. Staking shall be accomplished in accordance with standard survey and engineering practices.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. This section covers the furnishing of materials, labor, equipment and supervision required to complete the project earthwork including driveways, sidewalks, parking areas and building pad excavation, fill and backfill and site grading as shown on the contract drawings.

B. All surveying shall be provided by Contractor.

1.02 TESTING

A. Soil Density Compaction Standards.
Where compaction requirements are specified, the maximum soil density shall be determined by one of the laboratory procedures listed below. The particle size distribution of the soil dictates which laboratory procedure should be used.

1. Soils meeting the following gradation requirement and having cohensionless, free-draining characteristics should be tested in accordance with ASTM D 4253 "Maximum Index Density of Soils using a Vibratory Table."

Sieve Size	Percent Fines by Dry Weight
3 "	100*
1-1 / 2 "	70 - 100
No. 200	0 - 15

* The field sample may contain up to 10% cobbles, which should be discarded prior to testing.

2. Soils which do not meet the gradation requirement presented in Item 1, above, and which do meet the following gradation requirement, should be tested in accordance with ASTM D 1577 "Moisture-Density Relations of Soils and Soil-Aggregate Mixture using a 10-lb (4.54-kg) rammer and l8-in. (457mm) drop."

Sieve Size	Percent Fines by Dry Weight
3"	100*
3/4"	71 - 100

* The field sample may contain up to 10% cobbles which should be discarded prior to testing.

3. In lieu of the above described test methods, contractor may use the Alaska Test Method T-11, if approved by the owner's representative.

4. Soils which do not meet the gradation requirements presented in Items l and 2, above, should be tested in accordance with one of the methods listed above which has been modified with the concurrence of the project geotechnical engineer.

B. Soil Density Test Methods:
The in-place soil density shall be determined in accordance with:
ASTM D 1556 - Density of soil in-place by the sand cone method;
ASTM D 2167 - Density and Unit Weight of Soil In-Place by the Rubber Balloon Method; and/or;
ASTM D 2922 - Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth).

C. Frequency of Soil Compaction Testing.
In-place density tests shall be taken on each lift of fill or backfill placed during site grading at the rate of one test per 5,000 square feet of area. In-place density tests on each lift of trench backfill shall be taken at the rate of one test per 100 lineal feet, or one test per lift if the trench is less than 100 feet long. Failing test areas shall be re-compacted and retested until the compaction requirements are met.

1.03 SUBMITTALS

A. Contractor shall submit a gradation test, in accordance with ASTM D-422, on each type and source of material used in fills and backfills. If material is to be non-frost susceptible, hydrometer tests shall be performed in accordance with ASTM D-422 unless the material has less than 4% passing the 200 sieve. The results of a new gradation and hydrometer test shall be submitted by the Contractor for each furnished material and each time the furnished material changes from that which was previously approved.

B. Submit product literature and manufactures certification of compliance with these specifications for geotextile fabric.

1.04 DEFINITIONS

A. Classified Material
Classified Material shall be Type II or Type III as indicated on the drawings and shall conform to the following requirements:

1. Type III Classified Material. Non-frost susceptible (NFS) well graded, unfrozen, inorganic soils meeting the following gradation requirements.

Sieve Size	Percent Finer by Weight
2"	100*
1 ½"	90-100
1"	70-100
¾"	60 – 90
3/8"	45-75
#4	30 - 60
#8	22 – 52
#40	8 – 30
#200	0 - 6

* In addition to the grading limits listed above, the fraction of material passing the #200 sieve shall not be greater than 15% of that fraction passing the #4 sieve.

2. Type II Classified Material. Materials furnished by the contractor for use as Type III classified material shall be approved non-frost susceptible sand or gravel with a maximum of 6% passing the #200 sieve.

B. Unclassified Material: Inorganic soils, free of trash, peat, volcanic ash, debris, or frozen clods, which are capable of being satisfactorily compacted as required by the plans and these specifications.

C. Screened Material: Shall be crushed or naturally occurring granular material. It shall conform to the following gradation requirements:

MATERIAL GRADATION REQUIREMENTS (% PASSING)

SIEVE	1-1/2	3/4	3/8	#4	#10	#16	#50	#100	#200
SAND			100	95-100	45-80	10-30	0-10	0-3	
WASHED SAND					100		0-5		
PEA GRAVEL			100		0-5				
FILTER ROCK	100	0-5							

Foundry sand and other material which may be cementitious or that is otherwise not suitable for water percolation shall not be used.

D. Unsuitable Material: Soil materials which do not qualify as "classified," "unclassified," or "screened" material.

E. General Excavation: Any excavation of any type of material, including rock and frozen material, within the limits of excavation as shown on the drawings or called for in the specifications.

F. Over-Excavation: Any excavation beyond limits of the contract that has been done without the written authorization of the Owner's representative.

G. Additional excavation: Excavation beyond the limits necessary to place classified or unclassified material, where authorized in writing in advance by the Owners Representative.

H. Subgrade: The surface upon which classified material, topsoil, or new improvements are placed.

I. Area Grading: Area grading consists of the excavation and fill work, along the perimeter of the site, necessary for a smooth transition from the design site grades to the grade(s) of the adjacent properties. This work is also commonly called "site grading" or "overlot grading".

J. Non-Frost Susceptible Material (NFS): Granular soils free of organic material and containing less than three (3) percent by weight finer than 0.02 millimeters when compacted in place.

1.05 WEATHER LIMITATIONS

A. Unless otherwise authorized by the Owner's Representative, fill or backfill material, base course and leveling course shall not be placed when the atmospheric temperature is below 35 degrees Fahrenheit. When the temperature falls below 35 degrees Fahrenheit, it shall be the responsibility of the Contractor to protect all areas of completed work against any detrimental effects. Any areas of work not completed in accordance to the plans and specifications that are damaged by weather shall be reconditioned, reshaped, and re-compacted by the Contractor in conformance with the requirements of these specifications without additional cost to the owner.

1.06 EXISTING UTILITIES

A. At various stages of the project the Contractor will be required to work in close proximity to existing utilities, including possible removal of material over, under, and adjacent to the lines. It is the Contractor's responsibility to contact the utility owners for locations, scheduling, and additional information.

B. The Contractor shall protect existing utilities in a manner approved by both the Owner's Representative and the Utility Owner in writing. Costs to repair utilities that are damaged by Contractor’s operations shall borne by Contractor.

C. Compaction density and techniques shall conform to requirements for classified fill.

D. The Contractor is directed to contact the utility companies both prior to bidding and during construction, for information about existing utilities, scheduling, location and other pertinent information.

1.07 RELATED WORK

A. Sub-drains shall be as specified in Section 027210.
B. Storm drain shall be as specified in section 028000

PART 2 PRODUCTS

2.01 MATERIAL SOURCE

A. When the quantity of classified, unclassified, and screened soils required for the work exceeds that available from excavated materials, the additional material shall be from Contractor-furnished borrow areas. The Contractor shall locate, obtain, develop and process classified and unclassified materials to complete the requirements of work.

B. The source of materials shall be approved by the Owners Representative. Any change in the source of materials during the construction shall be approved by the Owners Representative.

2.02 MATERIAL HANDLING

A. When the soils into which the excavation will penetrate and/or when the backfill soils are sensitive to erosion, sloughing under seepage forces, softening during soaking, and/or repeated loading of heavy equipment, the Contractor shall take all necessary steps to protect the work. These may include, but are not limited to:

1. Sloping the excavation to drain and/or dewatering from inside the excavation with sumps and/or pumps or from outside the excavation with well-points or other means;

2. Limiting construction traffic to designated and maintained construction roads and placing additional temporary fill as necessary to support the traffic loads;

3. Developing alternate access routes;

4. Excavating with a smooth bladed backhoe from outside the excavation.

5. Covering of temporarily stockpiled unclassified fill to protect it from precipitation prior to reuse.

6. Using only dryer unclassified fills for compaction and reuse.

7. The costs to protect the work shall be included in the bid price for earthwork.

B. If the subgrade or backfill soils are disturbed by surface runoff, ponding, seepage, and/or construction traffic, the disturbed soils shall be regraded and densified to the density requirements specified herein or completely removed and replaced with classified materials compacted to the density requirements specified herein. The corrective work shall be performed by the Contractor at no additional expense to the owner.

2.02 GEOTEXTILE SEPARATION FABRIC

A. Non-Woven Fabric for The filter fabric shall be Amoco 4545, or equal as approved by the Engineer.

B. Woven Fabric shall be Amoco 2002, or equal as approved by the engineer.

PART 3 EXECUTION

3.01 CONSTRUCTION STAKING

A. General

The Contractor shall furnish all vertical and horizontal controls and staking sufficient for Contractor's needs to accurately complete the requirements of this project.

3.02 EXCAVATION

A. General

1. Excavation consists of the removal and reuse or disposal of all materials encountered to obtain the required subgrade elevations in accordance with the typical sections shown on the drawings, and as directed by the Owner’s Representative.

2. Classified and unclassified excavated materials shall not be removed from the site unless they are surplus to the requirements of the work and then only with the written approval of the Owner's Representative. Excess material not incorporated in the work and unsuitable material shall be transported to a contractor furnished disposal site. The drawings indicate the extent of the excavation required.

3. The excavation shall conform to the limits shown on the drawings and as directed by the engineer. Over excavation is not permitted without written approval of the engineer.

4. Excavation shall be performed in a manner that will not endanger adjacent structures or improvements.

B. Dewatering

Where excavation extends below the water table the Contractor shall plan his operation in a sequence that will provide drainage at all times. The excavation shall be shaped to drain and shall be maintained in a dry condition, free of puddles or holes where water may accumulate. Any areas that cannot be so drained shall be kept free of standing water by pumping, if necessary.

C. Roadways, Parking Areas, Walkways, and Paved Parking Areas

1. Excavation shall be carried to the subgrade elevations required for the placement of classified material and to such additional depths as required to remove all unsuitable material as directed by the Owner's representative.

2. Classified fill shall not be placed until the subgrade has been approved in writing by the Owner's Representative.

D. Building Pad

1. Excavation shall be carried to the subgrade elevations required for the placement of classified material and to such additional depths as required to remove all unsuitable material as directed by the Owner's Representative.

2. Classified fill shall not be placed until the subgrade has been approved in writing by the Owner's Representative.

E. Lawn and Slope Areas

1. Excavation shall be carried to the subgrade elevations required for the placement of classified material and to such additional depths as required to remove all unsuitable material as directed by the Owner's Representative.

2. Classified fill shall not be placed until the subgrade has been approved in writing by the Owner's Representative.

F. Additional Excavation

1. The Owner's Representative will inspect and approve the various subgrade areas as they are excavated. Owner’s Rep may direct that soils found to be excessively soft, wet, or otherwise unsuitable below the subgrade elevations shall be removed.

2. The Contractor shall promptly perform all such additional excavation that is authorized in writing.

3. The resulting additional excavation will be measured for unit price payment along with the original mass excavation.

4. Backfill shall be classified material.

G. Over Excavation

1. Over excavation shall be restored by the Contractor by backfilling with classified material and compacting to 95% of the maximum density at no cost to the Owner.

H. Stability of Excavations

1. The Contractor shall slope the sides of excavations to the angle required for safety, or shore and brace where sloping is not possible either because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in a safe condition until completion of backfilling, by scaling, benching, shelving or bracing. Take precautions to prevent slides or cave-ins when excavations are made in locations adjacent to backfilled excavations, and when sides of excavations are subjected to vibrations from vehicular traffic or the operation of machinery, or any other source. In all cases the sides of all excavations shall be constructed to satisfy the requirements set forth in the local, state, and federal safety regulations regarding shoring and slope angle.

I. Cold Weather Protection

1. The subgrade must be kept from freezing from the time earthwork begins until final grades have been achieved or backfill is done, unless specified otherwise, in writing, by the Owner's Representative.

2. All subgrade which is allowed to freeze shall be thawed and redensified to 95% of the maximum density by the Contractor at no expense to the Owner, unless specified otherwise, in writing, by the Owner's Representative.

3.03 FILL AND BACKFILL

A. General

1. Fill and backfill consists of the placement of classified and/or unclassified material in layers to the required elevations.

2. All excavated materials meeting the requirements for classified and unclassified materials shall be incorporated into the work unless they are surplus to the requirements of the work and the Owner's representative has given written approval not to use the material.

3. The Contractor shall keep all fills and backfill well-shaped, drained, and maintained.

B. Roads, Parking Areas, Walkways, and Paved Areas

1. Fills and backfills shall be constructed of classified material up to the bottom of leveling course.

2. The top six (6) inches shall have a maximum particle size of 2 inches.

3. Fills and backfills shall be constructed in lifts of twelve (12) inches maximum thickness, (six inches maximum thickness if hand operated compactors are used) and compacted to not less than 95% of maximum density. The finished surface of fills and backfills shall be smooth with no soft or yielding areas and shall be graded to not more than 0.05 feet above or below the design grade.

4. The Contractor shall backfill excavations as promptly as the work permits, but not until completion of the following:

a. Owner's acceptance of construction below finish grade such as culverts, subdrains, and other utilities.

b. Inspection, testing, approval, and recording locations of underground utilities.

c. Removal of shoring and bracing, and backfilling of any resulting voids with satisfactory materials. Cut off temporary sheet piling driven below the bottom of structures and remove in a manner to prevent settlement of the structure or utilities; or leave in place if required.

d. Removal of trash and debris.

e. Placement of permanent or temporary horizontal bracing on earth retaining wall.

C. Building Pad

1. All fills and backfills required to raise the grade of the building pad shall be made with classified material.

2. Fills and backfills shall be constructed in lifts of 12 inches maximum thickness and compacted to 95% of maximum density.

D. Cold Weather Protection

1. The fill and backfill must be kept from freezing from the time earthwork begins until final surfacing is complete, unless work is discontinued due to a seasonal shutdown. In the event work is suspended due to a seasonal shutdown, such as winter, the ground shall be completely thawed to all depths prior to resuming work.

2. All fill and backfills which is allowed to freeze shall be thawed and redensified to 95% of the maximum density by the Contractor at no expense to the Owner, unless specified otherwise, in writing, by the Owner's Representative.

3.04 AREA GRADING

A. Area grading fill shall be constructed of unclassified material. The top six (6) inches shall have a maximum particle size of three (3) inches. The finished surface of the fill shall be smooth with no soft or yielding areas and shall be graded to not more than 0.20 foot above or below the design finish grade. In those areas where the grade at the limit of grading is above or below the elevation of the adjoining natural surface, the design finish grade shall be maintained to the limit of grading, and the edge of the cut or fill feathered off to make a smooth transition) to the adjoining natural surface.

3.06 GEOTEXTILES

A. Filter Fabric

1. The subgrade shall be shaped according to the typical section shown on the drawings and as directed. The subgrade shall be free of large rocks, sticks, and deleterious material. Fabric shall be installed in full roll widths. All end and side joints shall be field sewn using a portable sewing machine as recommended by the fabric manufacturer and the sewing machine manufacturer.

2. Where fabric passes through a horizontal curve, the fabric shall be cut and sewn to affect the curve. Back lapping fabric on the inside of the curve will not be allowed. Where manholes, valve boxes, or other items will penetrate the fabric, the fabric shall be neatly cut in the shape of the penetration. A second piece of

fabric shall then be placed on top of the main fabric. The second piece shall extend at least four feet in all directions from the penetration.

3. Fill and backfill shall be dumped and spilled over the fabric. No equipment shall operate directly on the filter fabric. Filter fabric must be covered with at least one foot of classified material backfill before equipment is allowed to operate over it.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall provide all labor, material, equipment and supervision necessary for the furnishing and placing of the aggregate Base Course and Asphalt Concrete Pavement as shown on the contract drawings.

1.02 REFERENCE SPECIFICATIONS

All work in this section shall be in conformance to the "Standard Specifications for Highway Construction, 2004 Edition" of the Alaska Department of Transportation and Public Facilities (ADOT&PF), Section 301 (Aggregate Base Course), Section 401 (Asphalt Concrete Pavement), and Section 703 (Aggregates).

1.03 REFERENCE STANDARDS

A. Testing Standards for Asphalt Concrete Pavement

1. Cores: ASTM D979. "Sampling Bituminous Paving Mixtures".
2. Core Density: ASTM D 2726. "Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface Dry Specimens".
3. Thickness: ASTM D 3549. "Thickness and Height of Compacted Bituminous Mixture Specimens".
4. Nuke Density: ASTM D 2950. "Density of Concrete in Place by Nuclear Method".
5. Asphalt Content: ASTM D 4125. "Asphalt Content by Nuclear Method".
6. Gradation: ASTM C136. "Sieve Analysis of Coarse and Fine Aggregate".
7. Marshall Analysis (Stability):ASTM D 1559 and D 2726. "Resistance to Plastic Flow of Bituminous Paving Mixtures Using Marshall Apparatus". "Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface Dry Specimens".
8. Extraction: ASTM D 2172. "Quantitative Extraction of Bitumen from Bituminous Paving Mixtures".

B. Testing Standards for Base Course

1. Gradation: ASTM C 136. "Sieve Analysis of Coarse and fine Aggregate".
2. Density: ASTM D 2922 and ASTM D 3017. "Density of Soil-Aggregate in Place by Nuclear Methods, Shallow Depth". "Moisture Content of Soil in Place by Nuclear Methods, Shallow Depth".

3. Maximum Density: ASTM D 1557. "Moisture-Density Relations of Soil and Soil-Aggregate Mixtures Using 10 lbs. (4.54 kg) Rammer and 18 Inch (457 mm) Drop".

1.04 SUBMITTALS

A. Base Course: Contractor shall submit Gradation and Maximum Density test results for base course aggregate materials to be incorporated into the project.

B. Asphalt Concrete: The Contractor, at his expense, shall submit for approval, a Job Mix formula (with accompanying curves) within the limits established by the reference specifications, for the mix designated by this Contract. The Contractor shall also submit a certification that all materials provided under this project comply with the Job Mix formula and the project specifications.

PART 2 - PRODUCTS

2.01 BASE COURSE

A. Base Course material shall meet the requirements of ADOT&PF "D-1 Aggregate for Untreated Base".

2.02 ASPHALT CONCRETE PAVEMENT

A. Asphalt Concrete shall meet the requirements of ADOT&PF "Type II Asphalt Concrete".

PART 3 - EXECUTION

3.01 TESTING

A. Compaction tests shall be taken on at the average rate of one test per 5,000 square feet of area for both the Base Course and the Asphalt Pavement. Failing tests shall be retested at no additional cost to the Owner.

B. Gradation tests, in accordance with ASTM C 136, shall be performed on the Base Course at the rate of one test per 100 cubic yards or each day's haul, whichever is less.

C. Asphalt content and gradation tests shall be taken for the Asphalt Pavement at the average rate of one test per 5,000 square feet of area.

3.02 CONSTRUCTION STAKING

A. The Contractor shall provide construction staking (blue tops) for establishing proper grades on the leveling course on a nominal 50 ft grid plus all breaks in grade.

3.03 BASE COURSE

A. The base course material shall be deposited and spread in a uniform layer to the required contour and grade and to such loose depth that when compacted to the density required, the layer will be a minimum of 2" thick.

B. Blading, rolling and tamping shall continue until the surface is smooth and free from waves, bumps and depressions. The leveling course shall be compacted to at least 95 percent of maximum density. The surface of the leveling course , shall not show any deviation in excess of 3/8 inch when tested with a ten foot straightedge applied to the area to be paved. The surface grade shall not deviate more than 0.05 foot from the plan grade. Any deviation in excess of these amounts shall be corrected by loosening, adding, or removing material and reshaping and compacting to 95% of maximum dry density.

3.04 ASPHALT PAVEMENT

A. Weather Limitations
1. The mixing and placing of hot-mix asphalt shall be performed only when weather conditions are suitable.
2. No mix shall be placed when water is puddled or standing on the surface.
3. No mix shall be placed when the temperature of the surface on which the mix is to be placed is less than 45 degrees Fahrenheit except that, with the permission of the Owner's Representative, asphalt mixes may be placed upon surfaces having temperatures of not less that 35 degrees Fahrenheit provided hot-mix asphalt shall be delivered continuously to the paver at temperatures between 250 and 325 degrees Fahrenheit.

B. Asphalt Placement
1. Joints and edges shall be constructed without bumps or apparent seams.
2. The completed pavement shall have a minimum density of 96% of the maximum laboratory density as determined by ASTM D 2726 for the job mix.
3. The final surface shall be of a uniform texture conforming to true grade and cross- sections as shown on the plans. All irregularities which vary more than 3/16 inch in 10 feet, or 5/16 inch in 16 feet shall be corrected.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall provide all labor, material, equipment and supervision necessary for the furnishing and placing pavement marking as shown on the contract drawings.

1.02 REFERENCE SPECIFICATIONS

All work in this section shall be in conformance to the "Standard Specifications for Highway Construction, 2004 Edition" of the Alaska Department of Transportation and Public Facilities (ADOT&PF), Section 670 (Traffic Markings), and Section 708 (Traffic Paint),

1.04 SUBMITTALS

A. Paint.

1. Contractor shall submit type of paint, paint brand and specific product to be incorporated into the project.

PART 2 - PRODUCTS

2.01 PAINT TYPES

A. Use one of the following:

1. AASHTO M 248, Type F (Alkyd Resin).
2. FSS TT-P-19D(1) Paint, Latex (Acrylic Emulsion, Exterior)
3. The current State of Alaska DOT&PF maintenance specification for pavement marking paint.

PART 3 - EXECUTION

3.01 PAINT APPLICATION

A. Apply paint only to pavements that are clean, dry, and warmer than 40 °F.

B. Remove all dirt, oil, grease, and other foreign matter from the surfaces to be painted in a satisfactory manner.

C. Apply the paint at the rate of 80 ft^2/gal (approximately 20 mils wet film thickness). This rate is effectively 1 gallons of paint per 240feet of solid 4-inch stripe. A tolerance not to exceed 10% is allowed for film thickness or yield.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

This item consists of furnishing and installing standard signs and post assemblies per State of Alaska DOT/PF, Standard Specifications for Highway Construction 2004, Sections 615 and 730. The sign location (s) shall be as shown on the plans or as directed by the Engineer.

PART 2 PRODUCTS

2.01 SIGN MATERIALS

1. Sign Blank: Sheet Aluminum per ADOT Section 730-2.01

2. Sign Face: Reflective Sheeting per ADOT Section 730-2.03.

3. Posts: Square, non-perforated 2 ½" x 2 ½" x 3/16" hot dip galvanized, non-perforated steel tubing per ADOT Section 730-2.04 (6.)

PART 3 EXECUTION

3.01 GENERAL

Construction shall conform to DOT-PF, Section 615. Unless otherwise indicated, sign posts shall be 2½"x 2½" x 3/16" non-perforated steel tubing, set in concrete base as indicated on the drawings.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

Concrete sidewalks, exterior slabs, curbs and gutters.

1.02 RELATED SECTIONS

A. 033000 Concrete

1.03 QUALITY ASSURANCE

Perform work in accordance with Section 033000.

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete Materials: As specified in Section 033000.
B. Joint Filler: Asphalt impregnated wood fiberboard, 1/2" thick.
C. Reinforcing Steel: ASTM A615; 40 ksi yield grade: deformed billet steel bars.
D. Welded Steel Wire Fabric: Plain type, in flat sheets.
E. Dowels: Plain steel, uncoated finish.
F. Curing Compound: Spray on type, MB-429, manufactured by. Masterbuilders.
G. Joint Sealant: Asphaltic, pour applied type.

2.02 CONCRETE MIX

Provide concrete for the following characteristics:

A. Compressive strength at 28 days: 3000 psi.
B. Slump: 2-4 inches maximum.
C. Air entrainment: 5-7 percent.

PART 3 EXECUTION

3.01 FORMING

A. Place and secure forms to correct location, dimension, and profile.
B. Place joint filler vertical in position, in straight lines. Secure to formwork.
C. Place expansion joints at maximum 20 foot intervals, at points of curvature, at intersections or abrupt changes in direction and as indicated. Align joints.
D. Place joint filler between paving components and other appurtenances.
E. Score joints at 10' on center in curbs and at 5' on center in sidewalks.
F. Seal all joints with asphalt joint sealant.

3.02 REINFORCEMENT

A. Reinforce all exterior slabs with 6x6-W10/W10 welded wire mesh unless noted otherwise.
B. Place reinforcement at mid-height of slabs-on-grade.
C. Interrupt reinforcement at expansion joints.

3.03 PLACING CONCRETE

A. Place concrete in accordance with ACI 301 and Section 033000.
B. Do not disturb reinforcement or formwork components during concrete placement.
C. Place concrete continuously between predetermined joints.

3.04 WEATHER LIMITATIONS

Comply with weather limitations specified in Section 033000.

3.05 FINISHING

A. Sidewalk, slab, and curb and gutter surfaces: Light broom, 3/4 inch radiused and troweled edges.
B. Apply curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section covers all Labor, equipment, material and supervision to complete the water service to the building in accordance with the drawings.

1.02 SUBMITTALS

A. The Contractor shall submit for approval manufacturer's specifications, drawings, and recommendations for all materials incorporated into the project. The submittal shall include manufacturer's published data, engineering data, letter of certification or certified test laboratory report indicating that each material complies with specified standards and other requirements.

B. Contractor shall submit gradation test results for all contractor furnished soils materials to be incorporated into the project. Hydrometer test results shall be required for Contractor furnished classified soils materials to be incorporated into the project.

1.03 RELATED WORK

A. SECTION 02200 EARTHWORK

1.04 APPLICABLE STANDARDS

A. The most recent revisionof the following standards of the American Society for Testing and Materials (ASTM) and the American Association for State Highway and Transportation Officials (AASHTO), the American Standards Association (ASA) and the American Water Works Association (AWWA) are hereby made part of these specifications:

ASTM D3035	Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) based or Controlled Outside Diameter.
ASTM D3261	Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for PE Plastic Pipe and Tubing.
ASTM D3350	Specification for Polyethylene Plastic Pipe and Fitting Materials
AWWA C-115	Rubber Gasket Joints for Cast Iron and Ductile Iron Pipe with Threaded Flanges.
AWWA C-500	Gate Valves.
AWWA C-502	Dry Barrel Fire Hydrants.
AWWA C-601	Disinfection of Water Mains.
AWWA C-901	Standard for Polyethylene (PE) Pressure Pipe and Tubing.

1.05 TRENCH COMPACTION TESTING

A. Where compaction density is specified, the maximum density shall be determined in accordance with the current requirements of ASTM D 4253.

B. The in-place soil density may be determined by use of:
Nuclear densometer - ASTM D 2922.
Sand cone - ASTM D 1556.
Rubber balloon - ASTM D 2167.

C. Compaction tests shall be taken on each lift of fill or backfill, including trenches, at the average rate of one test per 200 feet of trench. Failing tests shall be retested at no additional cost to the Owner.

D. A gradation test, in accordance with ASTM D 422, shall be performed on each type of material used in fills and backfills. If material is to be non-frost susceptible, hydrometer tests shall be performed in accordance with ASTM D 422.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS

A. High Density Polyethylene (HDPE) Pipe:

1. Pipe and Fittings shall be manufactured in accordance with AWWA C906.

2. The pipe and fitting material shall have a cell classification of 345434C or better in accordance with ASTM D3350. Pipe and Fitting material shall contain color and Ultraviolet stabilizer meeting or exceeding requirements of Code C per ASTM D3350.
3. Electrofusion fittings shall comply with ASTM F1055.

4. All fittings shall have pressure class ratings not less than the pressure class rating of the pipe to which they are joined.

5. The extruded pipe shall have impact strengths greater than three foot pounds per inch (3ft-lv/in) in accordance with ASTM D256 Izod Impact Test.

6. The material shall be listed by the National Sanitation Foundation (NSF) for potable water service and shall bear markings on the pipe indicating NSF listing for potable water service.

B. Flanged Fittings at Gate Valve, Saddle, Hydrant and Riser.

1. Provide fused flanges with Class 150 epoxy coated ductile iron backup rings conforming to ASTM A536 grade 65/45/12, 150 psi rated.

2. Bolts shall conform to AWWA C-111 with Xylan coating, ROMAC R-Blue, or approved equal.

3. Butyl rubber gasket joints shall conform to AWWA Specification C-111. Provide 1/8 inch thick cloth inserted rubber full face type meeting the requirements of ANSI B16.21 and AWWA C207. Provide gasket materials free from corrosive alkali or acid ingredients and suitable for use in potable water service.

2.02 VALVES AND VALVE BOXES

A. GATE VALVES:

1. Gate valves shall be iron body, fully bronze mounted, double disc, resilient seat valves. Valve shall comply with AWWA Specification C-509. All valves shall have non-rising stems, an O ring seal, a two-inch square operating nut, and open counterclockwise. Valves shall have flanged ends.

2. Manufacturer: Mueller, or approved equal.

B. VALVE BOXES:

1. Valve boxes shall be cast iron of sliding adjustable height type with round bottom hood sections to fit over the top of the valve. The top section shall be recessed to receive a closed fitting "eared" lid with the word "water" cast into it. Casting shall be smooth with a 5/16" minimum thickness and a minimum of 5" internal diameter and of sufficient length

to extend from the pipe to the ground surface. Valve box sections shall be dipped in coal-tar pitch. Dust pans shall be installed in all valve boxes including hydrant valves.

2.03 FIRE HYDRANTS

A. Fire hydrants shall be conform to the requirements of AWWA C-502 for Dry barrel Fire Hydrants. Hydrants shall be American Darling B-62-B. No substitute will be allowed. Provide hydrant with flanged connection compatible with flanged connection to hydrant leg. Furnish hydrant with break away traffic flange.

B. All "single pumper" hydrants shall have two 2½" hose connections and one 4½" pumper connection. Main valve shall be 5 ¼".

C. Painting and coating shall be in accordance with the cited AWWA Specification for dry barrel fire hydrants, Section 4, Article 4.2 (Paint). Color of paint shall be "Caterpillar Yellow".

D. The adjustment of hydrant barrel and valve box to the required finish grade will be at the expense of the Contractor.

E. All hydrants shall have drain outlets at the base of the barrel. Plugs shall be removed prior to installation.

F. Operating nozzle nuts shall be pentagon shaped with one and one half inch (1 ½") point to flat dimension.

2.04 CONCRETE

A. General.

1. Concrete shall be in accordance with Section 03300.

2. Concrete for thrust blocks and piping supports shall have a minimum 28 day compression test strength of 3,000 psi, maximum 1½" aggregate, and maximum slump of 3".

PART 3 - EXECUTION

3.01 UNDERGROUND PIPING

A. Construction Staking

1. The Contractor shall furnish the following surveys for construction staking:

   a. The limits of clearing will be flagged by stringing ribbons, placing stakes, or otherwise identifying the boundary of the areas to be cleared.

   b. Two offset hubs with guard stakes shall be placed to mark the offset and cut to the invert of each tee, bend, valve, hydrant, vertical grade change, and service connection on the waterline. On longer lines, additional stakes shall be provided to mark line and grade at two hundred foot intervals.

B. Line and Grade

1. Horizontal distances are from center to center of fittings or appurtenances, unless otherwise noted. Elevations are to pipe invert.

2. The Contractor shall provide a competent surveyor to maintain line and grade during all pipe laying operations with a transit and engineer's level at no additional cost to the Owner.

3. The pipe shall be so laid in the trench that after the line is completed the interior surface thereof conforms accurately to the grades and alignment given on the plans. A maximum 0.2 foot deviation from design elevation and alignment will be allowed. The pipe shall be straight to the eye, unless otherwise called for on the plans.

4. All adjustments to line and grade shall be done by scraping away or filling the earth under the body of the pipe and not by blocking or wedging up.

5. Any time pipe has to be deflected around curves where no fittings are used, the line and grade shall be staked at intervals of each length of pipe.

6. All survey work shall be incorporated to provide complete as-built drawings of the water system

C. Trench Excavation

1. General

a. Contractor shall accomplish all excavation required by the contract drawings through whatever substances encountered. All excavation shall be accomplished in accordance with the State of Alaska safety code and other applicable safety requirements.

b. Unauthorized excavation below the required grade line shall be backfilled with approved material and mechanically compacted to 95% of maximum density at the expense of the Contractor.

c. If material encountered in the trench is unsuitable for use as trench backfill as determined by the Owner's Representative, the material shall be designated as 'Unusable Excavation' and hauled off and disposed of at a Contractor furnished disposal site. Type II classified material shall then be provided by the Contractor to replace the disposed material.

2. Water Removal

a. During excavation and pipe installation, the Contractor shall remove by pumping or other approved means, all water above the bottom of trench.

3. Limits on Open Trenches

a. The maximum length of open trench shall be 400 feet; however, should this maximum length be considered detrimental to public safety, it may be reduced at the discretion of the Owner's Representative. No more than 100 feet of trench may remain open over night.

D INSTALLATION

1. Pipe

a. Water line may be bedded in in-situ material.

b. All pipe shall be laid in compliance with AWWA C-600 with a minimum of 7 feet of cover and shall not be less than 7 feet below finished grade of road centerline. True line and grade shall

be kept with the spigot end fully seated into the adjacent bell. Backfill under and around the pipe shall be fully tamped so that no voids exist that will allow bridging or settlement of the pipe.

c. All faulty workmanship and all materials found to be defective before or after installation shall be replaced, repaired or corrected to meet the specification requirements without additional expense to the Owner.

d. Cutting of pipe shall be done in a workmanlike manner as recommended by the manufacturer and approved by the Owner.

e. Open ends of pipe and appurtenances shall be protected with an approved plug at all times to prevent earth or other substances from entering the pipe.

2. Joints and Fittings

a. Pipe Fusion all joints for HDPE pipe and fittings shall be accomplished by butt fusion. All joining shall be accomplished in accordance with the pipe manufacturer's recommendations as to equipment and technique. The fusion operation shall be performed by an individual who has demonstrated the ability to fuse polyethylene pipe in the manner recommended by the pipe manufacturer. The individual performing the fusing procedure must hold a current certification for fusing HDPE in accordance with the Plastic Pipe Institute standard TR-33 Butt Fusion Joining Procedure.

b. Joining pipe to valves and saddles shall be made with flanged joints.

3. Pipe Deflection

When it is necessary to deflect HDPE pipe from a straight line in either the vertical or horizontal plane, or where long radius curves are permitted, the amount of deflection shall not form a radius of less than 40 pipe diameters.

4. Joint Restraint at Hydrants.

a. Unless tie rods are used, concrete thrust blocks shall be installed at all tees, crosses, and bends, or combination of bends, 11¼

degrees or greater in deflection. Precast blocks may be used where approved by the Owner. Precast blocks shall bear on undisturbed trench walls.

No voids will be allowed between the bearing portion of the precast block and the undisturbed trench wall.

b. Thrust blocks shall provide a minimum of 6 square feet of bearing area against surrounding soils.

5. Tie Rods

All water service lines used for fire protection shall have tied back joints for at least 40 feet from each end and from each fitting. Use 3/4" threaded steel rod, coated with a heavy duty bituminous coating, applied per manufacturer's recommendations. Tie rods shall be connected to the pipe at intervals less than 27 feet.

6. Trace Wire

All HDPE pipe shall be installed with a no. 6 bare copper locate trace wire. Trace wire shall be secured to the top of the pipe with tape or other approved method at intervals of 10 feet or less.

7. Flushing

a. Before the pressure or leakage tests are performed and before the system is sterilized, all newly laid mains shall be thoroughly flushed to remove all foreign material. The Contractor shall provide for "open bore" flushing so that all parts will be cleaned. The use of fire hydrants for this initial flushing will not be permitted. Flushing times shall be at the discretion of the Owner and utility.

b. In the event repeated flushing is necessary to approve and certify the system, such flushing shall done at the expense of the Contractor.

c. A representative of the Owner and Contractor shall be present for all flushing and testing.

8. Connect to Existing Waterline

a. Connections to the existing waterlines shall be coordinated with the City of Homeri Public Works Department. The City will shut off the water for the Contractor. The Public Works Director shall be given 24 hours notice prior to any shutdown of existing

water facilities. Maximum allowable shutdown time shall be four hours.

9. Sewer Line Crossing

a. Where water mains cross below or within three feet above an existing sewer line, the Contractor shall replace the sewer main for a minimum distance of 10 feet each side of the water main measured perpendicular to the water main with cast iron or ductile iron pipe using watertight joints, or encase the sewer line in concrete 10 feet each side. Encasement shall be 4 inch minimum thickness all around pipe and reinforced with 4"X4" 14/14 welded wire fabric all around.

b. The waterline shall not cross a sewer line with less than 18" clearance. If an existing sewer line is found to be closer than 18" from the proposed waterline, deflect the line as required to provide 18" clearance. Advise Owner's Representative of proposed changes as soon as possible.

10. Valves

a. Valves and valve boxes shall be installed where shown on the plans. Valves shall have the interiors cleaned of all foreign matter before installation. The valve shall be inspected in the open and closed position to insure that all parts are in working condition.

b. Stuffing boxes shall be tightened prior to installation. The base of the hood section shall rest on compacted fill and should be approximately two inches above the flanged joint of the valve dome.

c. The valve box assembly shall be plumb and accurately centered over the valve operating nut. The top section shall be so set as to permit vertical adjustment above or below finished grade. On gravel streets the top of the valve box shall be set three inches below the surface and on paved streets one quarter inch (¼) below finished grade. Earth fill shall be carefully compacted around each valve box. Burlap or rubber shall be wrapped around the base of the valve box. Dust pans shall be installed in all valve boxes. An alignment pole shall be used on each valve to insure the bottom and 10 foot sections are straight.

d. Install steel pipe valve marker posts, painted yellow with black letters facing valve box with number of feet to valve box.

11. Fire Hydrants

a. Fire hydrant assemblies shall be installed where shown on the plans. Hydrant barrels shall be installed plumb. The hydrant barrel shall be wrapped full height with two layers of four-mil polyethylene, securely fastened to the barrel.

b. The Contractor shall install hydrants with the flange a minimum of 2 inches and a maximum of 6 inches above finished grade. Backfill along the hydrant lead shall be in accordance with the section covering pipe backfill and compaction.

c. Hydrants shall have tie rods from hydrant tee to valve and valve to hydrant barrel using 3/4" OD black iron or mild steel coated with a bituminous corrosion resistant material.

d. All hydrants shall be installed with separate thaw pipes for the barrel and supply leg.

e. If shown on the drawings, install guard posts in accordance with the details.

E. BACKFILL

1. General

a. After the lines have been inspected and tested, the trenches shall be backfilled. Backfill may be accomplished prior to testing at the Contractor's risk.

b. Unsuitable or surplus excavated materials shall be removed from the area. Contractor shall furnish additional backfill materials, if required, from off-site sources.

c. The Contractor shall carefully place and thoroughly compact backfill around and above the pipe to 95 percent of maximum dry density.

d. Material shall be compacted in maximum 12 inch lifts. The Owner's Representative may require shallower lifts to facilitate proper compaction.

F. TESTING

1. General

a. After open bore flushing, and prior to installing water service connections, all newly laid water mains and appurtenances shall be subjected to pressure and leakage tests as specified herein. Said testing shall be done at the expense of the Contractor. This work shall be considered incidental to the installation of the water utility system, and shall not be paid for separately.

b. A representative of the Owner, the City of Homer, and the Contractor shall be present for all testing.

2. Pressure Test

a. Before applying the specified test pressure, all air shall be expelled from the pipe. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks at such points so that air can be expelled as the is filled with water. The newly laid piping, or any valved section thereof, shall be subjected to a hydrostatic pressure test of 150 psi. After the required test pressure has been reached, the pumping will be terminated. If the pressure (150 psi) remains constant for 30 minutes without the aid of a pump, the waterline will not be subjected to any further hydrostatic test. If the pressure does not remain constant for 30 minutes, a leakage test will follow. All valves within the section of line being tested will be closed and reopened after the required pressure (150 psi) has been obtained and prior to the 30 minute constant pressure test.

3. Leakage Test

a. The duration of each leakage test shall be at least two hours and during the test the main shall be subjected to a constant pressure

of 150 psi for two hours. Leakage for any newly laid pipe or any valved section thereof is defined as the quantity of water that is necessary to maintain the specified leakage test pressure after the pipe had been filled with water and the air is expelled.

b. The allowable leakage per 100 feet of main at 150 psi is as follows:

Pipe Diameter (Inches)	Gallons per Hour
6	.06
8	.08
10	.10
12	.12

c. Cracked or defective pipe, gaskets, mechanical joints, fittings, valves or hydrants discovered as a consequence of the hydrostatic tests shall be removed and replaced with sound material at the contractor's expense. The test shall then be repeated until the results are satisfactory.

4. Continuity Test

a. The electrical continuity test will be taken with a gasoline powered welder. The continuity will have to register a minimum load of 600 amperage for a period of 15 minutes. Such test will be performed by the Contractor with a representative from the Owner present.

G. DISINFECTION

1. General

a. After pressure, leakage, and continuity tests and before being placed into service, all newly laid water mains shall be thoroughly disinfected by the Contractor.

2. Method of Disinfection

a. Calcium hypochlorite solution shall be supplied by Contractor for sterilization.

b. The chlorinating agent shall be applied at the beginning of the section adjacent to the feeder connection and shall be injected through a corporation cock, hydrant, or other connection insuring treatment to the entire line. Water shall be fed slowly into the new line with chlorine applied in amounts to produce a dosage of 40 to 50 ppm through the entire extent of the new system. The disinfecting agent shall be allowed to stand in the mains for at least 24 hours.

c. A residual of not less than 5 ppm chlorine shall remain in all parts of the line after 24 hours of detention time. During the chlorination process, all intermediate valves and accessories shall be operated. Valves shall be manipulated so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water. After chlorination, all water with a higher chlorine content than that at the permanent source of supply shall be thoroughly flushed from all parts of the new system.

d. All test coppers and air vent coppers shall be disconnected and removed from the main and the corporation stop turned off before the line is accepted.

H. Existing Utilities

1. Contractor is responsible for the protection of all existing underground, surface and overhead utilities and for the protection of adjacent structures. Plan locations of existing underground facilities are to be considered approximate only and shall be verified with the owning utility by the Contractor. The methods used to protect existing utilities, appurtenances, structures, etc., shall be subject to the approval of the Owning Agency.

2. Contractor shall verify location of and elevations of existing waterlines that new lines tie into prior to construction.

I. As-Built Drawings

1. The Contractor shall provide a red-lined blueline drawing prior to final payment showing as built information for the following:

a. Horizontal location and elevation at least every 100 feet along the pipe and of all tees, bends, changes in grade and end of any dead-end runs.

b. Horizontal location for all valves, hydrants, bleeders, change in pipe size or class. In addition to stationing, location of valves shall also be shown by three (3) swing ties from each valve to appropriate prominent features. Swing ties shall not exceed 100' in length without the written consent of the Owner's Representative.

c. Horizontal and vertical location of any other utilities intercepted in the trench.

d. Type and depth of bedding used, if any.

e. Accurate detail and location of any unique tie-ins, special combination of fittings, etc.

f. On service key boxes, show station on mainline for corporation stop, length and size of service line, location of key box by 2 or more swing ties and station and offset to terminus. Swing ties to be as close to 90 degrees to one another as possible and shall not exceed 100' in length.

g. If adequate as-built data is not provided as defined above, the Owner may perform an as built survey and deduct the cost from moneys due the Contractor.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Work included:
The work under this section consists of providing all operations pertaining to the construction required for sanitary sewer service connections.

B. Related Work Specified Elsewhere

Earthwork	Section 022000

1.02 QUALITY ASSURANCE

A. Qualifications of Workmen:

1. To perform the work of this section, employ at least one thoroughly experienced supervisor who is familiar with the materials, equipment, and operations required, and who shall be present at all times during actual construction and direct all operations under this section.

2. In the acceptance or rejection of work of this section no allowance will be made for lack of skill on the part of the workmen.

3. Employ qualified engineers or surveyors for the establishment of lines and grades.

B. Referenced Standards

The latest revision of the following standards of the the American Standards Association (ASA):

ASA A-21.10	Cast Iron Fittings
ASA A-21.11	Cast Iron Joints

1.03 SUBMITTALS

Submit manufacturer's product data and installation instructions for each product specified for installation.

PART 2 PRODUCTS

2.01 EQUIPMENT

The Contractor shall utilize equipment both suitable for the work intended and appropriate for the weather and conditions encountered.

2.02 MATERIALS

A. Pipe and Fittings.

All sanitary sewer service connects shall be constructed with hub and spigot style cast iron pipe and fittings with “Ty-seal” joints.

1. Pipe shall and fitting shall conform to ASTM A-74, ANSI A112.5 and Federal Spec WW-P-401E.
2. Gaskets shall be neoprene and shall conform to ASTM C-564.

B. Insulation

Insulation shall be DOW Styrofoam “HI-40” extruded polystyrene ‘blueboard’ and shall be furnished in 2’ or 4’ wide x 8’ long x 2” thick sheets.

C. Saddle

Saddle at main shall be Romac CB-4.28 saddle or equal and shall be secured to the main with a single, 304 stainless steel band of three and one-half inches (3-1/2”) inches or more in width.

PART 3 EXECUTION

3.01 JOB CONDITIONS

A. Inspection:

Prior to beginning any of the operations of this section, become thoroughly familiar with the site, site conditions, and all portions of the work affected by the installation of the sewer system.

B. Discrepancies:

In the event of discrepancy, ambiguity, interference, or any other unanticipated condition which might impede timely installation under this section immediately notify the Owner's Representative and do not proceed in the questioned areas until resolution or clarification has been obtained.

C. Survey:

The Contractor shall be responsible for all construction surveying of underground sewer pipe utilities .

3.02 INSTALLATION

A. TRENCH EXCAVATION AND BACKFILL

This work shall consist of all excavation and backfill required for sewer service installation and all other related work as specified in this section.

1. Excavation

a. All excavation shall be unclassified and the Contractor shall do all excavation of whatever substances encountered, including rock and frozen ground, to the depth shown on the plans. where distinct surface layers are encountered, of topsoil, clay, silt, peat or other materials undesirable for inclusion in the backfill, these materials shall be segregated into separate stockpiles during the excavating.

b. Survey. Lines and grades shall be carried by means of transit and level, or approved equivalent. Whenever there is an indication of a discrepancy in grade, the Owner's Representative shall be consulted and the grade changed or approved before proceeding with work.

c. Utilities:
All water lines, sewers, gas lines, or other utilities encountered in excavation of the trenche or appurtenances shall be supported and protected from injury throughout the entire construction period until adequate backfill has been completed.

d. Water Removal:
Ground adjacent to the excavations shall be graded to prevent water from running into the trench. The Contractor shall remove, by pumping or other means, any water accumulated in the excavation which is detrimental to the proposed installation of the sewer lines, appurtenances and structures.

2. Backfill.

a. Bedding. The service connections shall be bedded with material excavated from the trench. The bedding shall be laid the full extent of ditch and up to the spring line of the service connect.

b. The remainder of the backfill shall be free of extraneous material such as trees, stumps, trash and large boulders. Backfill shall be placed in lifts and compacted in a manner such that 95% of maximum density is obtained.

B. PIPE LAYING

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 the naked eye. 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. Each section of pipe shall be properly supported to insure true alignment and an invert which is smooth and free from roughness or irregularity.

2. 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 substances will enter the pipe or fittings.

3. Minimum slope shall be 2 % for 4” pipe and 1% for 6” pipe.

C. Main Line Tap.

1. Taps shall be made with a mechanical hole cutter as manufactured by the Pilot Manufacturing Company or equal. Tee and wye saddles will be allowed on mains twelve inches (12”) and larger. Tee saddles will be the only saddles allowed on mains smaller than twelve inches (12”).

2. All service connections to sanitary sewer mains shall be approved cast iron or “Ty-seal” pipe. Saddles shall be placed over a hole sawed no larger than one-eighth inch (1/8”) larger than the inside diameter of the service line. The strap(s) shall be tightened in accordance

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Work included:

This Section covers the pipe laying, jointing and testing of storm drain systems, constructionof a stormwater pil and sediment separator and adjustments to existing storm drain systems. The construction of these systems shall meet the requirements herein and as shown on the Plans.

B. Related Work Specified Elsewhere

1. Earthwork Section 02200

C. Subsurface Data:

Subsurface investigations have not been performed at the project site and the engineering designs incorporated into the Contract Documents are predicated upon the assumption that suitable non frost susceptible soils will be encountered in the excavation. It is expressly understood that neither Owner's Representative, Engineer, nor Owner will be responsible for interpretations or conclusions drawn regarding subsurface conditions by Contractor.

D. Dewatering:

All work necessary to dewater the excavation as will be necessary to construct items covered in this section.

1.02 QUALITY ASSURANCE

A. Qualifications of Workmen:

1. To perform the work of this section, employ at least one thoroughly experienced supervisor who is familiar with the materials, equipment, and operations required, and who shall be present at all

times during actual construction and direct all operations under this section.

2. In the acceptance or rejection of work of this section no allowance will be made for lack of skill on the part of the workmen.

3. Employ qualified engineers or surveyors for the establishment of lines and grades.

B. Referenced Standards

The latest revision of the following standards of the American Society for Testing and Materials (ASTM), The American Association for State Highway Officials (AASHTO), the American Standards Association (ASA), and the American Water Works Association (AWWA) are hereby made a part of these specifications.

ASTM C-478	AASHTO-199 Specification for Precast Reinforced Concrete
ASTM C 443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
AASHTO M-36	Corrugated Aluminum Pipe & Fittings
AASHTO M-196 /M-197	Corrugated Aluminum Pipe & Fittings
AASHTO M-190	Bituminous Coating of CMP
AASHTO M-45	Sand for Cement Mortar
ASTM C-6	Hydrated Lime
ASTM A-48 / ASTM A-438	Strength Requirements for Manhole Frames and Covers
ASTM D-1248	Polyethylene Plastics Molding and Extrusion Materials, Type III High Density
ASTM D-3035	Polyethylene Plastic Pipe (SDR-PR) Based Controlled Outside diameter.
ASTM D-3350	Polyethylene Plastic and Fittings Materials
ASTM D-4097	Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks

1.03 SUBMITTALS

Submit manufacturer's product data and installation instructions for each product specified for installation.

1.04 ABBREVIATIONS

Corrugated Metal Pipe	CMP
Gauge	Ga.
Invert	Inv.
Top of Casting	TC
Catch Basin	CB
Manhole	MH

North	N
South	S
East	E
West	W
Edge of Pavement	EP
Diameter	D
Slope	S

PART 2 PRODUCTS

2.01 EQUIPMENT

The Contractor shall utilize equipment both suitable for the work intended and appropriate for the weather and conditions encountered.

2.02 MATERIALS

A. Corrugated Metal Pipe:

Corrugated metal pipe is intended to refer to both steel and aluminum. The pipe shall conform to the following specifications:

1. Steel: Corrugated steel pipe shall meet the current requirements of AASHTO Specifications Designations M-36. Corrugations may be either annular or helical. Pipe with helical corrugations or a continuous lock seam paralleling the corrugations or a continuous welded longitudinal seam extending from end to end of each length of pipe. The seams will be fabricated in such a manner that they will not affect the shape of the nominal diameter of the pipe and so that they do not create an element of weakness in the pipe. The pipe shall be fabricated form galvanized coiled sheets of strips as provided under AASHTO Specifications M-36.

2. Aluminum: Corrugated aluminum pipe shall meet the requirements of the current AASHTO Specification Designation M-36 and M-197. Corrugations may be either annular or helical.

All wyes and fittings for corrugated steel and aluminum pipe shall meet the current requirements of AASHTO Specification Designation M-196 and M-197 and the manufacturer's recommendations.

Jointing for corrugated steel and aluminum pipe shall be made through the use of one-piece coupling bands applied as recommended by the manufacturer and approved by the Owner's Representative. Any aluminum pipe of aluminum fittings found in

contact with dissimilar metal will be removed and reinstalled. Nonconducting material must be used to prevent corrosion. Insulation material recommended by the manufacturer should be used. Other materials approved by the Owner's Representative may be used. All angles, bolts and nuts shall be as recommended by the manufacturer for the type of pipe used and as approved by the Owner's Representative. All corrugated metal pipe requiring bands shall be furnished with annular ends and annular coupling bands. The metal gage for pipe to be used shall be as shown on the Plans and/or as noted in the Contract Documents.

All pipe shall be of a true circular cross section

Aluminum pipe shall not be placed in direct contact with steel or other metal. Where it is necessary to repair an existing facility by replacing a section of steel with aluminum, or aluminum with steel, a proper insulation of the two (2) dissimilar metals will be effected by use of a bituminous coating, rubber or neoprene sheeting, special fabricated coupling, or concrete expansion block or other methods as approved by the Owner's Representative.

All welding performed by the Contractor on aluminum pipe shall incorporate the use of 4043 of 5356 alloy for welding wire. The welding shall be accomplished by either the "TIG" tungstem, (inert gas shielded) or "MIG" (metal arc welding inert gas shielded) process.

B. Corrugate Polyethylene Pipe (CPEP)

Corrugated Polyethylene pipe shall conform to the following specifications:

1. Three inch through ten inch (3" through 10") diameters: the requirements of AASHTO M-252.
2. Twelve inch (12") and larger diameters: the requirements of AASHTO M-294.

3. The corrugated Polyethylene Pipe covered by these specifications is classified as follows:

   a. Type C - This pipe shall have a full circular cross-section with a corrugated surface both inside and outside. Corrugations may be either annular or helical.

b. Type S - This pipe shall have a full circular cross-section, with an outer corrugated pipe wall and a smooth inner liner. Corrugations may be either annular or helical.

c. Type CP - This pipe shall be Type C with Class 2 perforations.

d. Type SP - This pipe shall be Type S with Class 2 perforations.

4. All CPEP fittings shall be rotational or blow molded and shall conform to the fitting requirements of AASHTO M-252 or M-294.

5. Contractor shall join CPEP segments per the manufacturer's recommendations. When a bell and spigot joint is utilized, the Contractor shall ensure that the rubber gasket is correctly inserted into the joint and that the bell is on the upstream end of the pipe.

6. For connections not using manufactured couplings, the Contractor shall join three inch to ten inch (3" - 10") CPEP with couplings corrugated to match the pipe corrugations or with push-on couplings with locking devices. Contractor shall join twelve inch (12") and larger CPEP with couplings, corrugated to match the index in the pipe corrugations and in a width not less than three-quarters (3/4) of the nominal pipe diameter. All couplings shall be manufactured to lap equally to a distance on each jointed pipe, to no less than the diameter of the pipe and shall provide a positive means of closure.

7. All flared end sections and saddles shall be constructed of the same material as the pipe and shall be factory assembled units to serve as structural, hydraulic, and/or aesthetic end treatment to CPEP culverts. CPEP connections shall be as recommended by the manufacturer. The cost of the end section and saddles shall be incidental to the pipe.

8. CPEP may be connected to CMP or may be used between or connected to dissimilar metals. When CPEP is used as a connection, the Contractor shall construct the connection utilizing a joint specifically manufactured for that type of connection.

9. Contractor shall not insert any portion of the bell of CPEP pipe into any manhole, catch basin, or catch basin manhole unless that portion will be completely removed when the pipe is trimmed to two inches (2") inside the manhole .

C. Manholes and Catch Basin Manholes

Materials used in the construction of manholes shall conform to the requirements of ASTM Specification Designation C-478 and Standard Details. Cones shall be Type (b), eccentric, unless otherwise approved.

Forty-eight (48) inch reinforced concrete pipe may be used for manhole riser sections as an alternate. This pipe shall conform th ASTM specifications Designation C-76 with a minimum thickness of five (5) inches.

Each precast concrete barrel section shall be set and sealed by use of a plastic gasket pipe joint sealer as manufactured by K.T. Snyder Co., Inc., Ram-Nek Gasket Division, 2100 Travis Street, Houston, TX or equal.

Use of, and installation of, these pre-molded plastic gaskets for manhole construction shall be strictly in accordance with the manufacturers printed instructions. Ram-Nek Gaskets will be trimmed on the inside of the manhole to prevent the excess gasket material from entering the storm or sanitary sewer lines.

Cement for mortar used in the construction of manholes shall conform with ASTM Specifications Designation C-150, Type II. Sand shall conform with AASHTO Specifications M-45. The mortar shall be composed of one(1) part cement and three (3) parts sand. The joints shall be made so as to produce a smooth, regular watertight surface. Only enough water shall be added to provide plasticity in placing the mortar.

The grout requirement for tensile strength of the gray cast iron shall be 30,000 PSI minimum as per ASTM A 48 and the requirement for transverse breaking load shall be 2,000 pounds as per ASTM 438

D. Catch Basin

Materials used in the construction of catch basins shall conform to the requirements of ASTM Specification Designation 478-M and Standard Details. Cement for mortar used in the construction of catch basins shall conform with ASTM Specification Designation C-150, Type II. Sand shall conform with AASHTO Specification Designation M-45.

E. Insulation

Insulation shall be DOW HI-40 Extruded Polystyrene Insulation, or approved equal. Insulation shall be furnished in 2'x8'x2" thick sheets.

F. Water and Sediment Separator

1. General.
   a. The separator shall be circular and constructed from pre-cast concrete circular riser and slab components. The internal fiberglass insert shall be bolted and sealed watertight inside the reinforced concrete component. The separator shall be capable to be used as a bend or junction structure within the stormwater drainage system.

   b. Specified product is 'Stormceptor- STC 450i', 450 gallon capacity, or approved equal.

2. Precast Concrete Sections.
   All precast concrete components shall be designed and manufactured to a minimum live load of AASHTO HS-20 truck loading or greater based on local regulatory specifications.

3. Joints.
   The concrete joints shall be water-tight and meet the design criteria according to ASTM C-443. Mastic sealants or butyl tape are not an acceptable alternative.

4. Frame and Cover.
   The frame and cover shall include an indented top design with lettering of the unit's name cast into the cover to allow for easy identification in the field.

5. Concrete.
   All reinforced concrete components shall be manufactured according to local specifications and shall meet the requirements of ASTM C 478.

6. Fiberglass.
   The fiberglass portion of the water treatment device shall be constructed in accordance with the following standard: ASTM D-4097: Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks.

7. Inspection.
   All precast concrete sections shall be inspected to ensure that dimensions, appearance and quality of the product meet local specifications and ASTM C 478

8. Performance.

   a. The stormwater treatment system shall remove oil and sediment from stormwater.

   b. Total Suspended Solids
      The treatment system shall be capable of removing 80 percent of the average annual total suspended solids (TSS) load without scouring previously captured pollutants. Design methodologies shall provide calculations substantiating removal efficiencies and correlation to field monitoring results using both particle size and TSS removal

efficiency. All manufactures shall provide performance data that the stormwater quality treatment system does not scour previously captured pollutants based on the particle size distribution specified in section 3.5. Performance data should be laboratory testing with an initial sediment load of 50 percent of the unit's sediment capacity at an operating rate of 125% or greater. Particle size distribution (PSD) for the initial sediment load shall conform to Table 3.5.

c. Free Oil
The separator must be capable of removing 95 percent of the floatable free oil. The first 16 inches (405 mm) of hydrocarbon storage shall be lined with fiberglass to provide a double wall containment of the hydrocarbon materials.

d. Particle Size.
The separator must be capable of trapping fine sand, silt, clay and organic particles in addition to larger sand, gravel particles and small floatables. The stormwater treatment system shall be sized to provide a specific particle size distribution that is clearly identified in both diameter and specific gravity. The example below is a Fine Particle Size that is a common PSD used in design of water quality devices to ensure proper design for capturing smaller particles and the high load of associated pollutants.

Table 3.5 – Particle Size Distribution

Amount	**Diameter**	**Specific Gravity**
20%	20 micron	1.3
20%	60 micron	1.8
20%	150 micron	2.2
20%	400 micron	2.65
20%	2000 micron	2.65

PART 3 EXECUTION

3.01 JOB CONDITIONS

A. Inspection:

Prior to beginning any of the operations of this section, become thoroughly familiar with the site, site conditions, and all portions of the work affected by the installation of the storm drain system.

B. Discrepancies:

In the event of discrepancy, ambiguity, interference, or any other unanticipated condition which might impede timely installation under this section immediately notify the Owner's Representative and do not proceed in the questioned areas until resolution or clarification has been obtained.

C. Survey:

The Contractor shall be responsible for all construction surveying of underground pipe utilities. Construction surveying shall include offset hubs and stakes set for each manhole, catchbasin, inlet and all other appurtenances and grade breaks shown on the Plans or as indicated by the Owner's Representative.

3.02 INSTALLATION

A. TRENCH EXCAVATION AND BACKFILL

This work shall consist of all excavation and backfill required for pipe installation, manholes and all other related work as specified in this section.

1. Excavation

a. All excavation shall be unclassified and the Contractor shall do all excavation of whatever substances encountered, including rock and frozen ground, to the depth shown on the plans. where distinct surface layers are encountered, of topsoil, clay, silt, peat or other materials undesirable for inclusion in the backfill, these materials shall be segregated into separate stockpiles during the excavating.

b. Trench Section:
Trench shall conform to OSHA requirements.

c. Utilities:
All water lines, sewers, gas lines, or other utilities encountered in excavation of the trench or appurtenances shall be supported and protected from injury throughout the entire construction period until adequate backfill has been completed.

d. Water Removal:
Ground adjacent to the excavations shall be graded to prevent water from running into the trench. The Contractor shall remove, by pumping or other means, any water accumulated in the excavation which is detrimental to the proposed installation of the sewer lines, appurtenances and structures.

2. Backfill.

Backfill with material excavated from trench. The backfill shall be free of extraneous material such as trees, stumps, trash and large boulders. Backfill shall be placed in lifts and compacted in a manner such that 95% of maximum density is obtained.

B. PIPE LAYING

1. Pipe laying shall, in all cases, proceed upgrade. 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 and shall be such that a full circle of light can be seen between manholes, etc., when sighting along all points of the pipe circumference. Each section of pipe shall be handled carefully and placed accurately. Each section of pipe shall be properly supported to insure true alignment and an invert which is smooth and shall not impede the flow. All seams shall be aligned uniformly for the length of the run. 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 substances shall enter the pipes or fittings.

2. 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 substances will enter the pipe or fittings.

3. Where a project outfalls into an existing storm drain, construction of the physical connection to the existing line shall be delayed until all upstream under-ground construction is complete and accepted unless special permission is granted by the Owner. Care shall be exercised during construction, flushing and testing operations of this connecting link to assure that water is not diverted into any portion of a storm drain line in service or a storm drain line which is not a portion of the construction project for which the Contractor is responsible.

4. 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 of reverse sloping invert.

Diameter Inches	Tolerance Feet	Diameter Inches	Tolerance Feet
8	0.03	14	0.04
10	0.03	16	0.04
12	0.03	18*	0.05

*note: For all pipe over 18 inches diameter, tolerance not to exceed 0.05 feet.

5. Test of Workmanship

The Contractor shall clean all storm drain pipe installed. All sand, debris, mortar and other foreign materials shall be removed from storm drain pipe and manholes prior to testing or final inspection.

C. MANHOLE-CATCH BASIN INSTALLATION

1. General

a. The manhole rings and covers shall be brought to the grades shown on the Plans unless otherwise approved by the Owner's Representative. Manhole rings shall be set in a full bed of mortar and made secure.

b. All portions of precast manholes must be owner approved prior to installation in the storm drain and sanitary sewer systems. The precast manhole manufacturer shall provide timely notice (at least two working days in advance) to allow time for the Owner to arrange for necessary tests. Installation of manhole sections without the Owner's stamp of approval will not be allowed. This approval does not relieve the Contractor of the responsibility for protection of manholes against damage during handling and installation. Manholes shall be installed at the locations shown on the plans such that primary leads enter radially at the invert elevations specified. The base section shall be set plumb on a prepared surface.

2. Storm Drain Manholes and Catch Basin Manholes

Storm drain manholes shall be constructed in accordance with the plans, details and Standard Details. There shall be a minimum of eight (8) inch catch constructed in the invert of the manholes unless otherwise specified. After the mortar is set, holding the pipe in place, the pipe is to be cut off evenly so that not more than two (2) inches of the pipe protrudes into the manhole.

D. Catch Basin Installation

1. After the mortar is set, holding the pipe in place, the pipe is to be cut off evenly so that not more than one (1) inch of the pipe protrudes into the catch basin. The catch basin rings and covers shall be brought to the grades shown on the Plans unless otherwise approved by the Owner's Representative.

2. The contractor may accomplish final setting of the casting by wedging it up with masonry material as approved by the Owner's Representative. The casting shall then be set in a full bed of mortar and made secure. Mortar used in the construction of catch basins shall be composed of one (1) part cement and three (3) parts sand. All joints and connections are to be mortared. The joints shall be made so as to produce a smooth, regular, watertight surface. Only enough water shall be added to provide plasticity in placing the mortar.

E. Connections To Existing Manholes and Storm Drains

1. Connection to Manholes.

a. Connections to existing manholes shall be made in a workmanlike manner, shall be tight and have smooth flow surfaces and curves. The invert shall be brought into the existing manhole at the elevation shown on the plans. An expanding type grout (jet set or equal) shall be used in connecting sewer pipe to existing manhole. The downstream pipe manholes shall be screened to prevent entry of mortar or other debris form entering the system.

b. After connection is made to a storm drain manhole and the mortar holding the pipe in place has set, the pipe is to be cut off evenly so that no more than one (1) inch of pipe protrudes into the manhole.

2. Connection to Existing Storm Drain
Connection to existing sewer shall be made as shown on the drawings. Special care shall be taken to avoid damaging existing pipes and cables. Adaptor fittings shall be installed per manufacturer's recommendation.

F. Adjustment of Existing Manhole to Finish Grade

Top of Manhole frames shall be adjusted to new elevations as shown on the Drawings. The manhole frame shall be adjusted by either adding/removing grade rings or adding/removing manhole barrel sections. Grade rings and barrel sections shall conform to the requirements for new manholes and shall be compatible with dimensions and configurations of the existing manhole. The adjusted manhole shall have no more than 3 grade rings with a total height of 12 inches for all three grade rings. If a barrel section adjustment is required, new joint gaskets shall be installed on the adjusted portions of the manhole.

G. Stormwater Treatment Manhole

1. Installation.
   a. The stormwater treatment manhole should not be installed on frozen ground. Excavation shall allow for adequate compaction around the structure. If the bottom of the excavation provides an unsuitable foundation additional excavation may be required. In areas with a high water table, continuous dewatering should be provided to ensure that the excavation is stable and free of water.

   b. The precast base should be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with gasketed joint seals, should be installed in accordance with the precast concrete manufacturer's recommendations.

   c. Adjustment of the stormwater treatment manhole can be performed by lifting the upper sections free of the excavated area, re-leveling the base, and re-installing the sections. Damaged sections and gaskets should be repaired or replaced as necessary. Once the stormwater quality treatment device has been constructed, any lift holes must be plugged with mortar.

2. Backfilling
   Backfill material should be placed in uniform layers not exceeding 12 inches in depth and compacted to 95% of maximum dry density.

3. Construction Sequence.
   The concrete storm water treatment system shall be installed in sections in the following sequence:
   - aggregate base
   - base slab
   - treatment chamber section(s)
   - transition slab (if required)
   - bypass section
   - connect inlet and outlet pipes
   - riser section and/or transition slab (if required)
   - maintenance riser section(s) (if required)
   - frame and access cover

4. Drop Pipe and Riser

   Once the upper chamber has been attached to the lower chamber, the inlet drop tee, and riser pipe must be attached. Pipe installation instructions and required materials shall be provided with the insert.

5. Inlet and Outlet Pipes.

   Inlet and outlet pipes should be securely set into the upper chamber using non-shrink grout or

approved pipe seals (flexible boot connections, where applicable) so that the structure is watertight.

6. Frame and Cover/Grate Installation.

The grade adjustment units should be laid in a full bed of mortar with successive units being joined using sealant recommended by the manufacturer. Frames for the cover should be set in a full bed of mortar at the elevation specified.

3.03 CLEANING UP

A. General

1. During the time that the work is in progress, the Contractor shall make every effort to maintain the sites in a neat and orderly condition. All refuse, broken pipe, excess fill material, cribbing, etc. shall be removed as soon as practicable.

2. The pipe laying shall not progress ahead of backfilling of ditches more than 400 feet. Should the cleanup not be maintained in a prudent manner, the Owner may cause the work to stop and payments to be withheld until the "cleanup" portion of the work had been done to the satisfaction of the Owner.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

Cast in place concrete required for this project is shown in the Drawings and includes, but is not necessarily limited to footings, foundation walls, slabs on grade, floor slabs, concrete tanks, concrete reinforcement, curbs and sidewalks as well as under slab vapor retarder.

1.2 QUALITY ASSURANCE

A. Codes and Standards:

In general, all concrete work on this Project shall comply with current American Concrete Institute Manuals of Concrete Practices. Comply with all applicable codes and regulations and pertinent portions of the following referenced standards and other standard publications referenced in subsequent articles, which shall become a part of these specifications to the extent of their applicability to the particular product, system, assembly, or item specified:

1. ACI 301: "Specifications for Structural Concrete for Buildings."
2. ACI 302: "Guide for Concrete Floor and Slab Construction."
3. ACI 304: "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete."
4. ACI 311: "Recommended Practice for Concrete Inspection."
5. ACI 315: "Manual of Standard Practice for Detailing Reinforced Concrete Structures."
6. ACI 318: "Building Code Requirements for Reinforced Concrete."
7. ACI 347: "Recommended Practice for Concrete Formwork."
8. ASTM C-156: “Standard Test Method for Water Loss (From a Mortar Specimen) through liquid membrane Form Curing Compounds”
9. ASTM C 171: “Standard Specification for Sheet Materials for Curing Concrete.”
10. ASTM D 882: “Tensile Properties of Thin Plastic Sheeting.”
11. ASTM D 2103: Standard Specification for Polyethylene Film and Sheeting."
12. ASTM D 4397: Standard Specification for Polyethylene Sheeting for Construction, Industrial and Agricultural Applications.
13. ASTM D 4635: Standard Specification for Polyethylene Film for General Use and Packaging Applications
14. ASTM D 4833: Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
15. ASTM E 96: Water Vapor Transmission of Materials.
16. ASTM E 154: Methods of Testing Materials for use as Vapor Barriers under Concrete Slabs and as Ground Cover in Crawl Spaces
17. ASTM E 1643: Installation of Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
18. ASTM 1745: Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.

19. Federal Specification: LP 378D
20. Federal Specification: LS-137
21. Federal Specification: UUP-147B

B. Conflicts:

In the event of conflict or inconsistency between or among referenced standards and any provisions of this specification, or other Contract Documents, the most stringent requirement shall prevail, and shall be enforced.

C. Testing:
1. Conduct tests of the concrete during construction in accordance with ACI 301. Submit results of tests for approval. Remove and replace concrete which fails to achieve minimum 28 day compressive strength shown on the Drawings, at Contractor's expense.
2. Test all concrete for footings, slabs, walls, curbs and sidewalks.
3. Reject concrete which fails to meet specified criteria for slump, air content, and temperature.

D. Frequency of Testing:
1. Slump tests - ASTM C-143: Perform one test for each set of compressive strength test specimens
2. Air content - ASTM C-231: Perform one test for each set of compressive strength test specimens.
3. Concrete temperature: Test hourly when ambient air temperature is 40^{O}F and below, and each time a set of compression test specimens are made.
4. Compression test specimen - ASTM C-31: One set of three standard cylinders for each compressive strength test. Field cure.
5. Compressive strength tests - ASTM C-39: Samples for strength tests for each class of concrete placed each day shall be taken not less than one a day nor less than once for each 20 cu. yd. of concrete, nor less than once for each 1,000 sq. ft. of surface area for slabs.

1.3 SUBMITTALS

Make all submittals in conformance with applicable section of these specifications. Conform with ACI 315 for nomenclature and conventions used in shop and placement drawings:

A. Concrete Materials: Submit concrete design specification, laboratory test results, and materials list showing source and gradation of all aggregates, type and brand of portland cement, admixtures source and quality of mixing water, and other aspects of the concrete design.

B. Reinforcing Steel: Provide Materials Certificates signed by manufacturer and Contractor certifying that each material item complies with, or exceeds, specified requirements.

C. Under Slab Vapor Retarder:
1. Product Data: Submit manufacturer product data indicating compliance with this specification.

2. Details: Submit manufacturer's standard detail for seaming of vapor retarder and installation of pipe boots and other accessories, if any.

D. Admixtures: Provide Materials Certificates signed by manufacturer and Contractor certifying that each material item complies with, or exceeds, specified requirements and that chloride content complies with specification requirements.

1.4 PRODUCT HANDLING

A. Delivery and Storage: Do not permit delivery of any of the products of this section to the project site until proper facilities, away from traffic, are available for their proper storage and which will permit sorting and handling without endangering the materials themselves or materials for installations of other sections.

B. Repairs & Replacements: In the event of damage make all repairs and replacements necessary to restore to undamaged condition and do not proceed in those areas until all repairs have been made. Repairs and replacements shall be subject to approval of the Contracting Agency and shall be accomplished at no additional expense to the Owner.

1.5 PROJECT CONDITIONS

A. Protection Against Freezing: Cover work with temporary or permanent cover as required to protect concrete against possibility of freezing during placement of concrete, and for at least 14 days after placement of concrete.

PART 2 - PRODUCTS

2.1 FORMS

A. Material:

Provide new, except as permitted in PART 3 of this section for re-use:

1. Plywood: U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill oiled and edge sealed, with each piece bearing legible grade mark of a recognized and approved inspection agency.
2. Dimensional lumber: Hem-Fir number two grade, seasoned.

B. Ties and Spreaders:

1. Provide type providing minimum working strength of 3,000 lbs. when fully assembled, which does not leave open holes through the concrete, and which permits neat and solid patching.
2. Metal shall not be closer than 3/4" to surface when forms are removed.
3. Do not use wire ties and wood spreaders.

4. Ties shall have rubber water stops installed prior to installation.

C. Alternate Forming Systems: Alternate systems will be considered upon submittal.

D. Coatings and Parting Compounds: Provide commercial fabrication that will not bond with stain or adversely effect concrete surfaces and will not impair subsequent treatment of concrete surfaces to be cured with water or compounds conforming to FSTT-3-001657.

E. Joint Fillers: Provide premolded, resilient, waterproof, compressible type with minimum 75% recovery conforming to FS HH-F- 341E, Type II; 1/2" thick for interior joints and 1/2" thick for exterior walks.

F. Other Materials: Provide all other materials required for complete installation as selected by Contractor subject to the approval of the Contracting Agency.

2.2 REINFORCING

All concrete reinforcement shall be new, free from rust, and shall comply with the following reference standards:

A. Reinforcing Bars: Provide ASTM A-615 grade 40 or 60 except where noted otherwise.

B. Wire: Provide ASTM A-82 #16 double annealed iron wire.

C. Welded Wire Fabric: Provide ASTM A-185 in Flat Sheets.

D. Accessories and Supports: Provide supports, bolsters, chairs, spacers and other devices and accessories conforming to recommended Concrete Reinforcing Steel Institute (CRSI) practices. Provide galvanized accessories within 1-1/2" of surface of concrete with plastic tip chairs for exposed finish surfaces. Concrete dobie or other block, brick, or wood supports will not be permitted, except where specifically noted.

E. Welding Electrodes: Conform to AWS Code D12.1.

F. Other Materials: Provide all other materials, not specifically described but required for a complete and proper installation of concrete reinforcement, as selected by the Contractor, subject to the approval of the Contracting Agency.

2.3 CONCRETE

A. General: Concrete mixes shall be designed to produce the tabulated properties below, and shall be subject to the approval of the Owner's Representative.

B. Quality:
1. Provide concrete having 3,000 psi minimum 28 day compressive strengths for footings, walls, slabs, sidewalks, curb and gutter and other concrete.

2. Provide concrete with maximum aggregate of 3/4" for all concrete except concrete for exposed aggregate surfaces, which shall have a maximum aggregate size of 3/8".
3. Slump at placement shall conform to the following:

Location	Concrete Without Superplasticizer	Concrete With Superplasticizer
a. Slab on Grade	3 inches	6 to 9 inches
b. Footings, Walls, Slabs and Beams	4 inches	6 to 9 inches

4. Entrained air content at placement shall be 6% with 1.5% tolerance.

C. Cement: Provide portland cement conforming to ASTM C-150, type I or III the product of a single manufacturer.

D. Aggregates:
1. Provide aggregates conforming to ASTM C-33, current edition, except as expressly permitted by the Contracting Agency.
2. Course aggregate size shall not exceed one-fifth the narrowest dimension between forms, one-third the depth of slabs, nor three-fourths the minimum clear spacing between individual bars or bundles of bars.
3. Fine aggregates shall be clean, sharp, natural sand, free from loam, clay, lumps, alkali, organic matter, or other deleterious substances.
4. Aggregates shall be well graded, clean, hard gravel and coarse sand, non-frost susceptible material, and free of vegetable matter and coatings of silt or clay. The gradations shall be determined by standard laboratory sieves with square openings. Material retained on a No. 4 screen shall be classified as coarse aggregate, which shall conform to the requirements of AASHTO M-80 and have the following limits of gradation:

COARSE AGGREGATE FOR PCC

Designated Sizes (AASHTO Gradation)	Percent by weight passing Laboratory Sieve having square openings in inches						
	2	1-1/2	1	¾	½	3/8	No.4
No.67 (3/4" to No.4)	..	..	100	90-100	..	20-55	0-10*

*Not more than 5% shall pass a No. 8 sieve.

All material passing a No. 4 sieve shall be classified as fine aggregate and shall conform to the requirements of AASHTO M-6 and have the following gradation:

FINE AGGREGATE FOR PCC

SIEVE SIZE	PER CENT PASSING SIEVE
Passing a 3/8 inch sieve	100
Passing a No. 4 inch sieve	95-100
Passing a No. 8 inch sieve	80-100
Passing a No. 16 inch sieve	45-80
Passing a No. 30 inch sieve	25-60
Passing a No. 50 inch sieve	10-30
Passing a No. 100 inch sieve	2-10

E. Water: Provide mixing water from an approved source, clean, fresh, and free of acids, alkalis, oil, organic or other deleterious matter.

F. Miscellaneous Inserts: Provide ASTM A-36 steel.

G. Air Entrainment: Comply with ASTM C-260.

H. Water Reducing Admixture: Comply with ASTM C-494.

I. Epoxy Grout: Provide Master Builder's "Masterflow 713", Sonneborn "Ferrolith", or approved equal.

J. Joint Sealer: Provide Grace "Daraweld-U Traffic Grade" or approved equal.

K. Crystalline Waterproofing Additive: Per Section 03301

L. Calcium chloride additives are not permitted.

M. Latex - cement leveling compound - Laticrete 4237 or approved equal. Provide a smooth trowel finish to accept finishes as scheduled.

N. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. BASF Construction Chemicals - Building Systems; Kure-N-Seal W.
      b. ChemMasters; Safe-Cure Clear.
      c. Conspec by Dayton Superior; High Seal.
      d. Dayton Superior Corporation; Safe Cure and Seal (J-19).
      e. Edoco by Dayton Superior; Spartan Cote WB II 20 Percent.
      f. Euclid Chemical Company (The), an RPM company; Diamond Clear VOX; Clearseal WB STD.
      g. Kaufman Products, Inc.; SureCure Emulsion.
      h. Lambert Corporation; Glazecote Sealer-20.
      i. L&M Construction Chemicals, Inc.; Dress & Seal WB.
      j. Meadows, W. R., Inc.; Vocomp-20.
      k. Metalcrete Industries; Metcure 0800.
      l. Nox-Crete Products Group; Cure & Seal 200E.
      m. Symons by Dayton Superior; Cure & Seal 18 Percent E.
      n. Vexcon Chemicals, Inc.; Starseal 0800.

O. Superplasticizers:
   1. Meet ASTM C 494, Type F or G, of second or third generation type.
   2. Do not use first generation superplasticizer.
   3. Hold slump to 6 inches or greater for 2 hours.
   4. Second Generation Superplasticizer: Batch plant added to extend plasticity time up to 2-1/2 hours, control temperature of fresh concrete, reduce water 20 to 30 percent, and give higher strengths at all ages.

5. Third Generation Superplasticizer: Batch plant added to extend plasticity time up to 2-1/2 hours, maintain setting characteristics similar to normal concrete throughout its recommended dosage range and at varying concrete temperatures, reduce water 30 to 40 percent, and give high-early and ultimate strengths.
6. Manufacturer and Product:
   a. Master Builders, Inc., Cleveland, OH, Rheobuild
   b. W.R. Grace & Co., Cambridge, MA, Daracem 100

P. Synthetic Fiber Reinforcement for Concrete Slabs:
1. 'GENISIS' synthetic fiber. Add to mix at rates recommended by fiber manufacturer.

Q. Under Slab Vapor Retarder
1. Basis of Design Product: Provide "Stego Wrap" brand polyethylene film as manufactured by T.R.M. or comparable manufacturer that will met or exceed the following requirements.
   a. Physical Properties
      1) Thickness: 15 mil
      2) Tensile Strength: Lengthwise – 1700 psi; Crosswise 1200 ps per ASTM D 882.
      3) Complies with Feral Specification LP 378D, Type 1, Class 1, Grade A, Finish 1.
      4) ASTM D 4397: Complies
      5) ASTM E 154: Complies
      6) ASTM C 171: Complies
      7) Permeance: Per ASTM E 96 0 no greater than 1.40 grams per 100 square inches per 24 hours for film 1 mil thick, inversely proportional for other thickness. For 10 mil 0.076 perms.
      8) Federal Specification LS-137: No fungus growth.
      9) Federal Specification UUP-147B: Complies with minimum requirements.
   b. Accessories:
      1) Mastic Tape: As recommended by vapor retarder manufacturer for conditions indicated but not less than 35 mils thick with a 3-inch seam shear of not less than 35lbs.
      2) Self-Adhesive Repair Tale: As recommended by vapor retarder manufacturer.

R. Other Materials: Provide all other materials not specifically described but required for a complete and proper concrete installation, as selected by Contractor and subject to the approval of the Contracting Agency.

PART 3 - EXECUTION

3.1 JOB CONDITIONS

A. Inspection: Examine the surface of areas to which the concrete work is to be applied and determine that prior work is complete, that all subgrades have been properly compacted and

graded, that all slab cushions are in place, and that all previous work is complete and ready for erection of forms, setting of reinforcement, and placement of concrete.

B. Discrepancies: In the event of discrepancy, ambiguity, interference, or any other unanticipated condition which might impede the timely execution of the work of this section, promptly notify the Contracting Agency and do not proceed in the area of discrepancy until all questions in regard thereto have been resolved.

C. Certificates: Obtain written acknowledgment(s) from the subcontractors or installers of the formwork, reinforcement, and concrete placement that the substrates affecting their work have been examined and found satisfactory for subsequent operations. Such acknowledgments countersigned by the Contractor and delivered to the Contracting Agency prior to the final inspection, shall be a condition of the acceptance of the work of this section.

D. Admixtures:
   1. Superplasticizers:
      a. Add at concrete plant only through equipment furnished and/or approved by admixture manufacturer.
      b. Equipment shall provide for easy and quick visual verification of admixture amount used for each dose.
      c. Discharge amount to be added to each load of concrete into separate dispensing container, measured verified as to amount, then add to concrete.
      d. Redosing of Concrete: Not permitted except when approved by inspection agency monitoring concrete quality and only after quality tests show this practice does not decrease the quality specified for concrete.
   2. Waterproofing:
      a. Add waterproofing admix to all concrete where directed on drawings.
      b. Add Waterproofing Admix to concrete at time of batching.
      c. Introduce Admix to concrete mix per manufacturer’s recommended procedure.
      d. Moist cure in accordance with ACI Reference 308, “Standard Practice for Curing Concrete”.

3.2 NOTICE

A. Notify the Owner's Representative at least 48 hours prior to beginning any pour of concrete, or 24 hours prior to closing any forms.

3.3 FORMWORK

A. Design: Design forms to support vertical and lateral loads that might be applied until such loads can be supported by the concrete structure, so that they may be readily removed without impact, shock, or damage to in place concrete and adjacent materials.

B. Construction:
   1. Construct forms to conform with ACI 347, to sizes, shapes, lines, and dimensions shown or as required to obtain accurate alignment, location, grades, and level and plumb work in

finished structure. Forms shall be set straight, plumb and true to within 1/4" in 10' of length.

2. Provide for openings, offsets, recesses, linkages, keyways, moldings, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts and other features required to attain the required configuration.
3. Use materials selected to achieve the indicated finishes. Solidly butt joints and provide back up to prevent leakage of cement paste.
4. Fabricate for easy removal without hammering or prying against concrete surfaces. Provide crush plates where stripping might damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.
5. Where interior area of formwork is inaccessible, provide temporary openings for cleanout, inspection prior to concrete placement, and for final placement. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.
6. Chamfer exposed corners and edges as shown or required using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

C. Form Ties: Use factory fabricated, adjustable length, removable or snap-off metal form ties, designed to prevent form deflection, and prevent spalling concrete surfaces upon removal. Position ties so portion remaining within concrete after removal is at least 1-1/2" inside the concrete and which will not leave holes larger than 1" diameter in the concrete surface.

D. Coordination With Other Trades: Provide necessary coordination with other trades to determine size and location of openings necessary for work of those trades. Accurately place and securely support items built into forms.

E. Cleaning & Tightening: Thoroughly clean forms and adjacent surfaces receiving concrete. Remove chips, wood, sawdust, dirt, and other debris prior to placement of concrete. Retighten forms after concrete placement if required to eliminate mortar leaks.

3.4 UNDER SLAB VAPOR RETARDER INSTALLATION

A. Install reinforced under slab vapor retarder in accordance with ASTM E 1643 and manufacturer’s instructions for under slab installation..

B. Install vapor retarders continuously at all location under slab on grade to receive interior floor finish materials.

C. Install vapor retarders in largest practical widths.

D. Ensure subgrade beneath vapor retarder is smooth, level and compacted with no sharp edges.

E. Join sections of vapor retarder and seal penetrations in vapor retarder with mastic tape.

F. Ensure there is no moisture entrapment by vapor retarder due to rainfall or ground water intrusion.

G. Immediately repair holes in vapor retarder with self adhesive repair tape.

H. Seal around pipes and other penetrations in vapor retarder with pipe boot in accordance with manufacturer instructions.

3.5 PLACING REINFORCEMENT

A. General: Comply with specified codes and standards and CRSI recommended placing practices for details and methods of placing reinforcement and supports.
   1. Protect reinforced under slab vapor retarder from damage during installation of reinforcing steel and utilities and during placement of concrete slab or granular materials.
   2. Immediately repair damaged vapor retarder in accordance with manufacturer's instructions.

B. Cleaning: Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

C. Positioning:
   1. Support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.
   2. Place reinforcement to obtain the minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports to hold in position during concrete placement. Set wire ties so ends are directed into concrete, not toward exposed surfaces.
   3. Do not place reinforcing bars more than 2" beyond the last leg of continuous bar support. Do not use supports as bases for runways for conveying equipment or similar construction loads.

D. Welded Wire Fabric:
   1. Install welded wire fabric. Mats only. No rolled material will be acceptable. Lap adjoining mats a minimum of one and one half meshes and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps.
   2. Support welded wire fabric with plastic chairs at intervals not exceeding 4 feet measured along both directions of the mesh. Support welded wire fabric to the middle of the slab thickness.
   3. The practice of lifting the welded wire fabric off the subgrade as concrete is poured will be allowed only if after lifting the wire it is supported per Item D, 2 above.

3.6 JOINTS

A. Construction Joints:
   1. Locate and install construction joints which are not shown on the drawings so as not to impair the strength and appearance of the structure, subject to the approval of the Contracting Agency.
   2. Place construction joints perpendicular to the main reinforcement. Continue all reinforcement across construction joints.

B. Keyways: Provide keyways at least 1-1/2" deep in all construction joints in walls, slabs, and between walls and footings; approved bulkheads designed for this purpose may be used for slabs.

C. Contraction Control Joints: Construct soft cut or green cut contraction control joints in slabs to form panels of patterns as shown on the drawings.

D. Expansion:
1. Expansion joints:
a. Expansion joints shall be placed where shown on the Drawings. Expansion joint material shall conform to the requirements at ASTM Specification.
b. Designation D-994 and AASHTO M-33. This material shall extend the full width of the structure and shall be cut to such dimensions that the base of the expansion joint shall extend to the subgrade and the top shall be depressed not less than one-quarter (1/4) inch nor more than one-half (1/2) inch below the finished surface of the concrete. The material shall be of one (1) piece in the vertical dimension and shall be securely fastened in a vertical position to the existing concrete face against which fresh concrete is to be poured. After the concrete has set, the expansion joints shall be filled flush to the finish concrete surface with asphalt cement, two hundred (200) to three hundred (300) penetration. Application temperature of the sealing asphalt shall be between 250 degrees and 350 degrees Fahrenheit.
c. Sealing asphalt shall be applied by pouring from a bucket with a V-shaped spout, equipped with a positive shutoff to prevent spilling or dripping of asphalt. Before sealing, the joint shall be cleaned of all dirt, gravel, concrete mortar or other extraneous material. Sealing shall be done in a neat workmanlike manner. Sloppy work in sealing of expansion joints will not be tolerated.

3.7 EMBEDED ITEMS

A. Set and build into the work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast in place concrete. Use approved setting drawings, diagrams, instructions, and directions provided by suppliers of the items to be attached thereto. Install and secure in position all embedded items prior to initiating concrete placement.

3.8 PREPARATION OF FORMS

A. Coat the contact surfaces of forms with an approved coating compound before placement of concrete, and according to manufacturer's instructions. Thin only with approved thinners according to manufacturer's recommendations. Do not permit application of excessive coating compound or allow it to accumulate in the forms or come into contact with concrete surfaces against which fresh concrete will be placed.

B. Coat steel forms with a non-staining, rust preventative, vegetable based form oil or otherwise protect against rusting. Rust stained steel formwork will not be acceptable and will be rejected. Diesel oil shall not be used in form release agent.

3.9 CONCRETE PLACEMENT

A. Replacement Inspection: Before placement of concrete, inspect the formwork and reinforcement and verify that all prior work has been completed to the point that placement of the concrete may be executed in complete conformance with the original design, the approved submittals and the referenced standards. Determine that all embedded items, supports, backing, and other provisions for items supported by or attached to the concrete have been provided for. Coordinate with other trades whose work will be affected by the operations of this section. Obtain all written acknowledgments specified in 3.01C above.

B. General: Comply with ACI 304 and as herein specified. Deposit continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within the section. If a section cannot be placed continuously, provide construction joints as specified in 3.05. Deposit concrete as nearly as practicable to its final location to avoid segregation due to rehandling or flowing.

C. Footings and Walls:
1. Deposit in forms in horizontal layers not exceeding 24" in depth and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while previous layer is still plastic to avoid cold joints. Where vertical drop is more than three feet, elephant trunks shall be used.
2. Consolidate by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with the recommended practices of ACI 309 to suit type of concrete and project conditions.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate the placed layer and at least 6" into the previous layer. Do not insert vibrators into lower layers of concrete that have begun to set. Limit the duration of vibration to the time necessary to consolidate the concrete and complete embedment of reinforcement and other embedded items without causing segregation of the mix.

D. Slabs:
1. Deposit and consolidate in a continuous operation within the limits of construction joints, until the placing of a panel or section is completed.
2. Consolidate by previously specified methods, working concrete around reinforcement, embedded items, and into corners.
3. Bring slab surfaces to the correct level with a straight edge and strikeoff. Use bull floats or darbies to smooth the surface, leaving it free of humps and hollows. Do not sprinkle water onto the plastic surface. Do not disturb the slab surfaces prior to beginning finishing operations.
4. Maintain reinforcing in the proper position during all placement and consolidating operations.

E. Sidewalks, Curb and Gutters:
1. Concrete shall be handled from transport vehicle to the place of final description in a continuous manner as rapidly as practicable. The rate of placement shall not exceed the rate at which the various placing and finishing operations can be performed in accordance

with these specifications. Where the vertical drop is more than six (6) feet, a tremmie or 'elephant trunk' shall be used.

2. If concrete is to be placed by the extruded method, the Contractor shall demonstrate to the satisfaction of the Contracting Agency that the machine is capable of placing a dense, uniformly compacted concrete to exact section, line and grade.

F. Cold Weather Placement:

Protect placed concrete from physical damage or reduced strength which could be caused by frost, freezing action, or low temperatures, in compliance with ACI 306 and as follows:

1. When ambient temperature has fallen to or is expected to fall below 40^{O}F, uniformly heat water and aggregates prior to mixing to maintain mixture temperature not less than 50^{O}F and not more than 80^{O}F at point of placement.
2. Do not use frozen materials or materials containing ice or snow and do not allow concrete to placed on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other material containing anti-freeze agents or chemical accelerators unless specifically permitted by the Contracting Agency for the particular situation encountered.

3.10 FINISHING FORMED SURFACES

A. Rough Form Finish: For formed surfaces not exposed to view in the finish work or by other construction, unless otherwise indicated, provide a surface having the texture imparted by the form facing material used with tie holes and defective areas repaired and patched and fins and other projections chipped down and rubbed off.

B. Smooth Form Finish: For formed surfaces exposed to view, or that are to be covered with a coating or covering material applied to or bonded directly to the concrete, such as waterproofing, damp proofing, painting or other similar system, provide a surface obtained by selecting form facing material, arranged symmetrically orderly with a minimum of seams. Repair and patch defective areas with fins and projections completely removed and smoothed.

C. Smooth Rubbed Finish: Provide smooth rubbed finish which has received smooth form finish treatment not later than the day after removal of the forms. Moisten the surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is attained. Do not apply cement grout other than the created by the rubbing process.

D. Grout Cleaned Finish: Provide grout cleaned finish as scheduled to surfaces which have received smooth form finish by combining one part of portland cement to 1-1/2 parts fine sand by volume, and mixing with water to the consistency of thick paint. Blend standard portland cement and white portland cement in amounts determined by trial patches so that final color of dry grout will closely match adjacent surfaces. Thoroughly wet concrete surfaces and apply grout immediately to coat surfaces and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.

E. Related Unformed Surfaces: At tops of walls, horizontal offsets and similar unformed surfaces occurring adjacent to formed surfaces, strike off smooth and finish with a texture

matching the adjacent surface. Continue the final surface treatment uniformly across adjacent informed surfaces unless otherwise indicated.

3.11 SLAB FINISHES

A. Scratch Finish:
   1. Where scheduled or shown provide scratch finish on monolithic slab surfaces that are to receive topping or mortar setting beds for tile, terrazzo, or other bonded cementitious finishes.
   2. After placement of slab, plane surface to a tolerance not exceeding 1/4" in 24". Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set, with stiff brushes, rakes, or brooms.

B. Float Finish:
   1. Apply float finish to monolithic slab surfaces that are to receive trowel finish and other finishes described in subsequent paragraphs, and surfaces which are to be covered by membrane or elastic waterproofing, roofing, or other finishes as scheduled.
   2. After screeding and consolidating concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit floating of surface. Consolidate surface with power or hand floats or both, using hand floats in small or inaccessible areas. Float surface to a tolerance not exceeding 1/4" in 10' when tested with a 10' straight edge. Cut down high spots and fill in low spots by floating. Do not apply cement or cement and sand mixture for filling in, use only grout removed from high spots. Uniformly slope to drains. Immediately after leveling refloat surface to a uniform, smooth, granular texture.

C. Trowel Finish:
   1. Apply trowel finish to slab surfaces that are to be exposed to view and surfaces that are to be covered by resilient flooring, paint, or other thin-film finish systems.
   2. After floating, begin first troweling operation with power driven or hand trowels. Begin troweling when surface produces a ringing sound as trowel is moved over surface. Hand trowel as necessary to obtain a smooth surface free of trowel marks and of a uniform texture and appearance, and with a tolerance not exceeding 1/8" in 10' when tested with a 10' straightedge.

D. Broom Finish:
   1. Apply broom finish to exterior and interior platforms, steps, stoops, walks, and ramps, and elsewhere as shown or scheduled.
   2. Immediately after trowel finishing, slightly roughen surface by brooming with a fiber bristle broom perpendicular to direction of travel. Coordinate final finish with Contracting Agency before application.

E. Chemical Hardener Finish:
   1. Apply chemical hardener finish to interior floors, after complete curing and drying of the concrete surface. Chemical hardeners shall be coordinated with adhesive to be used in conjunction with other flooring materials.
   2. Apply uniformly, using a garden-type sprayer, industrial sprayer or roller.

3. Do not add a thinner.
4. When using a short-nap roller, if the rolling action starts to create tiny bubbles on the surface, slow down the rolling motion.
5. Do not overlap; avoid thick applications.
6. Do not "pull" the material when applying.
7. Application rate 350 S.F./gallon.

F. Exposed Aggregate:
1. Provide exposed aggregate surface at locations indicated in the Drawings.
2. Concrete with a maximum slump of 3" shall be used in exposed aggregate areas. Air entrainment shall be in accordance with specifications.
3. Aggregate shall be 3/8" maximum.
4. Screed concrete to proper level. Do not jitterbug or tamp concrete.
5. Floating shall be limited to amount required to ensure that aggregate is surrounded and only slightly covered by mortar, leaving no holes in the surface.
6. Shortly after floating, Masterbuilders Confilm surface retarder may be sprayed over the surface to allow sufficient time to elapse before exposing operation begins.
7. Exposing operation should begin as soon as brushing and hosing of the surface can be done without over-exposing or dislodging the aggregate. Finishers are to stay off the newly exposed surface to avoid breaking the aggregate bond. If it is necessary for finishers to move about on the newly exposed surface, kneeboards are to be used. Kneeboards shall be gently placed on the surface, and shall not be slid or twisted when on the surface.
8. Exposed aggregate slabs shall be cured thoroughly.

3.12 CURING & PROTECTION

A. General:
1. Protect freshly placed concrete from premature drying and excessive cold, and maintain without drying at a relatively constant temperature for a period of time necessary for hydration of cement and proper hardening. Conduct all curing operations in compliance with ACI 301 & ACI 308.
2. Initiate curing process as soon as free water has disappeared from the concrete surface. Weather permitting, keep continuously moist for not less than 72 hours.
3. Begin final curing procedures immediately following initial curing and before concrete has dried.
4. Continue curing for a minimum of 10 days after initial placement unless otherwise permitted in writing by Contracting Agency.
5. Avoid rapid drying at end of curing period.
6. Maintain concrete surface temperature at least 50^{o}F. for 7 days after following placement of concrete.

B. Curing Methods:
1. Moisture Curing:
a. Keep concrete surface continuously wet by covering with water or continuous fog spray.

b. Cover concrete surface with specified absorptive cover, thoroughly saturated with water, and keeping continuously wet. Place absorptive cover to provide coverage at edges, with 4" lap over adjacent absorptive covers.

2. Moisture-cover Curing:
   a. Cover concrete surfaces with moisture retaining cover, placed in widest practicable width with sides and lapped a minimum of 3" and sealed with waterproof tape or adhesive. Immediately repair any holes or tears occurring during curing period using cover material and waterproof tape.
3. Membrane Curing: Do not use membrane curing compounds on surfaces which are to be covered with a coating material applied directly to the concrete such as liquid floor sealer waterproofing, damp proofing, membrane roofing, flooring paint, or other coatings unless specifically approved by Contracting Agency in writing.
   a. Apply membrane forming curing compound to concrete surfaces as shown as final finishing operations are complete (within 2 hours).
   b. Apply uniformly in continuous operation by power spray or roller according to manufacturer's instructions.
   c. Recoat areas which have been subject to rainfall within 3 hours after application.
   d. Maintain continuity of coating and repair damage occurring during curing period.

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

D. Unformed Surfaces:
1. Cure formed surfaces such as slabs, floor topping and other similar flat surfaces by application of the approved curing method.
2. Use moisture retaining curing method for surfaces which are to receive liquid floor hardener or finish flooring, unless otherwise specifically directed in writing by the Contracting Agency.

3.13 FORM REMOVAL

A. Non-Supporting Forms: Formwork not supporting concrete, such as sides of footings, may be removed after cumulatively curing at not less than 50^{o}F. for a minimum of 24 hours after placement, provided concrete has sufficiently hardened not to be damaged by removal operations, and providing curing operations are maintained.

B. Supporting Forms: Formwork supporting weight of concrete such as beam soffits, joints, slabs and other similar structural elements shall not be removed in less than 14 days, and not until design minimum compressive strength for 28 days has been attained, as determined by testing of field cured specimens representative of actual location of the members in question.

C. Metal decking forms shall be left in place.

3.14 RE-USE OF FORMS

Re-use of forms will be permitted only under the following conditions, subject to the approval of the Contracting Agency in each instance:

A. Clean and repair all contact surfaces to achieve capability equal to that of new forms.

B. Split, frayed, delaminated, or otherwise deteriorated facing or supporting materials will not be permitted.

C. Apply new coating compound to contact surfaces as specified for new work.

D. Where forms are extended for successive placement, thoroughly clean all surfaces and tighten to close joints. Align and secure joints to avoid offsets.

E. Do not use "Patched" forms for expressed surfaces unless specifically permitted in writing by Contracting Agency in each particular instance.

3.15 SURFACE REPAIRS

A. General:

Repair and patch defective areas with cement mortar immediately after removal of forms, but only when acceptable to Contracting Agency.

1. Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete, but in no case greater than 1".
2. Make edges of cuts perpendicular to the concrete surface.
3. Dampen the area to be patched with water and brush coat with neat cement grout or proprietary bonding agent.

B. Exposed to View Surfaces:

1. Blend white portland cement and standard portland cement so that when dry patching mortar will match color of surrounding surface. Provide test areas at inconspicuous location to verify match.
2. Compact mortar in place and stake off slightly higher than surrounding surface.
3. Apply appropriate finish as provided in 3.09.

C. High Areas:

1. Correct high areas by grinding, after concrete has cured at least 14 days.

D. Low Areas:

1. Correct low areas during or immediately after completion of surface finishing operations by cutting out the low area and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used upon approval of the Contracting Agency.

E. Other Repairs:

1. Repair defective areas, except random cracks and single holes not exceeding 1" dia. by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete, and brush with neat cement grout coating or concrete bonding agent. Mix patching concrete of same materials to provide concrete of the same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.
2. Repair isolated random cracks and single holes not over 1" in dia. by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose cement grout coating or concrete bonding agent. Mix dry-pack, consisting of one part portland cement to 2-1/2 parts fine aggregate passing #16 screen, using only enough water as required for handling and placing. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

F. Other Methods:
1. Repair methods not specified may be used, subject to the approval of the Contracting Agency.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
1. Structural metal framing for this Work is indicated in the Drawings and includes but is not necessarily limited to:
   a. Beams
   b. Bases
   c. Structural Steel Accessories
   d. Columns

B. Related Work Described Elsewhere:

1.	Steel Decking:	Section 053000
2.	Cold Formed Metal Framing:	Section 054000
3.	Metal Fabrications	Section 055000

1.2 QUALITY ASSURANCE

A. Qualifications of Suppliers and Personnel:
1. For the fabrication of the structural steel employ only a firm regularly established in the fabrication of structural steel.
2. For the erection of the structural steel employ only a firm regularly established in the erection of structural steel.
3. For welding of structural steel, (except for welds which do not carry calculated stresses) employ only welders who are currently qualified as prescribed in "Qualification Procedure" of the American Welding Society.
4. Credentials of welders are to be presented to the Owner's Representative prior to work starting. Credentials to include current welders certificate indicating type of test, position of welds, etc.

B. Codes and Standards:
1. In addition to complying with all pertinent codes and regulations, comply with:
   a. "Specifications for the Design Fabrication and Erection of Structural Steel for Buildings" of the American Institute of Steel Construction.
   b. "Code for Welding in Building Construction" of the American Welding Society.

1.3 SUBMITTALS

A. Provide certificates of compliance with referenced standards, and certification of selected fabricator's and erector's qualifications.

1.4 PRODUCT HANDLING

A. Do not deliver any of the structural steel to the jobsite until an secure area away from traffic is available for its storage, permitting its sorting and handling without endangering other stored materials. Take all measures necessary to protect the structural steel from damage and to protect the installed work and materials of all other trades.

B. In the event of damage to either the structural steel, or to other materials or work, make all repairs and replacements necessary to restore the original undamaged conditions. Repairs and replacements shall be subject to the approval of the Architect and shall be accomplished at no additional expense to the Owner.

PART 2 - PRODUCTS

2.1 STRUCTURAL STEEL

A. Shapes and Plates:
1. Provide steel plates and shapes conforming to ASTM A-36, (Fy) = 36ksi.

B. Hollow Structural Sections (HSS):
1. Provide rectangular, square and round steel tubing complying with ASTM A-500, Grade B with yield strength (Fy) = 46 ksi.

C. Structural Pipe:
1. Provide round steel pipe complying with ASTM A-53, with yield strength (Fy)=35ksi.

D. Wide Flange Shapes:
1. Provide wide flange shapes conforming to ASTM A992 with yield strength (Fy)=50ksi.

2.2 BOLTS & NUTS

A. Machine and Anchor Bolts:
1. Comply with ASTM A-325.

B. Tighten bolts to snug tight condition unless noted otherwise.

2.3 SHEAR STUDS

A. Welded carbon steel ‘Nelson Shear Connector Studs” or approved equal.

2.4 PRIMER PAINT

A. Provide primer paint which is compatible with finish coatings specified in Section 09900. Where no finish coating is specified, provide primer complying with FS TT-P-31D.

2.5 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of structural steel shall be new, free from rust, first quality of their respective kinds, and subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 FABRICATION

A. General:
   1. Fabricate all structural steel in strict accordance with the approved shop drawings and the referenced standards.

B. Shop Cleaning and Priming:
   1. Shop paint all structural steel one coat except steel to be encased in concrete and surfaces requiring field welding.
   2. Thoroughly clean all steel for concrete encasement.

3.2 WELDING

Unless Otherwise Specifically Noted:

A. Follow applicable portions of American Welding Society specifications in all welds.

B. Use ASTM A-233, E-60, or E-70 electrodes. Store electrodes in on site warming ovens at all times.

C. Make all finish welds 3/16" minimum.

D. Make all butt welds full penetration, using back up or chip and back weld.

E. Install shear studs in full compliance with manufacturer’s recommendations and ICBO Evaluation Report 2614.

3.3 JOB CONDITIONS

A. Determine that all previous work is complete and ready for the erection of the structural steel. Promptly notify the Architect of discrepancies and do not proceed in the questioned areas until fully resolved

3.4 ERECTION

A. Erect all structural steel in accordance with the original design and the approved submittals, all pertinent codes and regulations, and the referenced standards.

B. Align structural steel straight, true, square and plumb, and within a tolerance of 1 in 500.

C. After erection is complete, touch up all shop priming coats damaged during transportation and erection, and prime all field welds using same primer paint approved for shop priming.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specifications, apply to this section.

1.2 SUMMARY

A. This Section includes steel deck units for floor and roof applications.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specifications Sections.

B. Product data including manufacturer's specifications and installation instructions for each type of decking and accessories.
   1. Provide test data for mechanical fasteners used in lieu of welding for fastening deck to supporting structures.

C. Shop Drawings showing layout and types of deck units, anchorage details, and conditions requiring closure strips, supplementary framing, sump pans, cant strips, cut openings, special jointing, and other accessories.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following codes and standards except as otherwise indicated:
   1. American Iron and Steel Institute (AISI) "Specification for the Design of Cold-Formed Steel Structural Members."
   2. American Welding Society (AWS), D1.3 "Structural Welding Code - Sheet Steel."
   3. Steel Deck Institute (SDI), "Design Manual for Composite Decks, Form Decks and Roof Decks."

B. Qualifications of Field Welding: Use qualified welding processes and welding operators in accordance with "Welder Qualification" procedures of AWS.
   1. Welded decking in place is subject to inspection and testing. Owner will bear expense of removing and replacing portions of decking for testing purposes if welds are found to be satisfactory. Remove work found to be defective and replace with new acceptable work at no charge to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include but are not limited to the following:
   1. Canam Steel Corporation
   2. United Steel Deck
   3. Vulcraft Div., Nucor Corp.
   4. Verco Manufacturing Co.
   5. Wheeling Corrugating Co.

2.2 MATERIALS

A. Steel for Galvanized Metal Deck Units: ASTM A 446, grade as required to comply with SDI specifications, minimum 38 ksi yield strength.

B. Miscellaneous Steel Shapes: ASTM A 36.

C. Shear Connectors: Headed stud type, ASTM A 108, Grade 1015 or 1020, cold-finished carbon steel, with dimensions complying with AISC specifications.

D. Sheet Metal Accessories: ASTM A 526, commercial quality, galvanized.

E. Galvanizing: ASTM A525, G60, 0.6 oz./square foot, unless noted otherwise on the drawings.

F. Galvanizing Repair: Where galvanized surfaces are damaged, prepare surfaces and repair in accordance with procedures specified in ASTM A 780.

2.3 FABRICATION

A. General: Form deck units in lengths to span three or more supports, with flush, telescoped, or nested 2 inch laps at ends and interlocking or nested side laps, of metal thickness, depth and width as indicated.

B. Composite Steel Floor Deck: Fabricate deck units with integral embossing or raised pattern to furnish mechanical bond with concrete slabs. Fabricate open-beam deck units with fluted section having interlocking side laps.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install deck units and accessories in accordance with manufacturer's recommendations, shop drawings, and as specified herein.
   1. Place deck units on supporting framework and adjust to final position with ends accurately aligned and bearing on supporting members before being permanently fastened. Do not stretch or contract side lap interlocks.
   2. Align deck units for entire length of run of cells and with close alignment between cells at ends of abutting units.
   3. Place deck units flat and square, secured to adjacent framing without warp or deflection.
   4. Do not place deck units on concrete supporting structure until concrete has cured and is dry.
   5. Coordinate and cooperate with erector in locating decking bundles to prevent overloading of structural members.
   6. Do not use floor deck units for storage or working platforms until permanently secured.

B. Fastening Deck Units:
   1. Fasten floor deck units to supporting wood members with screws as indicated on the drawings, spaced not more than 6 inches on center with a minimum of two screws per unit at each support.
      a. Tack weld or use self tapping No. 8 or larger machine screws at 4 feet on center for fastening end closures.
   2. Provide ‘Punch-Lok’ side lap connection at a maximum spacing of 6” o/c.

C. Cutting and Fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking as shown.

D. Reinforcing at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking, and support of other work shown.

E. Joint Covers: Provide metal joint covers at abutting ends and changes in direction of floor deck units, except where taped joints are required.

F. Shear Connectors: Weld shear connectors to supports through decking units in accordance with manufacturer's instructions. Do not weld shear connectors through two layers (lapped ends) of decking units. Weld only on clean dry deck surfaces.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
1. Non-load bearing formed steel stud and joist framing; 20 ga. unless otherwise indicated on the drawings. size and gauge as indicated on the drawings.
2. Fasteners and accessories.

B. Related Work Described Elsewhere:

1.	Structural Steel	Section 051000
2.	Metal Fabrications	Section 055000

C. References:
1. American Society for Testing and Materials (ASTM):
   a. A90-81 Weight of Coating on Zinc-Coated (Galv.) Iron or Steel Articles.
   b. A446-83 Steel Sheet, Zinc-Coated (Galv.) by Hot-Dip Process, Physical (Structural) Quality.
   c. A570-84a Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality.
   d. A611-84 Steel, Cold-Rolled Sheet, Carbon, Structural.
   e. D1187-82 Asphalt-Based Emulsions for Use as Protective Coatings for Metal.
2. American Iron and Steel Institute (AISI): Specification for the Design of Cold-Formed Steel Structural Members - 19980 Edition.
3. American National Standards Institute (ANSI): A58.1-82 Minimum Design Loads for Building and Other Structures.
4. American Welding Society (AWS):
   a. C1.3-70 Recommended Practices for Resistance Welding Coated Low Carbon Steels.
   b. D1.1 Structural Welding Code.
5. Federal Specifications (FS):
   a. FF-B-561 Bolt (Screw), Lag
   b. FF-S-92 Screw, Machine, Slotted, Cross Recessed or Hexagon Head.
   c. FF-W-84 Washer, Lock (Spring)
   d. FF-W-92 Washer, Plat (Plain)
   e. TT-P-645 Primer, Paint, Zinc Chromate, Alkyd Type.

1.2 SUBMITTALS

A. Submit product data under provision of Section 01340.

B. Indicate profiles, sizes, connections, attachments, reinforcing, anchorage, size and type of fasteners and accessories.

C. Include erection drawings and applicable details.

D. Submit product data and installation instructions for each type of framing and accessories.

1.3 DELIVERY, STORAGE & HANDLING

A. Store materials to prevent damage and to comply with manufacturer's recommendations.

B. Keep steel members off ground using pallets, platforms, and other supports. Product steel members and packaged materials from corrosion and deterioration.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Dale Industries/Incor.

B. Roll Form Products, Inc.

C. Knoor Steel Framing Systems

D. Substitutions: Under provisions of Section 01630

2.2 FRAMING MATERIALS

A. Studs: ASTM A446 sheet, formed to channel shape, punched web, knurled faces; 16 ga. unless otherwise indicated; sizes indicated, galvanized.

B. Track: ASTM A446, Grade A sheet steel, formed to channel shape, same width as studs, tight fit; 16 ga. unless otherwise indicated; solid web, galvanized.

2.3 ACCESSORIES

A. Bracing, Furring and Bridging: Formed sheet steel, 16 ga., sizes indicated or if not indicated, as otherwise required for conditions encountered; manufacturer's standard shapes, galvanized.

B. Plates, Gussets, Clips: Formed sheet steel, 16 ga., sized indicated or if not indicated, as otherwise required for conditions encountered; manufacturers standard shapes galvanized.

2.4 FASTENERS

A. Self-drilling, Self-tapping Screws, Bolts, Nuts and Washers: Size suitable for thickness of metal being fastened, and type suitable for condition of use; hot dip galvanized per ASTM A153, A90, or equal.

B. Lag bolts: Square head type, FS FF-B-561.

C. Wood screws: Flathead carbon steel, FS FF-S-111.

D. Machine washers: Cadmium plated steel, FS FF-S-92.

E. Plain washers: Round carbon steel, FS FF-S-92.

F. Lock washers: Helical spring type carbon steel, FS FF-W-84.

G. Expansion bolts: Use Diamond "Di-Ex" machine bolts anchors, Parabolt "Drop-In" or Phillip's "Red Head" wedge type anchors in concrete. Use sleeve type anchors in masonry; similar and equal to Diamond "Sup-R-Sleeve", Hilti "Sleeve Anchors" or Phillip's "Red Head Sleeve Anchor".
   1. Use powder driven studs and pins only where load is acting in shear on anchor (parallel with surfaces), where there is no possibility of anchor's withdrawal, and where structural stability and strength are not impaired.
   2. Provide anchors to resist vibration, leverage, and shock as conditions require.
   3. Use anchors having ultimate holding capacity in direction of applied load, based on manufacturer's published literature, equal to 4 times load to be supported. Furnish anchors backed by certified test data.

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

I. Touch-up Primer for Galvanized Surfaces: FS TT-P-645.

J. Protective Coating: Non-fibrated asphalt coating, conforming to ASTM D1187, Type A.

2.5 FINISHES

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Galvanizing: G60 coating class.

C. Primer: FS TT-P-645, touch-up for galvanized surfaces.

PART 3 - EXECUTION

3.1 PREPARATION

A. Do not proceed until conditions detrimental to work of this Section have been corrected.

B. Clean and strip site primed steel items to bare metal where site welding is scheduled.

3.2 ERECTION OF STUDDING

A. Install components in accordance with manufacturer's instructions.

B. Align top and bottom tracks; locate to wall and partitions layout. Secure in place with fasteners or welding at maximum 24 in o.c.

C. Place components at spacing indicated; not more than 2 in. from abutting walls and corners, and at each side of openings. Connect studs to tracks using clips and ties, screws or welding, in accordance with manufacturer's instructions.

D. Construct corners using minimum three studs. Double studs at openings.

E. Erect studs one piece full length. Splicing of studs is not permitted.

F. Install intermediate studs above and below openings to match wall stub spacing.

G. Attach cross studs to studs for attachment of fixtures anchored to walls.
   1. Supporting loads up to 100 lbs. per ft.: Minimum 6 x 1-1/4 in. long 16 ga. tracks notched around and welded to each minimum 16 ga. vertical stud each side. Weld tracks to studs all around with 1/16 in. fillet welds.
   2. Supporting loads up to 200 lbs. per ft. : Minimum 3 5/8 x 1 1/4 in. x 14 in. long 16 ga. track channel stiffeners welded to inside face of 6 in. x 14 ga. backing plates spanning min. two studs. Composite backing plates attached to each minimum 16 ga. vertical stud with #10 flat head sheet metal screw at midheight of plate. Weld tracks to plates with three 1/16 in. fillet welds, two in. long, ea. side of plate.

H. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

I. Touch-up field welds and damaged galvanized surfaces with primer.

J. Assure Framing provides true and flat surfaces, ready to receive finish.

3.3 ERECTION OF JOISTS

A. Install framing components in accordance with manufacturer's instruction.

B. Set joists parallel and level, with lateral bracing as required.

3.4 TOLERANCES

A. Maximum Variation from True Position: 1/8 in. in 10 ft., in any direction.

B. Maximum Variation of any Member from Plane: 1/8 in.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Steel framing and supports for overhead doors.
   2. Steel framing and supports for countertops.
   3. Steel framing and supports for mechanical and electrical equipment.
   4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
   5. Aluminum ladder with security door.
   6. Metal bollards.
   7. Loose bearing and leveling plates for applications where they are not specified in other Sections.
   8. Trench grate and frame.

B. Related Sections:
   1. Division 05 Section “Solid Phenolic Wall and Soffit Panels” for aluminum sub-framing for solid phenolic wall and soffit panels.
   2. Division 05 Section "Structural Steel Framing."
   3. Division 06 Section “Interior Architectural Woodwork” for countertops to receive steel framing a supports.
   4. Division 08 Section “Sectional Doors” for sectional door assemblies to receive steel framing and support.

1.3 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
   1. Temperature Change: 120 deg. F, ambient; 180 deg. F, material surfaces.

B. Structural Performance of Aluminum Ladders: Aluminum ladders shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Paint products.
3. Grout.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.
1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
2. Where fabrication interfaces with Work specified in other Sections clearly indicated the required interface,

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.8 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate fabrication of steel framing and supports for overhead doors, countertops, mechanical and electrical equipment and for applications where framing and supports are not specified in other Sections with the requirements of those products and materials for a complete and finished installation.

C. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Tubing: ASTM A 500, cold-formed steel tubing.

C. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.

2.3 NONFERROUS METALS

A. Aluminum Plate and Sheet: ASTM B 209, Alloy 5005-H34.

B. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.

2.4 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
1. Provide stainless-steel fasteners for fastening aluminum.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Machine Screws: ASME B18.6.3.

D. Lag Screws: ASME B18.2.1.

E. Wood Screws: Flat head, ASME B18.6.1.

F. Plain Washers: Round, ASME B18.22.1.

G. Lock Washers: Helical, spring type, ASME B18.21.1.

H. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in

concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Shop Primers: Provide primers that comply with Division 09 Sections "Interior Painting," and "High-Performance Coatings."

C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
   1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

F. Non-shrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.

G. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

H. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

I. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.6 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

C. Galvanize miscellaneous framing and supports where indicated.

D. Prime miscellaneous framing and supports with zinc-rich primer for interior applications and with primer specified in Division 09 Section "High-Performance Coatings" where indicated.

2.8 ALUMINUM LADDER WITH SECURITY DOOR

A. Aluminum Ladder with Security Door:
   1. Aluminum Ladder Basis of Design: Subject to compliance with requirements, Tubular Rail Low Parapet Access Ladder with Platform Model 503A with Security Door as manufactured by O'Keeffe's, Inc. or comparable product by one of the following:
      a. ACL Industries, Inc.
      b. Alco-Lite Industrial Products.
      c. Halliday Products.
      d. Precision Ladders, LLC.

e. Royalite Manufacturing, Inc.
f. Thompson Fabricating, LLC.

2. Aluminum ladder shall conform to the requirements of OSHA 1910.27 – Fixed Ladders.
3. Space siderails 24 inches apart unless otherwise indicated.
4. Siderails: Continuous extruded-aluminum tubes, not less than 2-1/2 inches deep, 3/4 inch wide, and 1/8 inch thick.
5. Rungs: Extruded-aluminum tubes, not less than 1-1/4 inch deep and not less than 1/8 inch thick, with serrated tread surfaces.
   a. Rungs shall withstand a 1,500 pound load without deformation or failure.
6. Fit rungs in centerline of siderails; fasten by welding or with stainless-steel fasteners or brackets and aluminum rivets.
7. Provide platforms as indicated fabricated from pressure-locked aluminum bar grating or extruded-aluminum plank grating, supported by extruded-aluminum framing.
   a. Limit openings in gratings to no more than 3/4 inch in least dimension.
   b. 1-1/2 inch or greater diameter tubular aluminum guard rails and decks with serrated treads.
8. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted aluminum brackets.
9. Security Doors: Formed 1/8 inch thick aluminum sheet. Security panels shall extend on both sides, perpendicular to the door face, to within 2 inches of the wall. Provide security door with continuous aluminum piano hinge and heavy duty stainless steel locking hasp for Owner furnished Owner installed padlock.
10. Ladder and security door finish: Mill.

2.9 COUNTERTOP SUPPORTS

A. Fabricate countertop supports from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

B. Prime countertop supports with zinc-rich primer.

2.10 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe of size indicated.

B. Fabricate sleeves for bollard anchorage from steel pipe with 1/4-inch- thick steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches deep and 3/4 inch larger than OD of bollard.

C. Prime bollards with primer specified in Division 09 Section "High-Performance Coatings."

2.11 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates.

C. Prime interior plates with zinc-rich primer. Prime exterior plates with primer specified in Division 09 Section "High-Performance Coatings."

2.12 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.13 TRENCH GRATE AND FRAME

A. Trench Grate: Subject to requirements provide 6904M2 Heavy Duty Trench Grate Product 00690441 as manufactured by East Jordan Iron Works, Inc., or comparable product manufactured by one of the following:
1. Alabama Metal Industries Corporation; a Gibraltar Industries company.
2. All American Grating.
3. BarnettBates Corporation.
4. Borden Metal Products (Canada) Limited.
5. Fisher & Ludlow; Division of Harris Steel Limited.
6. Grating Pacific, Inc.
7. Grupo Metelmex, S.A. de C.V.
8. IKG Industries; a division of Harsco Corporation.
9. Marwas Steel Co.; Laurel Steel Products Division.
10. Ohio Gratings, Inc.
11. Seidelhuber Metal Products; Division of Brodhead Steel Products.

B. Properties:
1. Loading: Heavy duty, suitable for sidewalks and vehicular driveways, subject to trucking: Uniform load of 250 lbf/sq. ft. or concentrated load of 8000 lbf, whichever produces the greater stress.
2. Limit deflection to L/240 or 1/4 inch, whichever is less.
3. Module size: 14 inches by 24 inches provide modules to fully cover trench indicated.
4. Finish: Black asphalt coated.

C. Trench Grate Frame: Fabricate from metal shapes, plates, and bars of welded construction to sizes, shapes, to grating profiles indicated and as necessary to receive gratings. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.
1. Unless otherwise indicated, fabricate from same basic metal as gratings.
2. Equip units indicated to be cast into concrete or built into masonry with integrally welded anchors. Unless otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.
3. Galvanize steel frames.

2.14 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.15 STEEL AND IRON FINISHES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates.

C. Prime interior plates with zinc-rich primer. Prime exterior plates with primer specified in Division 09 Section "High-Performance Coatings."

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for

use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 INSTALLING COUNTERTOP SUPPORTS

A. Install countertop supports in conjunction with solid surface countertops, divider, and wood casework as specified Division 06 Section “Interior Architectural Woodwork” and as indicated on approved Shop Drawings.

3.4 INSTALLING METAL TRENCH GRATES AND FRAMES

A. General: Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.

B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.
1. All units shall be removable.

3.5 INSTALLING METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.

B. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete or in formed or core-drilled holes not less than 8 inches deep and 3/4 inch larger than OD of bollard. Fill annular space around bollard solidly with non-shrink, nonmetallic grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward bollard.

C. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

D. Fill bollards solidly with concrete, mounding top surface to shed water.

3.6 INSTALLING ALUMINUM LADDER AND SECURITY DOOR.

A. Install aluminum ladder and security door in proper relationship with adjacent construction, in accordance with approved Shop Drawings and manufacturer's instructions.

3.7 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
   1. Use non-shrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use non-shrink, nonmetallic grout in exposed locations unless otherwise indicated.
   2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.8 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in [Section 099113 "Exterior Painting."] [Division 09 Sections "Interior Painting" and High Performance Coatings.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included:
   1. Materials required under this section include, but are not necessarily limited to all wood, plywood, nails, bolts, framing anchors and other hardware, and all other materials or items needed for rough and finish carpentry, but not specifically described in other sections.

B. Related work described elsewhere:

1.	Rough Carpentry	Section 062000
2.	Glue Laminated beams	Section 063000

1.2 QUALITY ASSURANCE

A. In addition to complying with applicable codes and regulations, comply with the following standards:
   1. Lumber Grading Rules and Wood Species to be in conformance with ANSI/AF&PA NDS-1997.
   2. Grading rules of the following associations apply to materials furnished under this Section:
      a. West Coast Lumber Inspection Bureau (WCLB).
      b. American Plywood Association (APA).

B. Grade marks of the above association shall appear on all wood products furnished under this section.

C. Regulatory agencies:
   1. International Building Code (IBC) published by the International Conference of Building Officials.
   2. Lumber Treatment:
      a. Preservative treatment of lumber and plywood: American Wood Preserves Bureau Standards (AWPB).
      b. Fire retardant treatment of lumber and plywood: American Wood Preserves Bureau Standards (AWPB).

D. Reference Standards:
   1. American Society for Testing and Materials (ASTM)
   2. America Wood Preserves Bureau (AWPB)
      a. AWPB LP-2 Standard for Softwood Lumber, timber and plywood treated with Waterbone Preservatives for above ground locations.
   3. American Forest and Paper Association
      a. ANSI/AF&PA NDS-1997.
   4. American Institute of Timber Construction (AITC).

1.3 SUBMITTALS

A. Submit in accordance with Section 013400, the following:

1. Materials list:
   a. A complete list of all the types of materials proposed to be furnished under this section.

PART 2 - PRODUCTS

2.1 GRADE STAMPS

A. Framing lumber:
1. Identify all framing lumber by the grade stamp of the West Coast Lumber Inspection Bureau.

B. Plywood:
1. Identify all plywood by the grade of the American Plywood Association.

C. Other:
1. Identify all other products by the grade stamp of the appropriate grading agency for that particular product.

2.2 DIMENSION LUMBER

A. Material:
1. Provide kiln dried dimension lumber of the species and grade noted on the Drawings with not more than 19% moisture content, and complying with the dry size requirements of the appropriate grading agency.
2. Dress dimension lumber s4s unless otherwise specifically called out.

B. Appearance:
1. Where framing lumber will be exposed to view and is shown or scheduled to receive a transparent or natural finish, provide lumber of “Appearance” grade.

C. Pressure Treated:
1. Provide where wood is in contact with masonry or concrete, or where noted on drawings. Cut ends to be treated with Ammoniacal Copper Arsenate (ACA) to a retention of 0.60 pcf per UBC Standard 25-12 and American Wood Preserves Bureau AWPB “FDN”.

2.3 PLYWOOD

A. Rough Carpentry:
   1. Provide interior type with exterior glue of the grade and type indicated on the Drawings.

B. Appearance:
   1. Where plywood will not be concealed by other work, provide A-B plugged grade with 'A' side showing unless otherwise noted.

2.4 ORIENTATED STRAND BOARD

A. 7/16" Stuctural

   1. panels with exterior glue.

2.5 SOFFIT BOARDS

A. T-111 plywood, 5/8" thick. Class 303-18 W Grade.

2.6 FASCIA BOARDS

A. Provide "Hardiplank" 1X4 and 1X8 fascia board and 7/16" hardipanel siding. James Hardie Building Products, 1-800-9-HARDIE

2.7 MISCELLANEOUS MATERIALS

A. Anchorage and Fastenings. Select proper type, size, material, and finish for each application. Comply with the following:

1. Nails and staples:	FS FF-N-105
2. Tacks:	FS FF-N-103
3. Wood screws:	FS FF-N-111
4. Bolts and studs:	FS FF-B-575
5. Nuts:	FS FF-B-836
6. Washers:	FS FF-W-92
7. Lag Bolts:	FS FF-B-561
8. Toggle bolts:	FS FF-B-588
9. Bar or strap anchors:	ASTM A-575

PART 3 - EXECUTION

3.1 PRODUCT HANDLING

A. Storage and protection:

Do not deliver any of the products of this section to the jobsite until a secure, dry, sheltered area, away from traffic, is available for their storage. Use all means necessary to protect the products of this section before, during, and after installation and to protect the installed materials and work of all other trades.

B. Repairs and replacement:

1. In the event of damage make all repairs and replacements necessary to restore the item to original undamaged condition. Repairs and replacements shall be subject to approval of the Architect and shall be accomplished at no additional expense to the Owner.

C. Damaged material:

1. Segregate all damaged material to ensure against its incorporation into the Work, until all necessary repairs, where authorized, have been accomplished.

D. Stockpiling:

1. Stockpile all materials sufficiently in advance to ensure their availability in a timely manner for the work of all related sections.

E. Compliance:

1. Do not permit non-complying materials to be delivered to the jobsite and immediately remove any which are delivered, replacing them with materials complying with the requirements of this section

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

The carpentry work required for this project is shown in the Drawings and includes, but is not necessarily limited to framing, blocking, sheathing, backing, inserts, fasteners, framing anchors and other hardware, and all other materials or items needed for Carpentry but not specifically described in other sections of this specification.

B. RELATED SECTIONS

1.	Lumber:	Section 061000
2.	Glue Laminated Beams	Section 063000
3.	Engineered Wood	Section 065000
4.	Finish carpentry:	Section 062500

1.2 QUALITY ASSURANCE

A. For actual cutting, fitting, and installing of the rough carpentry and associated woodwork, employ only qualified journeymen mechanics who are trained and experienced in the skills required and who are completely familiar with the materials and methods involved.

B. Qualifications of Supervisors:

Employ at least one supervisor who is thoroughly trained in the trade, who is completely familiar with the requirements of the work, who shall be present during all the rough carpentry operations, and who shall direct all the work under this section..

1.3 PRODUCT HANDLING

A. Storage and Protection:

Do not deliver any of the products of this section to the jobsite until a secure, dry, sheltered area, away from traffic, is available for their storage. Use all means necessary to protect the products of this section before, during, and after installation and to protect the installed materials and work of all other trades.

B. Repairs and Replacement:

In the event of damage make all repairs and replacements necessary to restore the item to original undamaged condition. Repairs and replacements shall be subject to approval of the Architect and shall be accomplished at no additional expense to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lumber: Refer to Section 06010 "Lumber".

B. Metal connector plates, fasteners and anchorages.
   1. Connector plate material:
      a. Metal Complying with following requirements, unless otherwise indicated; not less than "0.036" thick, coated thickness at the Contractors option.
      b. Galvanized sheet steel:
         ANSI/ASTM A 446, Grade A, Coating G60.
      c. Electrolytic zinc coated steel sheet:
         ANSI/ASTM A 591, Coating Class C, with minimum structural quality equivalent to ANSI/ASTM A 446, Grade A.
      d. Stainless steel:
         ANSI/ASTM A 167, Type 304, with minimum structural quality equivalent to ANSI/ASTM A 446, Grade A.
   2. Manufacturer:
      a. Metal connector plates shall be "Simpson" as manufactured by the Simpson Strong-Tie Company, Inc. or approved equal.etal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

PART 3 - EXECUTION

3.1 PREPARATION

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

3.2 INSTALLIATION

A. General: Install all work in strict accordance with the design, the approved submittals, and all applicable codes and regulations. All wood framing shall be true, straight and plumb to within 1/4" in 12 foot of length.

B. Workmanship:
   1. Discard material with defects which might impair the quality of the work, and units which are too small to fabricate into the work with minimum joints, or with optimum joint arrangement.

2. Set all work accurately to required levels and lines, with members plumb and true; accurately cut and fitted. Workmanship shall conform to NFPA Construction Specification.

C. Grounds, Nailers, Blocking, Backing:
1. All material in contact with concrete or built-up roofing shall have moisture protection treatment as specified.
2. Provide where shown or where required for screening or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate with other work or trades involved.
3. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces unless otherwise shown.

D. Plywood:
1. Install as recommended by APA "Guide to Plywood Sheathing for Floors, Walls, and Roofs", using tight butt joints with edges true and plumb. Back vertical joints as required to keep edges flush. Provide thicknesses shown, or if not shown, provide thickness recommended by APA.

E. Fastening and Support:
1. Securely attach carpentry work to substrates by anchoring and fastening as shown or necessary, or required by recognized standards.
2. Nail as appropriate to the particular item according to nailing tables in the applicable edition of the Uniform Building Code.
3. Use common wire nails except as otherwise indicated. Use finish nails for finish work.
4. Select fasteners that will not penetrate where opposite side will be exposed to view or receive finish materials.
5. Pre drill as necessary to prevent splitting. Do not lubricate fasteners where friction is essential to develop strength.
6. Screw, do not drive wood screws and lag bolts, except that they may be started by driving and then screwed home.
7. Provide joist hangers, post caps, post bases, and attachment clips as necessary to provide a fully supported and securely attached member at all connecting points and bearing locations.
8. Provide continuous solid support under header and beam bearing points continuous to foundation.

F. Other Items:
1. Install other items in compliance with original design, approved submittals, and applicable codes and regulations. Anchor all work into place for long life under hard use.

3.3 CLEAN UP

A. Remove all work related debris and at completion leave work broom clean.

END OF SECTION

This Page Not Used

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Work included:
   1. The glued laminated structural units (Glulam) required for this Work are indicated on the drawings, and include, but are not necessarily limited to:

   2. Straight-grained beams including headers, girders and purlins.

B. Definition:
   1. Glued laminated timbers is hereby defined to include wood members fabricated from 1" or 2" nominal thickness lumber glued face-to-face to a depth of 6" or more.

C. Related work described elsewhere:

1.	Lumber:	Section 061000
2.	Rough carpentry	Section 062000

1.2 QUALITY ASSURANCE

A. Supervision:
   1. Employ at least one supervisor who is experienced in the work and products of this section, who is familiar with the manufacturer's recommended procedures, and who shall be present at all times during, and shall direct, the work of this section.

B. Qualifications of installers:
   1. Employ only personnel who are thoroughly trained and experienced in the materials and methods specified, the recommended installation practices of the manufacturer, and the requirements of this Work.

C. Standards:
   1. Except as otherwise indicated, comply with PS 56 "Structural Glued Laminated Timber".
      a. Provide factory-glued structural units, produced by an AITC-license firm, qualified to apply the AITC "Quality Inspected" mark.
      b. Factory mark each piece of glued laminated structural units with AITC Quality Inspected mark. Place AITC mark on timber surfaces which will not be exposed in completed work.

1.3 SUBMITTALS

A. Product data:

1. Submit manufacturer's data, specifications and installation instructions covering lumber adhesives, fabrication process, preservative treatment, accessories and protection.

2. Submit certification, signed by an officer of the manufacturing firm, indicating glued laminated timbers comply with requirements of PS 56.

1.4 DELIVERY, STORAGE, HANDLING

A. Keep glued laminated structural units dry during delivery, storage, handling, and erection, by maintaining factory-applied protective covering in weather-tight and light-proof condition, or by applying other weather tight protection. Maintain protective covering until building enclosure is completed to extent necessary for protection of interior GLULAM work, and until final finishing of exterior work is ready to proceed. Do not store GLULAM in areas of either excessively high or excessively low relative humidity; comply with manufacturer's instructions.

B. Time delivery and installation of GLULAM work to avoid extended on-site storage, and to avoid delaying work of the other trades whose work must follow erection of GLULAM work.

PART 2 - PRODUCTS

2.1 GLUED LAMINATED STRUCTURAL UNITS

A. Lumber:
   1. Comply with PS 56 and applicable lumber association standards cited therin for grades required to achieve GLULAM requirements for allowable stress, appearance, fabrication limitation sand species (if any).

B. Stress values:
   1. Provide glued laminated timber members sized as shown on drawings that meet or exceed following stress values.
      a. Bending (Fc), 2400 psi.
      b. Horizontal shear (Fv), 165 psi.
      c. Compression perpendicular to grain (Fc-tension face), 650 psi.
      d. Compression perpendicular to grain (Fc-compression face), 650 psi.
      e. Modulus of Elasticity (E), 1,800,000 psi.

C. Lumber species:
   1. Douglas Fir.

D. Adhesive:
   1. Comply with PS 56, using wet-use waterproof) adhesive, unless otherwise indicated.

E. End sealer:
   1. Manufacturer's standard transparent, colorless wood sealer, effective in retarding transmission of moisture at cross-grain cuts.

F. Penetrating sealer:
   1. Manufacturer's standard translucent penetrating wood sealer, which will not interfere with application of wood stain and transparent finish, or paint finish, as indicated.

G. Connectors, anchors, accessories:
   1. Provide fabricated steel (ANSI/ASTM A36) shapes, plates and bars, welded into assemblies of types of sizes indicated or, if not indicated, manufacturer's standard units for timber sized indicated, with steel bolts (ANSI/ASTM A307), lag bolts (FS FF-B-561). Nails (FS FF-N-105), and other standard fasteners as required.
   2. Finish:
      a. Except as otherwise indicated, finish fabricated assemblies with rust-inhibitive primer.
   3. Wet-use finish:
      a. Where 'Wet Use" GLULAM work is indicated, finish fabricated assemblies with hot-dipped zinc coating (ANSI/ASTM a153), including bolts and other fasteners.

2.2 FABRICATION

A. General:
   1. Comply with PS 56 in providing units indicated; where dimensions are not completely documented. Provide manufacturer's standard sizes and shapes required to fulfill indicated performances.

B. Appearance Classification:
   1. Provide Architectural Grade timbers, complying with AITC 110 for all columns and beams.

C. Camber:
   1. Except as otherwise indicated, fabricate horizontal load-bearing members (units of less than 1 to 12 slope), which are shown as straight members (not arched), with no camber.

D. End-Cut sealing:
   1. Immediately after end-cutting each member to final length, and after wood treatment (if any), apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces "flood-coated" for not less than 10 minutes.

E. Seal coat:
   1. After fabrication and sanding of each unit, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on surfaces of each unit, except for treated wood where treatment has included a water repellent.

2.3 FACTORY APPLIED PROTECTION

A. Before shipping or exposing to outdoor conditions, individually wrap each member with manufacturer's standard, opaque, durable, water-resistant, plastic-coated paper covering, with water-resistant seams.

1. At manufacturer's option, small members of uniform size may be bundle-wrapped, in lieu of individual wrappings. Provide protective slip-sheets between finished surfaces where factory-finishes have been provided.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
   1. Comply with AITC 108 "Standard for Heavy Timber Construction" and manufacturer's instructions.
   2. Install miscellaneous steel connectors, anchors, and accessories as indicated.

B. Cutting:
   1. Avoid cutting GLULAM member during erection, to greatest extent possible. Except for fastener drilling and other minor cutting, coat cuts with end sealer as specified for "Fabrication".
   2. Where treated members must be cut during erection, apply a heavy brush coat of the same treatment, complying with AWPA Standard M4.

C. Wrapping:
   1. Do not remove wrapping on individually wrapped members until it will serve no useful purpose, including protection from weather, soiling and damage from work of other trades. Coordinate removal of wrapping with finishing work specified in the Division 9 sections. Retain wrapping wherever it can serve as a painting shield.

D. Repairs:
   1. Repair damaged surfaces and finishes after completion of erection and removal of wrappings or replace damaged members as directed where damage is beyond satisfactory repair.

3.2 PROTECTION

A. Provide necessary heating, ventilating and air conditioning in storage area and in building, in order to avoid damage or deterioration of GLULAM work.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Interior standing and running trim.
   2. Wood cabinets.
   3. Solid-surfacing-material countertops, dividers and sills.
   4. Closet organizer system
   5. Installation of Owner furnished display cases.

B. Owner Furnished Materials: Display cases with sliding glass fronts and tackable surface on back interior and other items as indicated on the Drawings.

C. Related Sections include the following:
   1. Division 05 Section “Metal Fabrications” for metal countertop supports.
   2. Division 06 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork, including Owner furnished Contractor installed casework, and concealed within other construction before woodwork installation.
   3. Division 09 Section “Staining and Transparent Finishes” for finishes of interior architectural woodwork other than wood cabinets.

1.3 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.
   1. Wood furring blocking, shims and hangings strips for installing Owner furnished Contractor installed casework are included.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, including cabinet hardware and accessories, and finishing materials and processes.

B. Product Data: For solid-surfacing material, cabinet hardware, and accessories, and finishing materials, and processes.

C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show details full size.
   2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
   3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, and other items installed in architectural woodwork.
   4. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
   5. Show locations of, and interface details with, steel countertop supports specified in Division 05 Section “Metal Fabrications.”
   6. Apply WI-certified compliance label to first page of Shop Drawings.
   7. Show closet organizer system individual components and assembled system.

D. Samples for Initial Selection:
   1. Shop-applied transparent finishes.
   2. Thermoset decorative panels.
   3. Solid-surfacing materials.

E. Samples for Verification:
   1. Lumber with or for transparent finish, not less than 50 sq. in., for each species and cut, finished on 1 side and 1 edge.
   2. Veneer leaves representative of and selected from flitches to be used for transparent-finished woodwork.
   3. Veneer-faced panel products with or for transparent finish, 8 by 10 inches, for each species and cut. Include at least one face-veneer seam and finish as specified.
   4. Thermoset decorative-panels, 8 by 10 inches, for each type, color, pattern, and surface finish.
   5. Solid-surfacing materials, 6 inches square.
   6. Corner pieces as follows:
      a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
      b. Miter joints for standing trim.
   7. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For each type of product, signed by product manufacturer.

C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates or WI-certified compliance certificates.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program or shop is a licensee of WI's Certified Compliance Program.

B. Installer Qualifications: Certified participant in AWI's Quality Certification Program or licensee of WI's Certified Compliance Program.

C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood.

D. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements or comply with WI's "Manual of Millwork" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
   1. Provide AWI Quality Certification Program labels or WI-certified compliance labels indicating that woodwork complies with requirements of grades specified.

E. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
   2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.9 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.
   1. Include blocking for Owner furnished Contractor installed casework.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of AWI's or WI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Species and Cut for Transparent Finish: White Birch, plain sawn or sliced.

C. Wood Products: Comply with the following:
   1. Hardboard: AHA A135.4.
   2. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
   3. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
   4. Softwood Plywood: DOC PS 1.
   5. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.

D. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
   1. Provide PVC or polyester edge banding complying with LMA EDG-1 on components with exposed or semi-exposed edges.

E. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. ABA Industries.
      b. Avonite, Inc.
      c. E. I. du Pont de Nemours and Company.
      d. Formica Corporation.
      e. LG Chemical, Ltd.
      f. Meganite Inc.; a division of the Pyrochem Group.
      g. Nevamar Company, LLC; Decorative Products Div.
      h. Samsung; Cheil Industries Inc.
      i. Swan Corporation (The).
      j. Transolid, Inc.
      k. Wilsonart International; Div. of Premark International, Inc.
   2. Type: Standard type, unless Special Purpose type is indicated.

3. Thickness: ¾ inches unless indicated otherwise on the Drawings.
4. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.2 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Door Hardware (Scheduled by Describing Products)."

B. Butt Hinges: 2-3/4-inch, 5-knuckle steel hinges made from 0.095-inch-thick metal, and as follows:
1. Semi-concealed Hinges for Overlay Doors: BHMA A156.9, B01521.

C. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.

D. Catches: Push-in magnetic catches, BHMA A156.9, B03131.

E. Adjustable Shelf Standards and Supports:
1. BHMA A156.9, B04071; with shelf rests, B04081 for end supported shelves.

F. Drawer Slides: BHMA A156.9, B05091.
1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated steel ball-bearing slides.
2. Box Drawer Slides: Grade 1HD-100; for drawers not more than 6 inches high and 24 inches wide.
3. File Drawer Slides: Grade 1HD-200; for drawers more than 6 inches high or 24 inches wide.
4. Pencil Drawer Slides: Grade 1; for drawers not more than 3 inches high and 24 inches wide.
5. Keyboard Slides: Grade 1HD-100]; for computer keyboard shelves.
6. Trash Bin (Waste Container) Slides: Grade 1HD-200; for trash bins not more than 20 inches high and 16 inches wide.

G. Door Locks: BHMA A156.11, E07121.

H. Drawer Locks: BHMA A156.11, E07041.

I. Grommets for Cable Passage through Countertops: 1-1/4-inch black, molded-plastic grommets and matching plastic caps with slot for wire passage.
1. Product: Subject to compliance with requirements, provide "OG series" by Doug Mockett & Company, Inc.

J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
1. Satin Stainless Steel: BHMA 630.

K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.3 CLOTHES RODS

A. Clothes Rods: 1-5/16-inch- diameter, chrome-plated-steel tubes.

B. Rod Flanges: Chrome-plated steel.

2.4 CLOSET ORGANIZER SYSTEM

A. Closet Organizer System Basis of Design: Subject to requirements provide Martha Stewart Living wood closet organizer system as marketed by Home Depot or comparable products by one of the following:
   1. ClosetMaid
   2. John Lewis Home
   3. allen + roth

B. System Components: The following system components are components of the specified basis of design product:
   1. Finish: Classic White.
   2. Basic units (2 each): 72-inch high by 24-inch wide by 14-inch deep Hanging Starter Kits including two each 72-inch high vertical supports, three each 24-inch wide shelves, and a closet rod in each kit, Model #W2.
   3. Drawers: 24-inches wide by 12-inches high by 14-inches deep Model #W10 Drawer Kit.
   4. Shelves:
      a. 24-inches wide by 14-inches deep by 5/8-inch thick Model #W4 shelves.
      b. 35-inches wide by 14-inches deep by 5/8-inch thick Model #W5 shelves.
      c. 12-inches wide by 14-inches deep by 5/8-inch thick Model #W11 shelves.
   5. Short Vertical Panel: 48-inches high by 14-inches deep by 5/8-inches thick Model #W3 vertical panels.

2.5 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

C. Adhesives, General: Adhesives shall not contain urea formaldehyde.

D. VOC Limits for Installation Adhesives: Installation adhesives shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   1. Wood Glues: 30 g/L.
   2. Multipurpose Construction Adhesives: 70 g/L.
   3. Contact Adhesive: 250 g/L.

2.6 FABRICATION, GENERAL

A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
   1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch Thick or Less: 1/16 inch.
   2. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.
   3. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch .

D. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
   1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

E. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, grommets and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

F. Install glass to comply with applicable requirements in Division 8 Section "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

2.7 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

A. Grade: Custom.

B. Wood Species and Cut: White birch, plain sawn.

C. For trim items wider than available lumber, use veneered construction. Do not glue for width.

D. For rails wider or thicker than available lumber, use veneered construction. Do not glue for width or thickness.

E. Back out or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.

F. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.

2.8 WOOD CABINETS FOR TRANSPARENT FINISH

A. Grade: Custom.

B. AWI or WI Type of Cabinet Construction: Reveal overlay.

C. Reveal Dimension: 3/8 inch.

D. Wood Species and Cut for Exposed Surfaces: White birch, plain sawn or sliced.
1. Grain Direction: Vertically for drawer fronts, doors, and fixed panels.
2. Matching of Veneer Leaves: Random match.
3. Vertical Matching of Veneer Leaves: End match.
4. Veneer Matching within Panel Face: Balance match.

E. Semi-exposed Surfaces: Provide surface materials indicated below:
1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
2. Drawer Sides and Backs: Solid-hardwood lumber].
3. Drawer Bottoms: Hardwood plywood.

2.9 SOLID-SURFACING-MATERIAL COUNTERTOPS, DIVIDER, AND SILLS

A. Grade: Custom.

B. Solid-Surfacing-Material Thickness: 3/4 inch unless indicated otherwise on the Drawings.

C. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:
1. As selected by Architect from manufacturer's full range.

D. Fabricate tops, divider and sills in one piece, unless otherwise indicated, or in maximum lengths practicable for transportation and installation. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
1. Fabricate tops with shop-applied edges of materials and configuration indicated.
2. Fabricate tops with loose backsplashes for field application.

E. Drill holes in countertops for plumbing fittings and grommets in shop.

2.10 SHOP FINISHING OF WOOD CABINETS

A. Grade: Provide finishes of same grades as items to be finished.

B. General: Finish wood cabinets at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

1. Interior architectural woodwork other than wood cabinets shall be field finished as specified in Division 09 Section “Staining and Transparent Finishes.”

C. General: Shop finish transparent-finished wood cabinets at fabrication shop as specified in this Section.

D. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.

E. Transparent Finish:
1. Grade: Custom.
2. AWI Finish System: Catalyzed lacquer.
3. WI Finish System 3a.: Catalyzed lacquer.
4. Staining: None required.
5. Filled Finish for Open-Grain Woods: Apply paste wood filler to open-grain woods and wipe off excess.
6. Sheen: Semi-gloss, 46-60 gloss units measured on 60-degree gloss meter per ASTM D 523.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and back-priming.
1. Examine steel countertop supports specified in Division 05 Section “Metal Fabrications” for conformance with requirements and approved Shop Drawings. Do not install supports that do not conform/

C. Before installing Owner furnished Contractor installed casework examine units for damage and any condition that would preclude proper installation. Report damage and any condition that would preclude proper installation in writing to the Owner’s Representative. Do not proceed with installation of these items until directed by Owner’s Representative.

3.2 INSTALLATION

A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

F. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 96 inches long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.]
   1. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.

G. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
   1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
   2. Maintain veneer sequence matching of cabinets with transparent finish.
   3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.

H. Solid Surface Countertops and Divider: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
   1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations and approved Shop Drawings using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
   2. Install steel countertop supports specified in Division 05 Section “Metal Fabrications” countertops and divider with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
   3. Secure solid surface backsplashes to tops with adhesive recommended by solid surface material manufacturer.
   4. Secure solid surface divider to solid surface countertops as indicated on approved Shop Drawings.
   5. Seal space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."

I. Solid Surface Sills: Anchor securely by screwing through window sill plate or other supports into underside of sills.
   1. Align adjacent solid-surfacing-material sills and form seams to comply with manufacturer's written recommendations and approved Shop Drawings using adhesive in

color to match sill. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

2. Install sills with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
3. Secure solid surface backsplashes to tops with adhesive recommended by solid surface material manufacturer.
4. Seal space between solid surface sill and aluminum window sill with sealant specified in Division 07 Section "Joint Sealants."

J. Closet Organizer System: Install components of closet organizer system in accordance with manufacturer's instruction and as required to achieve configuration indicated on the Drawings.
1. Field cut components as necessary to achieve system assembly indicated on approved Shop Drawings.

K. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

L. Refer to Division 9 Sections for final finishing of installed architectural woodwork not indicated to be shop finished.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

This Page Not Used

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Definitions
1. Fabricated wood joists include planar structural units consisting of 'I' section members which are fabricated from dimension lumber or laminated veneer manufactured lumber flanges, with plywood or oriented strand board webs.
2. Engineered wood consists of rectangular section members fabricated from laminated wood veneers.

B. Work Included
1. Manufactured wood joists with laminated wood veneer chord and plywood or oriented strand board webs for floor and roof framing.
2. Bridging, bracing, and anchorage.
3. Framing for openings.
4. Engineered wood members.

C. Related Work

1.	Lumber:	Section 061000
2.	Rough Carpentry	Section 062000
3.	Glue Laminated Beams	Section 063000
4.	Finish carpentry:	Section 062500

1.2 QUALITY ASSURANCE

A. Wood Structural Design Standard: National design Specifications for Wood Construction, published by the National Forest Products Association (NFPA).

B. Grading of Lumber: Provide lumber graded by a recognized agency, with rules and service complying with requirements of American Lumber Standards Committee and PS 20. Use only lumber pieces which bear inspection service's grade marks, unless otherwise indicated. (Remove mark during fabrication if necessary.)

C. Manufacturer Qualifications: Company specializing in manufacture of wood joists with 3 years minimum experience producing joists comparable to type indicated for this project.

D. Design joists under direct supervision of Professional Engineer experienced in structural framing design, registered in the State of Alaska.

1.3 REGULATORY REQUIREMENTS

A. Conform to current edition of ICBO Uniform Building Code for loads, seismic zoning, and other governing criteria.Retain first paragraph below if Contractor is required to assume responsibility for design.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer’s specifications and installation instructions for required work, covering lumber, hardware, fabrication process, treatment (if any), handling and erection.

B. Submit certification, signed by an officer of the manufacturing firm, indicating that joists to be supplied for project comply with indicated specifications.

C. Shop Drawings: Submit shop drawings showing species, sizes and stress grades foe lumber to be used; pitch, span, camber, configuration, and spacing for each type of joist required; type, size, material, finish, design value and location of web members, bearing and anchorage details.

1.5 DELIVERY, STORAGE AND HANDLING

A. Transport, store and handle products as required to maintain structural integrity.
1. Transport and store joists in vertical position resting on bearing ends.
2. Protect joists from moisture, warpage, and distortion during transit and when site stored.
3. Do not allow joists to be lifted with flanges in horizontal orientation, or allow joists to be stressed perpendicular to vertical ‘strong’ axis.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lumber Species.- Douglas Fir-Larch.

B. Lumber Seasoning: Provide seasoned lumber with l5 percent maximum moisture content at time of dressing.

C. Lumber Grade: For species used, comply with the following stress-rated grade (or grades if more than one specified at fabricator's option).
1. WWPA Grade: No. 1 minimum.

D. Web: Graded by APA; PS 1-83 plywood or oriented strand board, waterproof glue.

E. Joist Bridging: Type, size and spacing recommended by joist manufacturer.

2.2 SOLID WEB JOISTS:

A. Joists shall be factory made of plywood webs and laminated veneer flanges, glued under pressure.

B. The design and manufacture of these joists shall be under the direct control and supervision of a Registered Professional Engineer.

C. Substitution of open web joists or lumber joists shall require architect written approval prior to installation.

D. Plywood webs shall be installed with the face grain of veneers running in the vertical direction of the joist and butt jointed to form a continuous web member. OSB webs shall be installed with the strength axis vertical. The web shall be pressure formed and fit into a groove in the center of the wide face of the flange members so as to form a pressurized glue joint at that junction.

E. The joists shall be designed to fit the dimensions indicated on the drawings and for maximum tabular loading conditions for span indicated on dravw4s.

2.3 FABRICATION

A. Provide close fitting joints in assembled units.

B. Assemble joist members in design configuration as indicated to ensure uniformity and accuracy of assembly with close fitting joints. Position members to produce design camber indicated.

2.4 ACCESSORIES

A. Fasteners: Galvanized steel, type to suit application.

B. Stiffeners: As recommended by joist manufacturer.

2.5 ACCEPTABLE MANUFACTURERS

A. Truss-Joist Inc.

B. Boise Cascade Inc.

C. Substitutions: Under provisions of Section 01600.

2.6 FABRICATION

A. Verify dimensions and site conditions prior to fabrication.

PART 3 - EXECUTION

3.1 INSPECTION

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

B. Verify sufficient end bearing area.

C. Beginning of installation means acceptance of existing conditions.

3.2 PROTECTION

A. Engineered wood columns and beams will be exposed as finish materials and shall be provided with protective covering as required to prevent water damage, including staining or discoloration of materials.

3.3 PREPARATION

A. Coordinate placement of support items.

3.4 INSTALLATION

A. Erect and brace joists to comply with recommendations of joist manufacturer.

B. Erect joists with plane of joist webs vertical (plumb) and parallel to each other, located accurately at design spacing indicated.

C. Provide temporary bracing to position joists in place until permanently secured.

D. Install permanent bracing and related components to enable joists to maintain design spacing and straight alignment, withstand live and dead loads and to comply with other indicated requirements.

E. Place headers and supports to frame openings required.

F. Frame openings between joists with lumber in accordance.

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

3.5 TOLERANCES

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

END OF SECTION

SECTION 072100
THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Foam–plastic perimeter insulation.
   2. Spray polyurethane foam insulation.
   3. Polyurea coating for spray polyurethane foam insulation.
   4. Glass-fiber blanket insulation.
   5. Vapor retarders installed as part of exterior wall assembly.

B. Related Sections:
   1. Division 03 Section “Cast-In-Place Concrete” for under-slab vapor retarder.
   2. Division 06 Section “Sheathing” for sheathing for exterior wall sheathing.
   3. Division 07 Section “Weather Barriers” for weather barrier installed as part of exterior wall assembly.
   4. Division 07 Section "Ethylen-Propylene-Diene-Monomer (EPDM) Roofing" for foam-plastic board roof insulation and vapor retarder installed in conjunction with EPDM roofing system.

1.3 REFERENCES

A. 2009 ICC: Includes IBC and IECC.

B. ASTM C209; Standard Test Method for Steady-State Thermal Transmission Properties by Means of Heat Flow Meter Apparatus.

C. ASTM C920: Standard Specification fore Elastomeric Joint Sealants.

D. ASTM C1289: Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

E. ASTM C1363: Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of Hot Box Apparatus.

F. ASTM D412: Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.

G. ASTM D1621: Standard Test Method for Compressive Properties of Rigid Cellular Plastics.

H. ASTM D1622: Standard Test Method for Apparent Density of Rigid Cellular Plastics.

I. ASTM D2240: Standard Test Method for Rubber Property – Durometer Hardness.

J. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials.

K. ASTM E96/E96M: Standard Test Method for Water Vapor Transmission of Materials.

L. ASTM E330: Standard Test Method for Structural Performance of Exterior Windows , Doors, Skylight, Doors and Curtain Walls by Uniform Static Air Pressure Difference.

M. ASTM E331: Standard Test Method for Water Penetration of Exterior Windows , Doors, Skylight, Doors and Curtain Walls by Uniform Static Air Pressure Difference.

N. ASTM E2357: Standard Test Method for Determining Air Leakage od Air Barrier Assemblies.

O. NFPA 285: Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non-Load-Bering Wall Assemblies Containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus.

P. US ANSI NSF-61: Potable Water Certification.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Include product characteristics and performance criteria: aged thermal resistance values, fire performance characteristics, moisture vapor permeance, water absorption ratings, and compressive strengths.

1.5 INFORMATIONAL SUBMITTALS

A. Research/Evaluation Reports: For foam-plastic insulation, from IBC, ASTM and NFPA indicating compliance with listed approval criteria and building codes and this specification.

1.6 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:
   1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
   2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
   3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not apply adhesives or sealant when substrate and ambient air temperatures are below 40 degrees F.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD RIGID INSULATION (PERIMETER INSULATION)

A. Perimeter and Under-slab Rigid Insulation: Extruded polystyrene board insulation: ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. DiversiFoam Products.
      b. Dow Chemical Company (The).
      c. Owens Corning.
      d. Pactiv Building Products.
   2. Type V, 100 psi .

2.2 GLASS-FIBER BLANKET INSULATION (BATT INSULATION)

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. CertainTeed Corporation.
   2. Guardian Building Products, Inc.
   3. Johns Manville.
   4. Knauf Insulation.

5. Owens Corning.

B. Recycled Content: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.

C. Unfaced, Glass-Fiber Blanket Insulation (Batt Insulation): ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

2.3 SPRAY POLYURETHANE FOAM INSULATION FOR DOOR AND WINDOW FRAMES

A. Closed-Cell Polyurethane Foam Insulation: ASTM C 1029, Type II, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. BASF Corporation.
      b. BaySystems NorthAmerica, LLC.
      c. Dow Chemical Company (The).
      d. ERSystems, Inc.
      e. Gaco Western Inc.
      f. Henry Company.
      g. NCFI; Division of Barnhardt Mfg. Co.
      h. Specialty Products, Inc.
      i. SWD Urethane Company.
      j. Volatile Free, Inc.
   2. Minimum density of 1.5 lb/cu. ft.
   3. Thermal resistivity (r- value) of 6.2 deg F x h x sq. ft./Btu x in. at 75 deg F.

2.4 SPRAY POLYURETHANE FOAM INSULATION WITH APPLIED COATING

A. Closed-Cell Polyurethane Foam Insulation: Two component, rigid, closed cell polyurethane foam insulation system for sprayed-in-place applications.
   1. Spray foam insulation shall be specifically designed for spray operations to produce rigid foam for roofs and foundations.
   2. Spray foam insulation shall contain no:
      a. dangerous heavy metal catalysts;
      b. ozone depleting products;
      c. bromine or other halogenated components;
      d. formaldehyde components;
   3. Spray foam insulation shall:
      a. be mildew, bacteria and fungus resistant;
      b. contain renewable resource components;
      c. be considered safe for burial and landfill disposal;
      d. be compliant with ASDA/FDA Requirements for Incidental Food Contact.

B. Closed-Cell Polyurethane Foam Insulation Basis of Design Subject to compliance with requirements, provide SPI ENVELO-SEAL™ as manufactured by Specialty Products, Inc., or comparable product by one of the following:
   1. BASF Corporation.
   2. BaySystems NorthAmerica, LLC.
   3. Dow Chemical Company (The).
   4. ERSystems, Inc.
   5. Gaco Western Inc.
   6. Henry Company.
   7. NCFI; Division of Barnhardt Mfg. Co.
   8. SWD Urethane Company.
   9. Volatile Free, Inc.

C. Insulation Core Density: 3.5 pounds per cubic foot.

D. Initial insulation thermal resistivity (r- value) of 5 deg F x h x sq. ft./Btu x in. at 75 deg F.

E. Polyurea Coating: 100% solid aromatic polyuria, NSF/ANSI Standard 61 Section 5-2011ASTM C 1029 Standard 61 Section 5-2011 Certified.
   1. No solvents.
   2. FDA/USDA compliant for incidental food contact.

F. Polyurea Coating Basis of Design Subject to compliance with requirements, provide POLYSHIELD HI-E ™ as manufactured by Specialty Products, Inc., or comparable product by one of the following:
   1. BASF Corporation.
   2. BaySystems NorthAmerica, LLC.
   3. Dow Chemical Company (The).
   4. ERSystems, Inc.
   5. Gaco Western Inc.
   6. Henry Company.
   7. NCFI; Division of Barnhardt Mfg. Co.
   8. SWD Urethane Company.
   9. Volatile Free, Inc.

G. Coating Properties: High performance, spray applied, plural component pure polyuria elastomer containing no tar, asphalt or VOC's.
   1. Color: Black
   2. Solids by volume: 100%
   3. Solids by weight: 100%
   4. Volatile organic compounds: 0 lb/gal
   5. Tensile strength per ASTM D412: greater than 2,500 psi +/- 200 psi.
   6. Tear Resistance per ASTM D624: greater than 400 pli per Bill.
   7. Elongation ASTM D412: 720% +/- 50%..
   8. 100% Modulus per ASTM D412: 780 psi +/- 100 psi.
   9. 300% Modulus per ASTM D412: 1240 psi +/- 100 psi.
   10. Hardness per ASTM D2240:

a. Shore A: 81 +/- 5%.
b. Shore D: 39 +/- 5%

11. Service Temperature: - -60 deg. F to +248 deg. F.
12. Flame Spread at 20 mils per ASTM E84: 10.
13. Smoke Density at 20 mils per ASTM E84: 10
14. Compliant with FDA/USDA for incidental food contact,

2.5 ACCESSORIES

A. Adhesive: Single component, poly urethane adhesives tested to:
1. Underwriters Laboratory Inc. UL 1897 Standard for Safety for Oplift Tests for Roof Covering Systems.

B. Joint Closure Strips – Clip Strip Type: Rigid PCV construction, L-channel shape, size as recommended by the insulation manufacturer for the conditions indicated.

C. Joint Tape: 2.0 mil thick aluminum tape, 3 inches wide for application at locations indicated and as recommended by insulation manufacturer for the conditions indicated.

D. Mechanical Fasteners - Screw Type: As recommended by the insulation manufacturer for the conditions indicated. Provide fasteners with 1¼ inch diameter plastic washer.

E. Sealant: One-part, flexible polyurethane based elestometic sealant, moisture curing and non-sagging; to ASTM C920, Type S, Grade NS, Class 25.

F. Protection Board: Class A glass fiber reinforced plastic (FRP) insulation protection board panels with the following physical properties:
1. Flexural strength: 10,000 psi when tested in accordance with ASTM D-790.
2. Flexural Modulus: 3.1 X 10^5 psi when tested in accordance with ASTM D-790.
3. Tensile strength: 7,000 psi when tested in accordance with ASTM D-638.
4. Tensile Modulus: 3.1 X 10^5 psi when tested in accordance with ASTM D-638.
5. Percent elongation: 1.80 percent when tested in accordance with ASTM D-638.
6. Water absorption:0.72 percent when tested in accordance with ASTM D-570 at 21 degrees C for 72 hours.
7. Izod impact strength: 7.16 ft.-lb/in. when tested in accordance with ASTM D-256.
8. Coefficient of linear thermal expansion: 2.38 X 10^{-5} in./in./F degree when tested in accordance with ASTM D-696.
9. Barcol hardness: 35 average when tested in accordance with ASTM D-2583.
10. Specific gravity: 1.574 when tested in accordance with ASTM D-792.
11. Abrasion Resistance: 1.5743 when subjected to the Tabor Test.
12. Flash ignition temperature: 400 degrees C when tested in accordance with ASTM 1929.
13. Self ignition temperature: 430 degrees C when tested in accordance with ASTM 1929.
14. Flame spread: Less or equal to 25 when tested in accordance with ASTM E-84.
15. Smoke generation: Less than 25 when tested in accordance with ASTM E-84.

2.6 VAPOR RETARDERS

A. Reinforced-Polyethylene Wall Vapor Retarders: Two outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nylon cord or polyester scrim and weighing not less than 25 lb/1000 sq. ft., with maximum permeance rating of 0.0507 perm .
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Raven Industries Inc.; DURA-SKRIM 6WW.
      b. Reef Industries, Inc.; Griffolyn T-65.

B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

C. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.

D. Single-Component Non-sag Urethane Sealant: ASTM C 920, Type I, Grade NS, Class 25, Use NT related to exposure, and Use O related to vapor-barrier-related substrates.

E. Adhesive for Vapor Retarders: Product recommended by vapor-retarder manufacturer and has demonstrated capability to bond vapor retarders securely to substrates indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Glass-Fiber Blanket (Batt) Insulation: Install at locations indicated in cavities formed by parapet or other framing members according to the following requirements:
   1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
   2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
   3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

3.4 SPRAY APPLIED INSULATION INSTALLATATION

A. Spray-Applied Insulation and Coating: Apply spray-applied insulation and coating at locations indicated according to manufacturer's written instructions.
   1. Window and Door Frames: Install spray foam insulation in window and door frames in manner that will fill the space indicated without voids prior to installation of window glazing or door hardware. Remove excess insulation such that no insulation is visible after glazing and/or hardware are installed.
      a. Coating is not required with this application.
   2. Exterior underfloor insulation:
      a. Mix spray foam insulation components in strict accordance with manufacturer’s written instructions.
      b. Apply only with equipment recommended by manufacturer for conditions indicated. Maintain hose temperature and temperature under insulation as recommended by the manufacturer.
         1) Do not apply to substrate with temperature below 50 deg. F.
      c. Verify that exposed underfloor location is clean, dry and free of oil or wax film or other foreign matter.
      d. Install with primer if recommended by coating manufacturer.
      e. Do not exceed 1.5 inches of foam thickness per pass. Wait 10 minutes between passes to allow reaction heat to dissipate.
      f. Provide successive passes as required to achieve thickness indicate on the Drawings.
   3. Exterior underfloor insulation coating:
      a. Mix coating components in strict accordance with manufacturer’s written instructions.
         1) Do not mix with thinner.
      b. Apply only with equipment recommended by manufacturer for conditions indicated. Maintain hose temperature and temperature under insulation as recommended by the manufacturer.

c. Apply only to clean, dry, sound surfaces free of loose particles and foreign matter.
d. Apply in conformance with coating manufacturer's written recommendations and procedures.
e. Apply to in successive multi-directional passes achieve continuous watertight film not less than 60 mil in thickness,

3.5 INSTALLATION OF VAPOR RETARDERS

A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.
1. Before installing vapor retarders, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
2. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.

C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.6 PROTECTION

A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

This Page Not Used

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Water resistive air and weather barrier system complete including flexible flashing and other components and accessories.

B. Related Requirements
   1. Division 06 Section “Sheathing” for substrate to receive weather barrier.
   2. Division 07 Section “Thermal Insulation” for vapor retarders.
   3. Division 07 Sections “Solid Phenolic Wall & Soffit Panels” for rain-screen type cladding assembly to be installed over weather barrier.

1.3 REFERENCE STANDARDS

A. American Association of Textile Chemists and Colorists (AATCC): ATCC 127 – Test Method for Water Resistance: Hydrostatic Pressure Test.

B. ASTM International (ASTM)
   1. ASTM D 882 – Test Method for Tensile Properties of Thin Plastic Sheeting.
   2. ASTM E 84 – Class A Surface Burning Characteristics.
   3. ASTM E 96 – Test Methods for Water Vapor Transmission of Materials.

C. International Code Council Evaluation Service, Inc. (ICC-ES): ICC-ES AC38 – Acceptance Criteria for Water Resistive Barriers.

1.4 ACTION SUBMITTALS

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

B. Shop Drawings:
   1. Showing extent of building wrap and locations of special components and accessories. Location of special component and accessory installation details.
   2. Special component accessory and installation details scale 3”=1’-0” or larger.

C. Samples:

1. Manufacturer's Sample Warranty.
2. Water resistive weather barrier sheet, minimum 10 inches by 10 inches.
3. Components, minimum 12-inch lengths.
4. Membrane flashings and tapes.
5. Fasteners, clips, strapping and ties
6. Sealants

D. INFORMATIONAL SUBMITTALS
1. Test Data and Evaluation Reports: Submit data from an approved independent testing laboratory certifying compliance with:
   a. ATCC 127 – Test Method for Water Resistance: Hydrstatic Pressure Test.
   b. ASTM D 882 – Test Method for Tensile Properties of Thin Plastic Sheeting.
   c. ASTM E 84 – Class A Surface Burning Characteristics.
   d. ASTM E 96 – Test Methods for Water Vapor Transmission of Materials.

PART 2 - PRODUCTS

2.1 WATER RESISTIVE AIR AND WEATHER BARRIER

A. General: Provide water resistive air and weather barrier membrane components and accessories from a single source to ensure total system compatibility and integrity.

B. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
1. Primary Water Resistive Air and Weather Barrier Basis of Design: Subject to compliance with requirements, provide WallShield® Water-Resistive Barrier Sheet as manufactured by VaproShield, LLC, or comparable products by one of the following:
   a. Dow Chemical Company (The);
   b. DuPont (E. I. du Pont de Nemours and Company); Ludlow Coated Products; Pactiv, Inc.; Raven Industries Inc.;
   c. Reemay, Inc.;
2. Water-Vapor Permeance per ASTM E 96 Method B: Not less than 200 perms: .
3. Air Permeance: Not more than 0.004 cfm/sq. ft. at 0.3-inch wg when tested according to ASTM E 2178.
4. Allowable UV Exposure Time: Not less than three months.
5. Color: Black
6. Water Resistance per AATCC 127: 550 mm hydrostatic head for 5 hours: No leakage.
7. Tensile Strength tested per ASTM D 882: 25 lbf/inch, machine direction; 20 lbf/inch, cross machine direction.
8. Surface Burning Characteristics tested per ASTM E 84: Class A, Flame spread index of less than 25, Smoke development index of less than 450.

C. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.2 MISCELLANEOUS MATERIALS

A. Sheet Membrane Fasteners:
   1. Stainless steel screws with performed head caps.
   2. Head caps: Membrane manufacturer's standard 1-3/4 inch diameter preformed type with a center hole that seals the membrane at the fastener penetration, specifically designed and tested to withstand wind loads and protect against water intrusion at screw penetrations.
   3. Select fasters recommended for substrate and sheathing conditions indicated.

B. Flexible Flashing: Membrane manufacturer's composite, self-adhesive, flashing product consisting of a pliable, compound, having the following properties:
   1. Air Leakage per ASTM E 2178: Less than 0.0000263 cfm/sqft at 75Pa.
   2. Water Vapor Permeance per ASTM E 96 Method B: not less than 50 perms
   3. Water Resistance per AATCC 127: 550 mm hydrostatic head for 5 hours: No leakage.

C. Flashing and Penetration Tapes: Membrane manufacturer's recommended UV stable, double/sinle sided, moisture resistant, flexible tape with adhesive backing having th following properties:
   1. Single sided: 20 mil thick by 3 inches wide penetration seam tape.
   2. Double sided: 30 mil thick by 1 inch wide penetration seam tape.
   3. Special UV resistant: 35 mil thick by 4 inches wide penetration seam tape, black.
   4. Aluminum tape: 20 mil thick by 4 1.2 inches wide and 9 inches wide foil faced, UV Stable, moisture resistant flashing and membrane transition tape for use with silicone sealants.

D. Preformed Window and Door Corners: Membrane manufacturer's factory formed window and door flashing corners, 18 inch by 18 inch performed 90 degree inside corner membrane with the same vapor permeance and resistance to air leakage physical properties as the primary weather/air barrier membrane.

E. Sill Pan Protection System: Membrane manufacturer's extruded polyvinyl chloride sections with integral sloped shape, preformed corner dams and window unit spacer supports configured to drain moisture from window unit base to exterior. Provide type as required to fit with curtain wall and /or storefront sills indicated.

F. Penetration Sealant: As recommend by membrane manufacturer for conditions indicated.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.

B. Cover sheathing and substrate with water-resistive air and weather barrier in strict accordance approved shop drawings and manufacturers written instructions to achieve air resistance, water resistance and vapor permeance equal to or exceeded tested assemblies.

3.2 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.
   1. Prime substrates as recommended by flashing manufacturer.
   2. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
   3. Lap flashing over water-resistive barrier at bottom and sides of openings.
   4. Lap water-resistive barrier over flashing at heads of openings.
   5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Solid phenolic exterior wall and soffit panels including supporting assembly.
   2. Accessories for rain-screen application.
   3. Installation for rain-screen application.

B. Related Sections:
   1. Division 07 Section "Weather Barrier" for vapor permeable, water resistive wrap installed under phenolic exterior wall and soffit panels.

1.3 SYSTEM DESCRIPTION

A. The rain-screen, open joint, exterior phenolic panel system consists of engineered solid phenolic panels, supporting assembly, trim and accessories required for a complete and finished system installation. The system shall be back ventilated and self weeping with a rain-screen track system and including but not limited to the following:
   1. Engineered solid phenolic exterior wall and soffit panels
   2. Pre-finished metal flashings, fascias, trim, and closures used in conjunction with the exterior panels.
   3. Provide all sub-frames, angles, aluminum reinforcing bars, struts, metal anchors, clips, bolts, nuts, shims as indicated to properly erect, align, and secure all work under this section. All materials including sub-framing: furnished and erected by, or erected under the supervision of, one contractor.
      a. Fasteners for attachment of sub-frames to plywood sheathing shall be as indicated on the Drawings.
   4. Semi-concealed fastening devices with gaskets at intersystem fastening to provide silent thermal movement.
   5. Electromotive isolators between dissimilar metals.
   6. Sealing penetrations through the air barrier system required to accommodate the installation of support and attachment systems under the Work of this section as per air barrier system manufacturer.

1.4 REFERENCES

A. Reference Standards: Current edition at date of Bid, except as otherwise specified.

B. ASTM International (ASTM):
   1. ASTM D638 - 10 Standard Test Method for Tensile Properties of Plastics.
   2. ASTM D790 - 10 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
   3. ASTM E84 - 12 Standard Test Method for Surface Burning Characteristics of Building Materials. (Also known as NFPA 255)

1.5 PERFORMANCE CRITERIA

A. Delegated Design: Design of rain-screen, open joint, exterior phenolic wall and soffit panels system including comprehensive engineering analysis shall be by a qualified professional engineer registered to practice in the State of Alaska, using performance requirements and design criteria indicated.

B. Structural Performance of Rain-Screen, Open Joint, Exterior Phenolic Wall and Soffit Panel System: Provide rain-screen, open joint, exterior phenolic wall and soffit panels system that has been designed, fabricated, and installed to withstand loads indicated.
   1. Calculate positive and negative wind loads based on the following:
      a. International Building Code Wind speed: 120 miles per hour.
      b. Exposure: D
   2. Support System Deflection: L/180
   3. Thermal Movement: Design system to accommodate vertical and horizontal thermal movement of components without causing distortion, excessive stress on fasteners, or oil canning when subject to recurring temperature variations.
   4. Drainage: Design for positive drainage of water leakage and condensation to exterior of wall and soffit panels system.
   5. Tolerance of Substructure: Design system to accommodate up to ¼-inch in 10 feet variation out of plane.
   6. Seismic Design: Conform to International Building Code for the Seismic Category appropriate for location of system installation.
   7. Fastener for attaching exterior phenolic panel system to plywood sheathing substrate shall be as indicated on the Drawings.

C. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame Spread: Class B
   2. Smoke Developed: Less than 450

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Delegated Design Submittal: For exterior wall and soffit panels assembly indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Submit structural calculation by a qualified professional engineer indicating compliance with the performance criteria.

D. Shop Drawings:
1. Include fabrication and installation layouts of support system, solid phenolic exterior wall and soffit panels and accessories; details of edge conditions, joints, panel profiles, corners, anchorages, sub-frame and attachment system, trim, flashings, closures, and accessories; and special details. Show distinction between factory and field assembled work.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.

E. Samples for Initial Selection: For each type of exterior phenolic wall and soffit panels indicated with factory-applied finishes.
1. Include samples of solid phenolic panel manufacturer’s full color for color selection by Architect.

F. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below:
1. Solid Phenolic Exterior Wall and Soffit Panels: 12 inches long by actual panel width, of colors selected. Include fasteners, closures, and other metal panel accessories.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data:
1. For system manufacturer.
2. For Installer.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Sample Warranties: For special warranties.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For solid phenolic exterior wall and soffit panels to include in maintenance manuals.

1.9 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.
1. Meet with Owner’s Representative, Architect, Owner's insurer if applicable, solid phenolic exterior wall and soffit panels system Installer, solid phenolic exterior wall and

soffit panels system manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.

2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to phenolic panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect phenolic panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for phenolic panel assembly during and after installation.
8. Review of procedures for repair of phenolic panels damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.10 QUALITY ASSURANCE

A. Manufacturer Qualifications: Sufficient plant facilities to provide quality and quantity of materials as required without delaying progress of the work.

B. Installer Qualifications: Company specializing in work of this Section with minimum three years documented experience of comparable scope and similar complexity to those required in Project. An entity that employs installers and supervisors who are trained and approved by manufacturer. The installer shall be approved in writing by the manufacturer.

C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of Alaska and who is experienced in providing engineering services of the kind indicated.

D. Affixing (Support) Systems shall meet building codes and all specifications and accreditations set forth in Article 1.4 above.

E. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Build mockup of typical solid phenolic exterior wall and soffit panels assembly as shown on Drawings, including supports, attachments, and accessories.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace solid phenolic exterior wall and soffit panels systems that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including rupturing, cracking, or puncturing.
      b. Deterioration of solid phenolic exterior wall and other materials beyond normal weathering.
   2. Warranty Period: Ten years from date of Substantial Completion.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Delivery:
   1. Deliver, handle, and store solid phenolic exterior wall and soffit panels in accordance with manufacturer’s instructions.
   2. Deliver components, solid phenolic exterior wall and soffit panels, and other manufactured items so as not to be damaged or deformed. Package wall and soffit panels for protection during transportation and handling.
   3. Unload, store, and solid phenolic exterior wall and soffit panels in a manner to prevent bending, warping, twisting, and surface damage.

B. Storage:
   1. Store solid phenolic wall and soffit panels on a flat, stable horizontal surface, elevated above the ground, and protected from direct sunlight until panels are ready to install.
   2. Do not store solid phenolic wall and soffit panels or fabricated panels vertically.
   3. Store solid phenolic wall and soffit panels to ensure dryness, with positive slope for drainage of water. Do not store panels in contact with other materials that might cause staining or other surface damage. Do not allow storage space to exceed 120 degrees Fahrenheit.

C. Handling:
   1. When moving panels, lift evenly to prevent dragging panels across each other and scratching the surface.
   2. Protective film should only be removed immediately prior to installation. Installed product must have protective film, labels and stickers removed.

1.13 PROJECT CONDITIONS

A. Comply with requirements of referenced standards and recommendations of material manufacturer’s for environmental conditions before, during and after installation.

B. Verify locations of structural members and wall opening dimensions by field measurements before solid phenolic wall and soffit panel fabrication and indicate measurements on Shop Drawings.

1.14 COORDINATION

A. Coordinate solid phenolic exterior wall assemblies with rain drainage work, flashing, trim, and construction of studs, soffits, and other adjoining work to provide a leak proof, secure, and non-corrosive installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

B. Surface Burning Characteristics: Class B when tested in accordance with ASTM E84.Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

2.2 SOLID PHENOLIC WALL AND SOFFIT PANEL MATERIALS

A. General: Solid phenolic engineered exterior wall and panels are rigid homogenous flat panel manufactured utilizing thermosetting resins reinforced with cellulose fibers, produced under high temperature and pressure and with integral properties and fire resistive qualities for use as an exterior façade material. Panels shall include manufacture's standard ultra violet light inhibiting protective covering

B. Solid Phenolic Exterior Wall and Soffit Panels Basis of Design: Subject to compliance with requirements, provide Fiberesin Stonewood solid core phenolic exterior wall and soffit panels as manufactured by Fiberesin Industries, Inc. or comparable product by one of the following:
   1. Architects Surfaces, LLC.
   2. Isomax Decorative Laminate Panels.
   3. KTI International, Inc.
   4. Richlite Company

C. Physical Characteristics:
   1. Panel Core: Fire retardant black core.
   2. Panel Thickness: As determined by delegated design analysis and calculations but not less than 3/8- inch except for curved panels.
   3. Flexural Strength per ASTM D-790:
      a. MD: 20,000 psi.
      b. CD: 16,000 psi.
   4. Flexural Modulus per ASTM D-790:
      a. MD: 2.0×10^6 psi.
      b. CD: 1.5×10^6 psi.
   5. Tensile Modulus per ASTM D-638:
      a. MD: 18,000 psi.

b. CD: 13,000 psi.

6. Ball Impact Resistance per NEMA Standards Publication LD3-2005 High pressure laminate: Inches drop 75-inches; panel thickness 0.250-inches; effect 96-inches plus.
7. Panels for Curved Installation: Panels for installation in curved condition shall be of a thickness that has been tested by the manufacturer for bend to a radius of 20 feet or less without delamination, breakage or other detrimental effects.

D. Finishes:
1. Ultra Violet Light Protection: Provide solid phenolic ultra violet light protection as required to limit color fading to comply with, classification, 3- 5 measured with the grey scale according to ISO 105 A02-93.
2. Colors:
a. Color #1: as selected by Architect from Fiberesin Stonewood collection.
b. Color #2: as selected by Architect from Fiberesin Stonewood collection.

2.3 SUPPORT SYSTEM

A. Exterior Wall and Soffit Panels Rain-Screen Support System: Subject to compliance with requirements provide rain-screen type non-exposed attachment system on fixed depth aluminum sub-framing phenolic exterior wall and soffit panels support system as manufactured by recommended by the solid phenolic panel manufacturer.

B. Support System Description: Provide depth indicated on Drawings from sheathing to backside of panel. Sub-frame attachment system shall be comprised of aluminum extrusions that span horizontally and attach to the structural members of the wall substrate. Aluminum extrusion clips shall engage into the horizontal member and shall be positioned at the attachment points of the phenolic panel. Exposed panel fasteners shall attach the panel to the extrusion clips. An aluminum extrusion shall span vertically overlapping the horizontal member and shall fasten to the horizontal member. At the vertical panel joint, exposed fasteners shall attach the phenolic panel to a flange on the vertical member. Open airspace between the back of the panel and the wall shall allow for unrestricted ventilation and shall provide drainage in the air space cavity. Horizontal and vertical panel joints shall be open. with an aluminum joint shield over the back side of the panel. Joint shield will be black in color unless otherwise specified.

C. Exposed fastening over fixed depth aluminum sub-framing tested and meeting the performance requirements of ASTM E84 - 12 (NFPA 255)

D. Components: Components shall be formed from extruded aluminum.
1. Aluminum extrusions shall be manufactured to ASTM B221 using aluminum alloy grade 6063 and temper T6 unless another alloy is approved by the Architect.
2. Aluminum sub-structure shall be designed to withstand structural loading due to wind load and dead load of the panel wall as required and shall be concealed behind the open joinery of the panel system.
3. Extrusions, formed members, sheet, and plate shall conform to the recommendations of the specified system.
4. Aluminum Trim: Color as selected by the architect from the manufacturer’s full range of available colors.
5. Weather Resistive Barrier: Provide weather resistive barrier as specified in Division 07 Section “Weather Barriers.”

6. Fasteners:
   a. Fasteners for attaching panels and accessories to sub-framing shall be austenitic stainless steel as recommended by panel manufacturer. Exposed fasteners shall be colored matched to panels.
   b. Fasteners for attaching sub-framing to plywood wall sheathing shall be as indicated on the Drawings.

E. Other installation systems - Include test documentation showing compliance with the performance criteria set forth in Article 1.5 and in accordance with the current edition of the International Building Code..

F. Wall and Soffit Panel Accessories: Provide components required for a complete solid phenolic wall and soffit panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, fillers, closure strips, and similar items. Closely match material and finish of phenolic wall and soffit panels unless otherwise indicated.
   1. Provide stainless steel insect screen at locations indicated and as recommended by solid phenolic exterior wall and soffit panel manufacturer. Paint screen black where exposed to view.

G. Flashing and Trim: Pre-finished aluminum as specified in Division 07 Section “Sheet Metal Flashing and Trim. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, end-walls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent solid phenolic engineered façade wall and soffit panels.

H. Aluminum Extrusions: ASTM B 221, alloy and temper is 6063-T6 unless otherwise specified by manufacturer for type of use and finish indicated.

I. Fasteners:
   1. Screws, bolts, nuts, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads for attaching panels and accessories to sub-framing shall be austenitic stainless steel as recommended by panel manufacturer. Exposed fasteners shall be colored matched to panels. Exposed fasteners shall be austenitic stainless steel with heads matching color of phenolic engineered façade wall and soffit panels by means of plastic caps or factory-applied coating
   2. Fasteners for attaching sub-framing to plywood wall sheathing shall be as indicated on the Drawings.

2.4 FABRICATION

A. General: Provide components required for a complete, weather-tight solid phenolic exterior panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of phenolic panels unless otherwise indicated.

B. Fabricate solid phenolic exterior wall and soffit panels, sub-framing support/affixing system and accessories at the shop to greatest extent possible, by manufacturer’s standard procedures and

processes, as necessary to fulfill indicated performance, dimensional and structural requirements.

C. Panel lines, breaks, and angles shall be sharp, true, and surfaces free from warp and buckle.

D. Panel Dimensions: Field fabrication shall be allowed where necessary. All fabrication shall be done under controlled shop conditions when possible.
   1. Thickness: Fabricate panels of thickness required to resist live and dead loads for the conditions indicated.
   2. Joint width tolerance: Fabricate panels to maintain joint widths indicated within 1/16-inch for every 60 inches of joint length. Joint widths shall not vary more the 1/16-inch from the dimension indicated over the full joint length.

E. Minimize stress cracks by ensuring that cutout and holes are oversized as recommended by the panel manufacturer for the conditions indicated.

F. Adhesives: Use only adhesives recommended by the panel manufacturer for the conditions indicated.

G. Sanding: Sanding of panels as recommended by the panel manufacturer to remove machining striations and to provide a smooth surface.

H. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

I. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
   1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by solid phenolic wall and soffit panels manufacturer.
   2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall and soffit panels manufacturer.
      a. Verify that weather resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration and water penetration.

B. Examine roughing-in for components and systems penetrating solid phenolic wall and soffit panels to verify actual locations of penetrations relative to seam locations of metal panels before installation

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Miscellaneous Framing: Install sub-girts, base angles, sills, furring, and other miscellaneous wall and soffit panels support members and anchorage according to ASTM C 754 and solid phenolic wall and soffit panels manufacturer's written instructions and approved Shop Drawings.

3.3 SOLID PHENOLIC EXTERIOR WALL AND SOFFIT PANELS INSTALLATION

A. General: Install solid phenolic wall and soffit panels according approved Shop Drawings and manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
   1. Shim or otherwise plumb substrates receiving phenolic wall and soffit panels.
   2. Flash and seal phenolic panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barriers and flashings that will be concealed by metal panels are installed.
   3. Install screw fasteners in predrilled holes.
   4. Locate and space fastenings in uniform vertical and horizontal alignment.
   5. Install flashing and trim as metal panel work proceeds.
   6. Align bottoms of phenolic wall and soffit panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
   7. Apply elastomeric sealant continuously between metal base sill angle and stud wall assembly, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
   8. Provide weather-tight escutcheons for pipe- and conduit-penetrating panels.

B. Sub-framing Attachment System Installation, General: Install sub-framing attachment system required to support solid phenolic wall and soffit panels and to provide a complete weather-tight rain-screen wall system, including sub-girts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.
   1. Fasteners for attaching sub-framing to plywood substrate shall be as indicated on the Drawings.

C. Rain-Screen Wall Installation: Install supporting/affixing system and standard back-ventilated, rain-screen wall system with extrusions that provide panel support for an open joint panel wall featuring an open airspace between the back of the panel and the wall substrate to allow for unrestricted ventilation and shall provide drainage in the air space cavity. Temporarily set panel by shimming it level and square and maintaining a 3/8" reveal around the panel. Starting at the center fixing fastener, attach the panel to the aluminum structure as indicated on the shop drawings. Attach the remaining fasteners by centering the fastener directly through the center of

the hole allowing proper clearance on the entire fastener to accommodate movements caused by expansion and contraction.

1. Do not apply sealants to joints unless otherwise indicated on approved Shop Drawings .
2. If field cutting of panels in required, cut with 50+ count tooth carbine tip blade unless recommended otherwise by panel manufacturer. Use saw recommended by manufacturer.

D. Fasteners: Use austenitic stainless-steel fasteners for surfaces exposed to the exterior.

E. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as detailed on approved Shop Drawings.

F. Do not install panels or component parts with known or visible manufacturing defects.

G. Do not field modify component parts during installation in a manner that would damage the finish, compromise the strength, or result in visual imperfection or a failure in performance. Return component parts that require modification to shop for re-fabrication or replacement.

H. Anchor panels and sub-framing securely per Drawings to allow for necessary movement and structural support.

I. Install accessories with positive anchorage to building and weather tight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete solid phenolic engineered façade wall and soffit panels assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

J. Flashing and Trim: Comply with performance requirements, manufacturer’s written installation instructions, and SMACNA’s “Architectural Sheet Metal Manual.” Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

K. Install panels in radius conditions in accordance with manufacturer’s written installation instructions for radiused conditions.

L. Installed product must have protective film, labels and stickers removed.

M. Adjusting: Adjust final panel installation so that all joints are true and even throughout the installation. Panels out of plane shall be adjusted with the surrounding panels to minimize any imperfection.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner reserves the right to engage a qualified testing agency to inspections.

B. Remove and replace phenolic wall and soffit panels where inspections indicate that they do not comply with specified requirements.

C. Additional inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

D. Testing agency shall prepare test and inspection reports and submit reports to Owner's Representative, Architect and Contractor.

3.5 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films as solid phenolic exterior wall and soffit panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of solid phenolic wall and soffit panels installation, clean finished surfaces as recommended by panel manufacturer.

B. Replace solid phenolic panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Adhered reinforced ethylene-propylene-diene-monomer (EPDM) roofing system.
2. EPDM plumbing vent flashing.
3. Flexible walkway material.
4. Cover board
5. Roof insulation
6. Tapered roof insulation
7. Vapor retarder.

B. Related Requirements:
1. Division 06 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
2. Division 07 Section "Building Insulation" for insulation not beneath the roof deck.
3. Division 07 Section "Sheet Metal Flashing and Trim" for metal roof flashings and counter-flashings.
4. Division 07 Section "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
5. Division 22 for roof drains.

1.3 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.
1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.

B. Calculations of Average R-Value: Design tapered thermal insulation system, including comprehensive average R-value calculations stamped and signed by a qualified professional, using performance requirements and design criteria indicated.
   1. Calculation Methodology: Calculate average thermal resistance, R value, for each one-way trapezoidal taper insulation area indicated on the Drawings using methodology outlined in ASHRAE article LV-11-019, “Determining the Average R-Value of Tapered Insulation,” published in ASHRAE Transaction, Volume 117, Part 1.
   2. Data Presentation Format: Each roof drain serves four one way trapezoidal tapers (sloped roof plane) which are keyed on the drawing. For each one way trapezoidal taper provide calculated insulation thickness at the parapet or ridge and at the roof drain as well as the slope of each one way trapezoidal taper.
   3. Provide roof insulation fabricator’s certification, signed by an authorized representative of the fabricator, indicating that when installed in accordance within approved Installation Drawings the installed roof insulation assembly will provide an average thermal resistance value (R-Value) not less than that indicated on the Drawings.

C. Thermal Performance of Tapered Insulation Assembly: Tapered rigid roof insulation thickness shall withstand heat flow and provide a thermal barrier meeting the following criteria.
   1. Calculate:
      a. Rigid insulation thickness at parapet or ridge required to provide average R value indicated on the Drawings. Maximum thickness of base layer(s) plus tapered layer at ridges and parapets shall be not more than specified below.
      b. Rigid insulation thickness at other than parapet or ridge insulation required to provide average R value indicated on the Drawings. Minimum thickness of base layer(s) shall be not less than specified below.
   2. Minimum thermal resistance (r) value for 1-inch thickness: Insulation manufacturer’s published thermal resistance (r) value, for aged material at average 32 degrees F.
   3. Average R Value: 38
   4. Maximum thickness at parapet or ridge (base layer(s) plus tapered layers): 14 inches.
   5. Minimum thickness at other than parapet or ridge: 4 inches minimum, base layer(s) thickness as required to achieve specified average R value while meeting the other specified criteria.
   6. Minimum roof slope to drain: ¼-inch per 1 foot 0 inches, unless specifically indicated otherwise.

D. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

E. Roofing System Design: Tested by a qualified testing agency to resist the following uplift pressures:
   1. Corner Uplift Pressure: 96.2 lbf/sq. ft..
   2. Perimeter Uplift Pressure: 64.0 lbf/sq. ft.
   3. Field-of-Roof Uplift Pressure: 38.1 lbf/sq. ft. .

F. FM Global Listing: Roofing, base flashings, and component materials shall comply with requirements in FM Global 4450 or FM Global 4470 as part of a roofing system, and shall be listed in FM Global's "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.

1. Fire/Windstorm Classification: Class 1A-120.
2. Hail-Resistance Rating: SH.

G. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

H. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:
1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Roof plan showing orientation of steel roof deck and orientation of roofing and fastening spacings and patterns for mechanically fastened roofing.
4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
5. Insulation R values and thickness shall be shown in accordance with calculations of average R values specified in Article “Performance Requirements.”

C. Calculations of Average R value: Submit calculations prepared signed by a qualified professional indicating average R value and thicknesses of roof insulation shall be within the performance requirements specified and indicated.

D. Samples for Verification: For the following products:
1. Sheet roofing.
2. Walkway pads or rolls, of color required.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
1. Submit evidence of complying with performance requirements.

C. Product Test Reports: For components of roofing system, tests performed by manufacturer and witnessed by a qualified testing agency.

D. Research/Evaluation Reports: For components of roofing system, from ICC-ES.

E. Field quality-control reports.

F. Sample Warranties: For manufacturer's special warranties.

1.7 PRE-INSTALLATION MEETINGS

A. Pre-installation Roofing Conference: Conduct conference at Project site.
   1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
   2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
   3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
   5. Review structural loading limitations of roof deck during and after roofing.
   6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
   7. Review governing regulations and requirements for insurance and certificates if applicable.
   8. Review temporary protection requirements for roofing system during and after installation.
   9. Review roof observation and repair procedures after roofing installation.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
   1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.11 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

1.12 WARRANTY

A. Special Warranty: Manufacturer’s full roofing system warranty that agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
   1. Special warranty includes membrane roofing, base flashings, roof insulation, fasteners, cover boards, and other components of roofing system.
   2. Warranty Period: 20 years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering Work of this Section, including all components of roofing system such as membrane roofing, base flashing, roof insulation, fasteners, cover boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:
   1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain components including roof insulation, fasteners for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 EPDM ROOFING

A. EPDM: ASTM D 4637,Type II, scrim or fabric internally reinforced, uniform, flexible EPDM sheet.
   1. EPDM Roofing Basis of Design: Subject to compliance with requirements, provide EPDM roofing system with SURE-Tough reinforced EPDM membrane as manufactured by Carlyle Syntec Incorporated or comparable system with comparable membrane by one of the following:
      a. ER Systems
      b. Firestone Building Products
      c. GAF Materials Corporation
      d. GenFlex Roofing Systems
      e. Johns Manville; a Birkshite Hathaway Company
      f. Lexcan Limited
      g. Mule-Hide Products Co., Inc.
      h. Roofing Products International, Inc.
      i. StaFast Building Products
      j. Versica Incorporated
   2. Thickness: 60 mils nominal.
   3. Exposed Face Color: Black.

2.3 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.
   1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
   2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Sheet Flashing: 60-mil- thick EPDM, partially cured or cured, according to application.

C. Bonding Adhesive: Manufacturer's standard.

D. Seaming Material: Manufacturer's standard, synthetic-rubber polymer primer and 3-inch- wide minimum, butyl splice tape with release film.

E. Lap Sealant: Manufacturer's standard, single-component sealant[, colored to match membrane roofing.

F. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.

G. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

H. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening membrane to substrate, and acceptable to roofing system manufacturer.

I. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, molded pipe boot flashings, preformed inside and outside corner sheet flashings, reinforced EPDM securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

2.4 COVER BOARDS

A. Cover Boards: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/2 inch thick or proprietary cover boards manufactured by the membrane manufacturer.

2.5 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by EPDM roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.

B. Molded-Polystyrene Board Insulation: ASTM C 578, Type II, 1.35-lb/cu. ft. minimum density.

or, at Contractor’s option

C. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 3, felt or glass-fiber mat facer on both major surfaces.

D. Tapered Insulation: Provide factory-tapered insulation boards fabricated to a minimum slope of 1/4 inch per 12 inches unless otherwise indicated.
   1. Slope may be greater than 1/4 inch per 12 inches as required to meet performance requirement and roof geometry.

E. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.6 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening cover boards and roof insulation to substrate, and acceptable to roofing system manufacturer.

C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer, one of the as following:

1. Modified asphaltic, asbestos-free, cold-applied adhesive.
2. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.
3. Full-spread spray-applied, low-rise, two-component urethane adhesive.

2.7 ASPHALT MATERIALS

A. Roofing Asphalt: ASTM D 312, Type III or Type IV.

B. Asphalt Primer: ASTM D 41/D 41M.

2.8 VAPOR RETARDER

A. Laminated Sheet: Polyethylene laminate, two layers, reinforced with cord grid, with maximum permeance rating of 0.06 perm.
   1. Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

2.9 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads, approximately 3/16 inch thick and acceptable to roofing system manufacturer.
   1. Tensile strength per ASTM D412: Not less than 500 psi.
   2. Tear resistance per ASTM D624: Not less 250 lbf/in.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work:
   1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
   2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
   3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 05 Section "Steel Deck."

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Install insulation strips according to acoustical roof deck manufacturer's written instructions.

3.3 ROOFING INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions and approved Shop Drawings.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.4 VAPOR-RETARDER INSTALLATION

A. Laminate Sheet: Loosely lay laminate-sheet vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 inches and 6 inches, respectively. Continuously seal side and end laps with tape.

B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

3.5 INSULATION INSTALLATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with roofing system and insulation manufacturer's written instructions and approved Shop Drawings for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated in approved Shop Drawings.

D. Install insulation under area of roofing to achieve thicknesses indicated in approved Shop Drawings. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 in each direction unless indicated otherwise on approved Shop Drawings

1. Where installing composite and non-composite insulation in two or more layers, install non-composite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

G. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
1. Fasten insulation according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
2. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and fasten to roof deck.
1. Fasten cover boards according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

3.6 ADHERED MEMBRANE ROOFING INSTALLATION

A. Adhere roofing over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll membrane roofing and allow to relax before installing.

B. Start installation of roofing in presence of roofing system manufacturer's technical personnel.

C. Accurately align roofing, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply to substrate and underside of roofing at rate required by manufacturer, and allow to partially dry before installing roofing. Do not apply to splice area of roofing.

E. In addition to adhering, mechanically fasten roofing securely at terminations, penetrations, and perimeters.

F. Apply roofing with side laps shingled with slope of roof deck where possible.

G. Adhesive Seam Installation: Clean both faces of splice areas, apply splicing cement, and firmly roll side and end laps of overlapping roofing according to manufacturer's written instructions to

ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing terminations.

1. Apply a continuous bead of in-seam sealant before closing splice if required by roofing system manufacturer.

or, at Contractor's option

H. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping roofing according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing terminations.

I. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.

J. Spread sealant or mastic bed over deck-drain flange at roof drains, and securely seal membrane roofing in place with clamping ring.

K. Adhere protection sheet over membrane roofing at locations indicated.

3.7 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.8 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish reports to Architect.

B. Flood Testing: Flood test each roofing area for leaks, according to recommendations in ASTM D 5957, after completing roofing and flashing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
   1. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches. Maintain 2 inches of clearance from top of base flashing.
   2. Flood each area for 48 hours.
   3. After flood testing, repair leaks, repeat flood tests, and make further repairs until roofing and flashing installations are watertight.

C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

D. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.10 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.11 ROOFING INSTALLER'S WARRANTY

A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

   1. Owner: <**Insert name of Owner**>.

2. Address: <**Insert address**>.
3. Building Name/Type: <**Insert information**>.
4. Address: <**Insert address**>.
5. Area of Work: <**Insert information**>.
6. Acceptance Date: _____.
7. Warranty Period: <**Insert time**>.
8. Expiration Date: _____.

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:

    a. lightning;
    b. peak gust wind speed exceeding <**Insert mph (m/sec)**>;
    c. fire;
    d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
    e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
    f. vapor condensation on bottom of roofing; and
    g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.

5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Formed low-slope roof sheet metal fabrications.
   2. Formed wall sheet metal fabrications.
   3. Formed equipment support flashing.

B. Related Requirements:
   1. Division 06 "Rough Carpentry" for wood nailers, curbs, and blocking.
   2. Division 07 Section “Solid Phenolic Exterior Wall & Soffit Panels” for installation of sheet metal fabrications provided in conjunction with rain-screen assembly and for coordination of pre-finished aluminum flashing with colors of solid phenolic exterior wall and soffit panels.
   3. Division 07 Section “Ethylene Propylene Diene Monomer (EPDM) Roofing” for membrane flashings provided in conjunction with membrane roofing.
   4. Division 08 Sections “Aluminum Framed Entrances,“ and “Aluminum Windows” for coordination of anodized aluminum flashing installed in conjunction with aluminum entrances and windows.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leak-proof, secure, and noncorrosive installation.

C. Coordinate prefinished aluminum flashing colors as required to achieve color match with colors selected for solid phenolic wall and soffit panel colors.

D. Coordinate profiles of prefinished aluminum wall flashings used in conjunction with solid phenolic wall and soffit panel system with phenolic panel system manufacturer’s requirements.

E. Coordinate profiles of anodized aluminum flashing used in conjunction with aluminum framed entrance and aluminum window. Flashing requirements indicated.

1.4 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.
   1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
   3. Review of phenolic wall and soffit panel system flashing is specifies in Division 07 Section “Flashing and Sheet Metal.”
   4. Review requirements for installation of anodized aluminum flashing in conjunction with aluminum framed entrances and aluminum windows.
   5. Review requirements for insurance and certificates if applicable.
   6. Review sheet metal flashing observation and repair procedures after flashing installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.
   1. Include plans, elevations, sections, and attachment details.
   2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
   3. Include identification of material, thickness, weight, and finish for each item and location in Project.
   4. Include details for forming, including profiles, shapes, seams, and dimensions.
   5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
   6. Include details of termination points and assemblies.
   7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
   8. Include details of roof-penetration flashing.
   9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counter-flashings as applicable.
   10. Include details of special conditions.
   11. Include details of connections to adjoining work.
   12. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Verification: For each type of exposed finish.
   1. Anodized Aluminum Flashing: 12 inches long by 12 inches wide of specified material with specified anodized finish. Samples to show full range of color variation to be expected for each color required.
   2. Prefinished Aluminum Flashing: 12 inches long by 12 inches wide of specified material with specified finish of colors selected for solid phenolic wall panels.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.10 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. FM Approvals Listing: Manufacture and install copings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-120. Identify materials with name of fabricator and design approved by FM Approvals.

D. SPRI Wind Design Standard: Manufacture and install copings tested according to SPRI ES-1 and capable of resisting the following design pressure:
1. Wind Load:
   a. Wind Speed: 120 mph.
   b. Exposure: D.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
1. Clear Anodic Finish, Coil Coated (Anodized Aluminum): AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
2. Exposed Coil-Coated Finish (Prefinished Aluminum):
   a. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   b. Color: To match phenolic wall panel colors indicated selected.

c. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil .

C. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation or aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 coating designation.
1. Surface: Smooth, flat and with manufacturer's standard clear acrylic coating on both sides.

2.3 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt; non-perforated.

B. Synthetic Underlayment: Laminated or reinforced, woven polyethylene or polypropylene, synthetic roofing underlayment; bitumen free; slip resistant; suitable for high temperatures over 220 deg. F ; and complying with physical requirements of ASTM D 226/D 226M for Type I and Type II felts.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape 1/2 inch wide and 1/8 inch thick.

D. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

F. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
   1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
   2. Obtain field measurements for accurate fit before shop fabrication.
   3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
   4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
   1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
   2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, non-expansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

G. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

H. Do not use graphite pencils to mark metal surfaces.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Copings: Fabricate in minimum 96-inch- long, but not exceeding 12-foot- long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Shop fabricate interior and exterior corners.
   1. Coping Profile: As indicated on the Drawings.
   2. Joint Style: Butted with expansion space and 6-inch-wide, concealed backup plate.
   3. Fabricate from the Following Materials:
      a. Prefinished Aluminum: 0.050 inch thick.

2.7 WALL SHEET METAL FABRICATIONS

A. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch- (50-mm-) high, end dams. Fabricate from the following materials:
   1. Anodized Aluminum: 0.032 inch thick.

B. Flashing in Solid Phenolic Wall and Soffit Panel: Fabricate to conform to profiles indicate in approved solid phenolic wall and soffit panels Shop Drawings prefinished as specified in the colors selected.
   1. Prefinished Aluminum: 0.032 inch thick.

2.8 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:
   1. Galvanized Steel: 0.028 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
   1. Verify compliance with requirements for installation tolerances of substrates.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
   3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

B. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, according to manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
   1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
   2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
   3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
   4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
   5. Torch cutting of sheet metal flashing and trim is not permitted.
   6. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
   1. Coat concealed side of uncoated-aluminum sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
   2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
   1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
   2. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws] [substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance] <Insert size requirement>.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.
   1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for

installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.

2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.
   1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 16-inch centers.
   2. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch centers.

C. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.5 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend beyond wall openings

C. Flashing installed as part of solid phenolic wall and soffit panel system shall be installed as specified in Division 07 Section “Solid Phenolic Wall & Soffit Panel System.”

3.6 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.7 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.8 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Silicone joint sealants.

B. Related Sections:
   1. Division 07 Sections “Ethylene-Propylene Diene Monomer (EPDM)” and “Sheet Metal Flashing and Trim” for sealants used in conjunction PVC roofing system roof system and exterior flashings.
   2. Division 08 Sections 088000 “Aluminum framed Entrances,“ “Aluminum Windows,” “Sectional Doors,” and "Glazing" for glazing sealants.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Verification: For each kind and color of joint sealant required, provide Samples of joint sealants 2-inches long of specified color.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

B. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.
   1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

C. Pre-installation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Two years from date of Substantial Completion.

B. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

D. Stain-Test-Response Characteristics: Where sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

F. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Single-Component, Non-sag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.
1. Products: Subject to compliance with requirements, provide one of the following:
   a. Dow Corning Corporation; 790.
   b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
   c. May National Associates, Inc.; Bondaflex Sil 290 or Bondaflex Sil 728 NS.
   d. Pecora Corporation; 301 NS.
   e. Sika Corporation, Construction Products Division; SikaSil-C990.
   f. Tremco Incorporated; Spectrem 1.

2.3 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bi-cellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.4 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from pre-construction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
      a. Concrete.
      b. Masonry.
      c. Unglazed surfaces of ceramic tile.
      d. Exterior insulation and finish systems.
   3. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
      a. Metal.
      b. Glass.

c. Porcelain enamel.
d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.

5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.
    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non-traffic surfaces.
1. Joint Locations:
    a. Control and expansion joints on exposed interior surfaces of exterior walls.
    b. Perimeter joints of exterior openings.
    c. Tile control and expansion joints.
    d. Joints between casework, countertops, splashes, plumbing fixtures, and wall/partition surfaces.
    e. Perimeter joints between interior wall surfaces and frames of interior doors and relites..
    f. Other joints as indicated.
2. Joint Sealant: Mildew resistant, single component, non-sag, neutral curing, Silicone.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes hollow-metal door and relite frames.

B. Related Requirements:
1. Division 08 Section “Fiberglas Reinforced Plastic (FRP) Doors and Frames” for door frames manufactured from fiberglass reinforced plastic.
2. Division 08 Section “Flush Wood Doors” for wood doors to be mounted in hollow metal frames.
3. Division 08 Sections “Aluminum Frame Entrances” and “Aluminum Windows” for aluminum doors, frames and windows.
4. Division 08 "Door Hardware" for door hardware to be used with hollow-metal door frames.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

A. Coordinate Throat Dimension of Hollow Metal Frames: Coordinate throat dimensions of hollow metal door and relite frames with thickness of partition to receive frames. Indicate that dimensions have been coordinated on Shop Drawings.

B. Coordinate Anchorage Installation for Hollow Metal Frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and finishes.

B. Shop Drawings: Include the following:
1. Elevations of each door frame type.
2. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
3. Frame throat dimension, indicate coordination with partitions to receive frames.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of conduit and preparations for power, signal, and control systems.

C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.7 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of hollow-metal door frame assembly, for tests performed by a qualified testing agency.

1.8 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. Pre-installation Conference: Conduct conference at Project site.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Amweld International, LLC.
2. Apex Industries, Inc.
3. Ceco Door Products; an Assa Abloy Group company.
4. Commercial Door & Hardware Inc.
5. Concept Frames, Inc.
6. Curries Company; an Assa Abloy Group company.
7. Custom Metal Products.
8. Daybar.
9. Deansteel.
10. de La Fontaine Industries.
11. DKS Steel Door & Frame Sys. Inc.
12. Door Components, Inc.
13. Fleming-Baron Door Products.
14. Gensteel Doors Inc.
15. Greensteel Industries, Ltd.
16. HMF Express.
17. Hollow Metal Inc.
18. Hollow Metal Xpress.
19. J/R Metal Frames Manufacturing, Inc.
20. Karpen Steel Custom Doors & Frames.
21. L.I.F. Industries, Inc.
22. LaForce, Inc.
23. Megamet Industries, Inc.
24. Mesker Door Inc.
25. Michbi Doors Inc.
26. MPI Group, LLC (The).
27. National Custom Hollow Metal.
28. North American Door Corp.
29. Philipp Manufacturing Co (The).
30. Pioneer Industries, Inc.
31. Premier Products, Inc.
32. Republic Doors and Frames.
33. Rocky Mountain Metals, Inc.
34. Security Metal Products Corp.
35. Shanahans Manufacturing Ltd.
36. Steelcraft; an Ingersoll-Rand company.
37. Steward Steel; Door Division.
38. Stiles Custom Metal, Inc.
39. Titan Metal Products, Inc.
40. Trillium Steel Doors Limited.
41. West Central Mfg. Inc.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 INTERIOR DOOR & RELITE FRAMES

A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Standard-Duty Door and Relite Frames: SDI A250.8, Level 1.
   1. Physical Performance: Level C according to SDI A250.4.
   2. Frames:
      a. Materials: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch.
      b. Construction: Full profile welded.
   3. Exposed Finish: Prime.

2.3 FRAME ANCHORS

A. Jamb Anchors:
   1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
   1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.4 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

F. Grout: ASTM C 476, except with a maximum slump of 4 inches , as measured according to ASTM C 143/C 143M.

2.5 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical,

fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
   1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
   2. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
   3. Jamb Anchors: Provide number and spacing of anchors as follows:
      a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
         1) Three anchors per jamb up to 60 inches high.
   4. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
      a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

C. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

D. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
   1. Reinforce door frames to receive non-templated, mortised, and surface-mounted door hardware.
   2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

2.6 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
   1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

B. Factory Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap door frames to receive non-templated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
   1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
      a. At fire-protection-rated openings, install frames according to NFPA 80.
      b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
      c. Remove temporary braces necessary for installation only after frames have been properly set and secured.
      d. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
      e. Field apply bituminous coating to backs of frames that will be filled with grout containing anti-freezing agents.
   2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
      a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
   3. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
      a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
      b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
      c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
      d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow-metal manufacturer's written instructions.
   1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.
   2. Install glazing and stops on “room side” of frames.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION

This Page Not Used

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Solid-core doors with wood-veneer faces.
   2. Factory finishing flush wood doors.

B. Related Requirements:
   1. Division 08 Section “Hollow Metal Door Frames” for frames to receive flush wood doors.
   2. Division 08 Section “Fiberglass Reinforced Plastic FRP Doors and Frames” for exterior FRP doors and frames.
   3. Division 08 Section “Aluminum Framed Entrance Doors” for glazed exterior entrance doors.
   4. Division 08 Section “Door Hardware” for hardware to be installed on flush wood doors..
   5. Division 08 Section "Glazing" for glass view panels in flush wood doors.

1.3 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
   1. Dimensions and locations of blocking.
   2. Dimensions and locations of mortises and holes for hardware.
   3. Dimensions and locations of cutouts.
   4. Undercuts.
   5. Doors to be factory finished and finish requirements.
   6. Fire-protection ratings for fire-rated doors.

C. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish.
    a. Finish veneer-faced door Samples with same materials proposed for factory-finished doors.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is a certified participant in AWI's Quality Certification Program.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather-tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
    a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
    b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Algoma Hardwoods, Inc.
   2. Ampco.
   3. Chappell Door Co.
   4. Eggers Industries.
   5. General Veneer Manufacturing Co.
   6. Graham Wood Doors; an Assa Abloy Group company.
   7. Haley Brothers, Inc.
   8. Ipik Door Company.
   9. Lambton Doors.
   10. Marlite.
   11. Marshfield Door Systems, Inc.
   12. Mohawk Doors; a Masonite company.
   13. Oshkosh Door Company.
   14. Poncraft Door Company.
   15. Vancouver Door Company.
   16. VT Industries, Inc.

B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI's, "Architectural Woodwork Standards."
   1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.
   2. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.

B. Particleboard-Core Doors:
   1. Particleboard: ANSI A208.1, Grade LD-2.
   2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware:

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:
   1. Grade: Premium, with Grade A faces.
   2. Species: Select white birch.
   3. Cut: Rotary flat cut.

4. Match between Veneer Leaves: Pleasing match.
5. Exposed Vertical Edges: Same species as faces - edge Type A.
6. Core: Particleboard.
7. Construction: Seven plies, either bonded or non-bonded construction.
8. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

2.4 LIGHT FRAMES

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.
   1. Wood Species: Same species as door faces.
   2. Profile: Manufacturer's standard shape.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
   1. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
   1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

C. Openings: Factory cut and trim openings through doors.
   1. Light Openings: Trim openings with moldings of material and profile indicated.
   2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."

2.6 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
   1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.

B. Factory finish doors.
   1. Transparent Finish:
      a. Grade: Premium.
      b. Finish: WDMA TR-4 conversion varnish or WDMA TR-6 catalyzed polyurethane.
      c. Staining: None required.
      d. Effect: Semi-filled finish, produced by applying an additional finish coat to partially fill the wood pores.

e. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.
   1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
   2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Division 08 Section "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
   1. Install fire-rated doors according to NFPA 80.
   2. Install smoke- and draft-control doors according to NFPA 105.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
   1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide1/4 inch from bottom of door to top of threshold unless otherwise indicated.
      a. Comply with NFPA 80 for fire-rated doors.
      b. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.

   2. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Re-hang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 082201
FIBERGLASS REINFORACED
PLASTIC (FRP) DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes:
   1. Fiberglass reinforced plastic (FRP) exterior doors.
   2. Fiberglass reinforced plastic (FRP) exterior door frames.
   3. Factory finishing of FRP doors and frames.

B. Related Requirements:
   1. Division 08 Section “Hollow Metal Frames” for hollow metal frames used with interior doors.
   2. Division 08 Section “Door Hardware” for hardware to be installed on FRP doors and frames.
   3. Division 08 Section “Flush Wood Doors” for interior wood doors.
   4. Division 08 Section “Aluminum Framed Entrances” for aluminum entrance doors.
   5. Division 08 Section “Glazing” for gazing of FRP doors.

1.3 COORDINATION

A. Coordinate anchorage installation for FRP frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.4 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, core descriptions, and finishes.

B. Shop Drawings: Include the following:
   1. Elevations of each door type.
   2. Details of doors, including vertical- and horizontal-edge details and FRP thicknesses.

3. Frame details for each frame type, including dimensioned profiles and FRP thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification:
1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.
2. For "Doors" and "Frames" subparagraphs below, prepare Samples approximately 12 by 12 inches to demonstrate compliance with requirements for quality of materials and construction:
   a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
   b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed FRP panels and glazing if applicable.

E. Schedule: Provide a schedule of FRP door and frame work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.6 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

1.7 QUALITY ASSURANCE

A. Flame Spread Rating: Not greater than 25 when tested in accordance with ASTM E84 and shall be self-extinguishing in accordance ASTM D635.

B. Provide door and frame assemblies that have been tested in accordance with ANSI A250.4-2011 cycle swing in excess of 1,000,000 cycles with no failure.

C. Door and frame assemblies shall have passed the Florida Building Code, including Miami-Dade, High Velocity Hurricane Zone standards including SFBC PA 201 Impact Procedures for Large Missile Impact, SFBC PA 202 Uniform Static Load on Building Components, SFBC PA 203 Products Subject to Cyclical Wind Pressure, SFBC 3603.2 Forced Entry Test.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver FRP door and frame work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
   1. Provide additional protection to prevent damage to factory-finished units.

B. Store FRP door and frame work vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.9 WARRANTY

A. FRP doors and frames shall be warrantied to be free from defects in material and workmanship including warp, separation or delamination for a period of 10 years from the date of Substantial Completion. Damage occurring due to abuse causing damage to the structural integrity of the doors and frames is excluded.

B. FRP doors and frames shall be warrantied for the life of the Project against failure due to corrosion.

PART 2 - PRODUCTS

2.1 EXTERIOR FRP DOORS AND FRAMES

A. FRP Doors and Frames Basis of Design: Subject to compliance with requirements, provide fiberglass reinforced plastic (FRP) exterior door and frame products as manufacture by the CORRIM Company or comparable products by one of the following:
   1. Chase Doors
   2. Chem-Proof Door Co., Ltd.
   3. Edgewater FRP Door.

B. Source Limitations: Obtain FRP door and frame work from single source from single manufacturer.

2.2 FABRICATION

A. General: Fabricate FRP door and frame work to be rigid and free of defects, warp, or buckle using Class 1 premium resin with no fillers that is specifically tailored to resist the chemicals and contaminates for which these specifications are written (sea salt spray). Accurately form FRP to required sizes and profiles, with minimum manufacturer’s standard radii at edges. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. FRP Doors
   1. Fabrication:
      a. Thickness: 1-3/4-inches.
      b. Size: As indicated on the Drawings.
      c. Lock stile bevel: 1/8-inch:2-inches.
      d. Construction: Completely seamless on all six surfaces.
   2. Face Sheets (Door Plates): FRP face sheets shall be manufactured in one continuous piece with corrosion resistant resin system with stabilizing additives and include a 25 mil gel colored coat integrally molded with multiple layers of 1.5 ounces per square foot of fiberglass and one layer of 18 ounce per square yard fiberglass woven roving. The resin shall be reinforced with fiberglass, 50 percent average by weight for enhanced strength.
      a. Face sheet thickness: 0.125-inch minimum.
      b. Face sheet impact resistance: per FBC TAS 201, Large Missile Impact
      c. Face sheet texture: Smooth.
   3. Stiles and Rails: Shall be 1-1/2-inch square pultruded fiberglass:
      a. Length and spacing: Tubes or U-shaped members, full width horizontal on 24-inch centers maximum for internal reinforcement.
      b. Hardware and corner reinforcements: 1-1/2-inch square solid fiberglass block.
      c. Screw fasteners: Minimum 1,150 pound withdrawal.
      d. Bottom rail: Allow for 1-1/4-inch of height alterability without loss of panel's integrity.
      e. No wood or metal reinforcements shall be allowed.
   4. Core: Manufacturer's standard polyurethane foam or polypropylene honey comb. 1-1/2-inch thick rigid block of polyurethane laminated to the interior of the panels.
      a. Thermal Resistance: R value = 12.
      b. Core Properties:: Class A and CFC free. Foam or honeycomb properties shall comply with ASTM E-84 and requirements of the International Building Code.
   5. Lites: Lite openings for lites of the sizes indicated shall be provided. Opening shall be completely sealed so that the interior of the door is not exposed to the environment. Provide manufacturer's standard fiberglass stops matching the door finish in color and texture. Mechanical fasteners shall not be used to attach stops.
      a. Factory install glazing. Glazing material shall be as specified in Division 08 Section "Glazing."
      b. Glazing stops fabricated from metal, vinyl, or PVC are not acceptable.
   6. Hardware Preparation: Reinforce and mortise doors for hardware with 1-1/2-inches X 1-1/2-inches of solid fiberglass to allow for application of butts and locks in accordance with requirements of Division 08 Section "Door Hardware," hardware manufacturer's instructions and templates.
      a. Reinforcement blocking: Non-swelling polymer or firestop block for all locksets, surface mounted hardware and thru-bolted hardware.
      b. Factory drill pilot holes for full mortise butts.
      c. Attach/install hardware using pilots holes and stainless steel wood screws.

C. FRP Frames:
   1. Fabrication: Fabricate frames to be rigid, neat in appearance, free from defects. Finish shall match doors.
      a. Material: Fabricate frames of 100 percent fiberglass with an average glass content of 50 percent by weight and complete uniformity in color and size.

b. Profile: One piece profile as indicated on the Drawings with integral stop.
   1) Size: 5-3/4-inches unless indicated otherwise on the Drawings.
c. Connections: Head and jamb members, standard 45 degree miter, for neatly mitered corner, tight fit, connections.
d. Assembly: One piece, resin bonded, factory assembled.

2. Reinforcements and Braces/Supports: Reinforce and mortise frames for hardware in accordance with Division 08 Section "Door Hardware," hardware manufacturer's instructions and templates.
   a. Corner reinforcement: 4-inches by 4-inches by 5-3/8-inches by ¼-inch thick pultruded fiberglass angle, attached to head bar at factory using stainless steel screws.
   b. Mortise hinge reinforcement: 3-inches by 7-inches by 9/16-inch (or 3/8-inch) thick FRP material attached to frame by means of bonding and stainless steel countersunk screws.
   c. Closer reinforcement: 1-1/2-inch by 19-inches by 3/16 inch thick FRP material attached to frame by means of bonding.
   d. Strike reinforcement: 1-1/2-inch by 9-inches by ¾-inch thick FRP material attached frame by means of bonding and countersunk stainless steel screws.
   e. Anchoring Systems: Provide not less than three anchors in each jamb of frames up to 90 inches high and one additional anchor for each 30-inches in height above 90-inches, in shapes sizes and spaces indicated in approved Shop Drawings.
      1) New stud wall: New stud anchor.
      2) Floor anchors: One each side.

2.3 FINISH

A. FRP Door and Frame Finish: Manufacturer's Seamless 25 mil minimum gloss polyurethane or resin rich gelcoat..
   1. Color: As selected by Architect from manufacturer's full range of colors.

B. Finish color and gloss on door frames shall match finish and gloss on doors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove shipping spreaders installed at factory. Restore exposed finish by in accordance with manufacturer's instruction as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware not prepared for in factory.

3.3 INSTALLATION

A. General: Install FRP door and frame work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings, approved Shop Drawing and manufacturer's written instructions.

B. FRP Frames: Install FRP frames of size and profile indicated.
   1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
      a. Remove temporary braces necessary for installation only after frames have been properly set and secured.
      b. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
   2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
      a. Floor anchors may be set with power-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.
   3. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
      a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
      b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
      c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
      d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. FRP Doors: Fit FRP doors accurately in frames, within clearances specified below. Shim as necessary.
   1. Non-Fire-Rated Doors:
      a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
      b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
      c. At Bottom of Door: 5/8 inch plus or minus 1/32 inch.
      d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.

END OF SECTION

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SECTION 083113
ACCESS DOORS
AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Access doors and frames for walls and ceilings to provide access as required for maintenance of mechanical work and electrical work.

B. Related Requirements:
   1. Division 22 “Plumbing” for valves and temperature control devises requiring access doors.
   2. Division 23 "Heating, Ventilating and Air Conditioning" for heating and air-conditioning duct access doors.

1.3 COORDINATE WITH EQUIPMENT REQUIREMENTS

A. Access Doors for Plumbing, Heating and Ventilating and Plumbing Equipment: Provide access doors as indicated and, *especially if not indicated*, as required to facilitate maintenance access to controls, valves, switches, and other components of concealed equipment requiring periodic maintenance or adjustment. Coordinate door locations and sizes with access requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details materials, individual components and profiles, and finishes.

B. Shop Drawings:
   1. Include plans, elevations, sections, details, and attachments to other work. Show all access doors indicated and especially those not indicated but otherwise required including specified finishes.
   2. Detail fabrication and installation of access doors and frames for each type of substrate.

C. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Access Panel Solutions.
2. Acudor Products, Inc.
3. Alfab, Inc.
4. Babcock-Davis.
5. Cendrex Inc.
6. Elmdor/Stoneman Manufacturing Co.; Div. of Acorn Engineering Co.
7. Jensen Industries; Div. of Broan-Nutone, LLC.
8. J. L. Industries, Inc.; Div. of Activar Construction Products Group.
9. Karp Associates, Inc.
10. Larsen's Manufacturing Company.
11. Maxam Metal Products Limited.
12. Metropolitan Door Industries Corp.
13. MIFAB, Inc.
14. Milcor Inc.
15. Nystrom, Inc.
16. Williams Bros. Corporation of America (The).

B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

C. Pre-finished Flush Access Doors with Exposed Flanges:
1. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
2. Locations: At all location as indicated on the drawings and as required to provide access to plumbing, heating and ventilating, and electrical equipment indicated to require access.
   a. Except: WOMEN’S REST ROOM 105, MEN’S REST ROOM 106, and UNISEX REST ROOM 123.
3. Door Size: As required to provide access to equipment served, but not loess than 16-inches by 16-inches.
4. Pre-finished Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch, 16 gage.
   a. Finish: Factory finish.
   b. Color: White
5. Frame Material: Same material, thickness, and finish as door.
6. Hinges: Manufacturer's standard.
7. Hardware: Lock.

D. Stainless Steel Flush Access Doors with Exposed Flanges:
1. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
2. Locations: All access doors located in WOMEN’S REST ROOM 105, MEN’S REST ROOM 106, and UNISEX REST ROOM 123.

3. Door Size: As required to provide access to equipment served, but not less than 16-inches by 16-inches.
4. Stainless-Steel Sheet for Door: Nominal 0.062 inch, @16 gauge.
   a. Finish: No. 4.
5. Frame Material: Same material, thickness, and finish as door.
6. Hinges: Manufacturer's standard.
7. Hardware: Lock.

E. Hardware:
1. Locks: Cylinder.
2. Hardware Material: Stainless steel, including latch and lifting mechanism assemblies, hold-open arms, and all brackets, hinges, pins, and fasteners.

2.2 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

C. Metallic-Coated Steel Sheet (for plumbing access): ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

D. Frame Anchors: Same type as door face.

E. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

F. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, [**Type 304**] [**Type 316**]. Remove tool and die marks and stretch lines or blend into finish.

2.3 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.
1. For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
2. Provide mounting holes in frames for attachment of units to metal or wood framing.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
   1. For cylinder locks, furnish two keys per lock and key all locks alike.

2.4 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Steel and Metallic-Coated-Steel Finishes:
   1. Factory Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry-film thickness of 1 mil for topcoat.

E. Stainless-Steel Finishes:
   1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
   2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
      a. Run grain of directional finishes with long dimension of each piece.
      b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
      c. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes electrically operated sectional doors.

B. Related Requirements:
   1. Division 05 Section "Metal Fabrications" for miscellaneous steel supports.
   2. Division 26 Electrical for connection to electrical power system.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of sectional door and accessory.
   1. Include construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
   1. Include plans, elevations, sections, and mounting details.
   2. Include details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
   4. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: For units with factory-applied finishes.

D. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:
   1. Flat door sections: 12-inches by 12-inches.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sectional doors to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including, but not limited to, excessive deflection.
      b. Failure of components or operators before reaching required number of operation cycles.
      c. Faulty operation of hardware.
      d. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.
      e. Delamination of exterior or interior facing materials.
   2. Warranty Period: Two years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

A. Source Limitations: Obtain sectional doors from single source from single manufacturer.
   1. Obtain operators and controls from sectional door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Sectional doors shall comply with performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.
   1. Design Wind Load:
      a. Wind speed: 120 mph
      b. Exposure: D
   2. Testing: Tested and labeled certifying compliance with ASTM D 1929 and ASTM E84-91A standards.
   3. Deflection Limits: Design sectional doors to withstand design wind loads without evidencing permanent deformation or disengagement of door components.
      a. Deflection of door sections in horizontal position (open) shall not exceed 1/120 of the door width.
      b. Deflection of horizontal track assembly shall not exceed 1/240 of the door height.
   4. Operability under Wind Load: Design overhead coiling doors to remain operable under design wind load, acting inward and outward.

C. Windborne-Debris Impact Resistance: Provide glazed sectional doors that pass missile-impact and cyclic-pressure tests according to ASTM E 1996 for Wind Zone 4 or DASMA 115.
   1. Large Missile Test: For overhead coiling doors located within 30 feet of grade.

D. Seismic Performance: Sectional doors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. Component Importance Factor: 1.5.

2.3 DOOR ASSEMBLY

A. Steel Sectional Door: Sectional door formed with hinged sections and fabricated according to DASMA 102 unless otherwise indicated.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide ThermoMark® 530 steel sectional electrically operated overhead door as manufactured by Wayne Dalton, a division of Overhead Door Corporation or comparable product by one of the following:
      a. Amarr Garage Doors.
      b. Arm-R-Lite.
      c. C.H.I. Overhead Doors.
      d. Clopay Building Products.
      e. Fimbel Architectural Door Specialties.
      f. Haas Door.
      g. Harmann LLC.
      h. Martin Door Manufacturing.
      i. Overhead Door Corporation.
      j. Raynor.
      k. Rite-Hite Corporation.
      l. Windsor Door.

B. Operation Cycles: Door components and operators capable of operating for not less than 100,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

C. Air Infiltration: Maximum rate of 0.09 cfm/sq. ft. at 15 when tested according to ASTM E 283.

D. Installed R-Value: 7.0 deg. F x h x sq. ft./Btu..

E. Steel Sections: Zinc-coated (galvanized) steel sheet with manufacturer's standard zinc coating.
   1. Section Thickness: 3 inches.
   2. Exterior-Face, Steel Sheet Thickness: not less than 0.017-inch- nominal thickness.
      a. Surface: Manufacturer's standard, stucco embossed.
   3. Insulation: Foamed in place with CFC and HCFC free polyurethane.
      a. Ignition: Tested in accordance with ASTM D-1929 and shown to have a Flash Ignition Temperature of not less than 734 degrees F and a Self Ignition Temperature of not less than 950 degrees F.
      b. Corner burn: Tested and shown to meet all of the requirements of UBC 17-5 corner burn.
      c. Flame spread and smoke: Tested in accordance with ASTM E-84-91 and shown to achieve a Flame-spread Index of not more than 10 and a Smoke Developed Index of not more than 210.
      d. Sections shall include an integral thermal break.
   4. Interior Facing Material: Zinc-coated (galvanized) steel sheet with a nominal coated thickness of not less than 0.017 inch.

F. Track Configuration: Standard-lift.

G. Weather-seals: Fitted to bottom and top and around entire perimeter of door. Provide combination bottom weather-seal and sensor edge.

H. Windows: Approximately 25-inches by 13-inches, with square corners,]and spaced apart the approximate distance as indicated on Drawings; in one rows at height indicated on Drawings; installed with glazing of the following type:
   1. Insulating Glass: Manufacturer's standard ½" tempered insulating glass.

I. Roller-Tire Material: Manufacturer's standard.

J. Locking Devices: Equip door with locking device assembly.
   1. Locking Device Assembly: Engage right hand track jamb sides, locking bars, operable from inside with thumb-turn, and outside with cylinder.

K. Counterbalance Type: Torsion spring.

L. Electric Door Operator:
   1. Usage Classification: Medium duty, up to 12 cycles per hour and up to 50 cycles per day.
   2. Operator Type: Manufacturer's standard for door requirements.
   3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet or lower].
   4. Motor Exposure: Interior, clean, and dry.
   5. Emergency Manual Operation: Chain type.
   6. Obstruction-Detection Device: Automatic photoelectric sensor and electric sensor edge on bottom section; self-monitoring type.
      a. Sensor Edge Bulb Color: Black.

7. Control Station: Where indicated on Drawings.
8. Other Equipment: Portable, radio-control system.

M. Door Finish:
1. Baked-Enamel or Powder-Coat Finish: Color and gloss as selected by Architect from manufacturer's full range.

2.4 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 STEEL DOOR SECTIONS

A. Exterior Section Faces and Frames: Zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A 653/A 653M, with indicated zinc coating and thickness.
1. Fabricate section faces from single sheets to provide sections not more than 24 inches high and of indicated thickness. Roll horizontal meeting edges to a continuous, interlocking, keyed, rabbeted, shiplap, or tongue-in-groove weather-resistant seal, with a reinforcing flange return.
2. For insulated doors, provide sections with continuous thermal-break construction, separating the exterior and interior faces of door.

B. Section Ends and Intermediate Stiles: Enclose open ends of sections with channel end stiles formed from galvanized-steel sheet not less than 0.0625-inch- nominal coated thickness and welded to door section. Provide intermediate stiles formed from not less than 0.0625-inch-thick galvanized-steel sheet, cut to door section profile, and welded in place. Space stiles not more than 48 inches apart.

C. Reinforce bottom section with a continuous channel or angle conforming to bottom-section profile.

D. Reinforce sections with continuous horizontal and diagonal reinforcement, as required to stiffen door and for wind loading. Provide galvanized-steel bars, struts, trusses, or strip steel, formed to depth and bolted or welded in place. Ensure that reinforcement does not obstruct vision lites.

E. Provide reinforcement for hardware attachment.

F. Foamed-in-Place Thermal Insulation: Insulate interior of steel sections with door manufacturer's standard CFC-free polyurethane insulation, foamed in place to completely fill interior of section and pressure bonded to face sheets to prevent delamination under wind load, and with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within steel sections and the interior facing material, with no exposed insulation.

G. Interior Facing Material: Zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A 653/A 653M, with indicated thickness.

H. Fabricate sections so finished door assembly is rigid and aligned, with tight hairline joints and free of warp, twist, and deformation.

2.6 TRACKS, SUPPORTS, AND ACCESSORIES

A. Tracks: Manufacturer's standard, galvanized-steel track system of configuration indicated, sized for door size and weight, designed for lift type indicated and clearances indicated on Drawings, Provide complete system including brackets, bracing, and reinforcement to ensure rigid support of ball-bearing roller guides for required door type, size, weight, and loading.
   1. Galvanized Steel: ASTM A 653/A 653M, minimum G60 zinc coating.
   2. Slope tracks at an angle from vertical or design tracks to ensure tight closure at jambs when door unit is closed.
   3. Track Reinforcement and Supports: Galvanized-steel members to support track without sag, sway, and vibration during opening and closing of doors. Slot vertical sections of track spaced 2 inches apart for door-drop safety device.
      a. For Vertical Track: Intermittent, jamb brackets attached to track and attached to wall.
      b. For Horizontal Track: Continuous reinforcing angle from curve in track to end of track, attached to track and supported at points by laterally braced attachments to overhead structural members.

B. Weather-seals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of sectional door unless otherwise indicated.

C. Windows: Manufacturer's standard insulating glass window units of type, size, and in arrangement indicated. Set glazing in vinyl, rubber, or neoprene glazing channel for metal-framed doors and elastic glazing compound for wood doors, as required. Provide removable stops of same material as door-section frames.

2.7 HARDWARE

A. General: Heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.

B. Hinges: Heavy-duty, galvanized-steel hinges of not less than 0.079-inch- nominal coated thickness at each end stile and at each intermediate stile, according to manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is impossible

C. Rollers: Heavy-duty rollers with steel ball-bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide 3-inch- diameter roller tires for 3-inch- wide track and 2-inch-diameter roller tires for 2-inch-wide track.

2.8 LOCKING DEVICES

A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded deadbolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
   1. Lock Cylinders: Cylinders specified in division 08 Section "Door Hardware"and keyed to building keying system.
   2. Keys: Three for each cylinder.

B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.9 COUNTERBALANCE MECHANISM

A. Torsion Spring: Counterbalance mechanism consisting of adjustable-tension torsion springs fabricated from steel-spring wire complying with ASTM A 229/A 229M, mounted on torsion shaft made of steel tube or solid steel. Provide springs designed for number of operation cycles indicated.

B. Cable Drums and Shaft for Doors: Cast-aluminum or gray-iron casting cable drums mounted on torsion shaft and grooved to receive door-lifting cables as door is raised. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of torsion shaft. Provide one additional midpoint bracket for shafts up to 16 feet long and two additional brackets at one-third points to support shafts more than 16 feet long unless closer spacing is recommended by door manufacturer.

C. Cables: Galvanized-steel, multistrand, lifting cables with cable safety factor of at least 5 to 1.

D. Cable Safety Device: Include a spring-loaded steel or spring-loaded bronze cam mounted to bottom door roller assembly on each side and designed to automatically stop door if either lifting cable breaks.

E. Bracket: Provide anchor support bracket as required to connect stationary end of spring to the wall and to level the shaft and prevent sag.

F. Bumper: Provide spring bumper at each horizontal track to cushion door at end of opening operation.

2.10 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and "operation cycles" requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
   1. Comply with NFPA 70.
   2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6; with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door-Operator Type: Unit consisting of electric motor, gears, pulleys, belts, sprockets, chains, and controls needed to operate door and meet required usage classification.
   1. Trolley: Trolley operator mounted to ceiling above and to rear of door in raised position and directly connected to door with drawbar.

D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated.
   1. Electrical Characteristics:
      a. Phase: Single phase.
      b. Volts: 120.
      c. Hertz: 60.
   2. Motor Size: Large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
   3. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
   4. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
   5. Use adjustable motor-mounting bases for belt-driven operators.

E. Limit Switches: Equip motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

F. Obstruction Detection Device: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. Activation of device immediately stops and reverses downward door travel.
   1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
      a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained pressure on close button.
   2. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom section. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.

      a. Self-Monitoring Type: Four-wire configured device designed to interface with door-operator control circuit to detect damage to or disconnection of sensor edge.

G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure, push-button control labeled "Close."
   1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.

H. Emergency Manual Operation: Equip electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf.

I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.

L. Portable, Radio-Control System: Consisting of **two** of the following:
1. Three-channel universal coaxial receiver to open, close, and stop door.
2. Portable control device to open and stop door may be momentary-contact type; control to close door shall be sustained- or constant-pressure type.
3. Remote antenna and mounting kit.

2.11 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.12 STEEL AND GALVANIZED-STEEL FINISHES

A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Tracks:
   1. Fasten vertical track assembly to opening jambs and framing, spaced not more than 24 inches apart.
   2. Hang horizontal track assembly from structural overhead framing with angles or channel hangers attached to framing by welding or bolting, or both. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.

C. Accessibility: Install sectional doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

D. Power-Operated Doors: Install automatic garage doors openers according to UL 325.

3.3 STARTUP SERVICES

A. Engage a factory-authorized service representative to perform startup service.
   1. Complete installation and startup checks according to manufacturer's written instructions.
   2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust doors and seals to provide weather-resistant fit around entire perimeter.

D. Touch-up Painting: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A 780/A 780M.

3.5 DEMONSTRATION

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

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Exterior manual-swing entrance doors and door-frame units.
   2. Interior manual-swing entrance doors and door-frame units.
   3. Sidelights.

B. Related Section:
   1. Division 08 Section “Door Hardware” for hardware to be installed on aluminum entrance doors and frames.
   2. Division 08 Section “Glazing” for glass tapes and installation of glazing in aluminum entrance doors and frames.
   3. Division 08 Section “Flashing and Sheet Metal” for aluminum flashing to be installed in conjunction with aluminum framed entrance doors.

1.3 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For aluminum-framed entrances. Include plans, elevations, sections, full-size details, and attachments to other work.
   1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
   2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances, showing the following:
      a. Joinery, including concealed welds.
      b. Anchorage.
      c. Expansion provisions.
      d. Glazing.
      e. Flashing and drainage.

3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
4. Show preparation for hardware installation including opening and reinforcing. Include pertinent portions of hardware submittal specified in Division 08 Section “Door Hardware”

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

E. Entrance Door Hardware Schedule: Prepared by or under supervision of hardware supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Energy Performance Certificates: For aluminum-framed entrances, accessories, and components, from manufacturer.
1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance.

C. Product Test Reports: For aluminum-framed entrances.

D. Field quality-control reports.

E. Sample Warranties: For special warranties.

1.6 COORDINATION

A. Coordinated selected color anodized aluminum finishes to assure color matching of aluminum framed entrances, with aluminum windows specified in Division 08 Section “Aluminum Windows”, and aluminum flashing specified in Division 07 Section “Sheet Metal and Flashing” used in conjunction with aluminum framed entrances and windows.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Structural Loads:
   1. Wind Loads:
      a. Wind speed: 120 mph
      b. Importance factor: 1.15
      c. Exposure: D

C. Structural: Test according to ASTM E 330 as follows:
   1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
   2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
   3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

D. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
   1. Entrance Doors:
      a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..

E. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..

F. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 ENTRANCE DOOR SYSTEMS

A. Exterior Thermal Entrance Doors
1. Thermal Entrance Doors Basis of Design: Subject to compliance with requirements provide extruded aluminum AA®250 Thermal Entrance Doors as Manufactured by Kawneer North America or comparable product by one of the following.
   a. Aracadia, Inc.
   b. CMI Architectural
   c. Commercial Architectural Products, Inc.
   d. Coral Industries, Inc.
   e. EFCO Corporation
   f. Kawneer North America
   g. Leed Himmel Industries, Inc.
   h. Manko Window Systems
   i. Old Castle Building Envelope
   j. Pitco Architectural Metals, Inc
   k. TRACO
   l. Trulite Glass & Aluminum Solutions. LLC
2. Door Construction: 2- to 2-1/4-inch overall thickness, with minimum 0.125-inch-thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
   a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior] <Insert description.
3. Door Design: Narrow stile.
   a. Top rail width: 2-1/2-inch
   b. Side rail width: 2-1/2-inch
   c. Bottom rail width: 3-7/8”
4. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
   a. Provide non-removable glazing stops on outside of door.

B. Interior Entrance Door Basis of Design:
1. Entrance Doors Basis of Design: Subject to compliance with requirements provide extruded aluminum 190 Narrow Stile Entrance Door as Manufactured by Kawneer North America or comparable product by one of the following:
   a. Aracadia, Inc.
   b. CMI Architectural
   c. Commercial Architectural Products, Inc.
   d. Coral Industries, Inc.

e. EFCO Corporation
f. Kawneer North America
g. Leed Himmel Industries, Inc.
h. Manko Window Systems
i. Old Castle Building Envelope
j. Pitco Architectural Metals, Inc
k. TRACO
l. Trulite Glass & Aluminum Solutions. LLC

2. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch-thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
   a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior] <Insert description.
3. Door Design: Narrow stile.
   a. Top rail width: 2-1/4-inch
   b. Side rail width: 2-1/8-inch
   c. Bottom rail width: 3-7/8”
4. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
   a. Provide non-removable glazing stops on outside of door.

C. Door Frame Members (Interior and Exterior) Basis of Design: Subject to compliance with requirements provide extruded aluminum Trifab® VG 451T Framing System entrance door frames as manufactured by Kawneer North America or comparable product by one of the following:
   a. Aracadia, Inc.
   b. CMI Architectural
   c. Commercial Architectural Products, Inc.
   d. Coral Industries, Inc.
   e. EFCO Corporation
   f. Kawneer North America
   g. Leed Himmel Industries, Inc.
   h. Manko Window Systems
   i. Old Castle Building Envelope
   j. Pitco Architectural Metals, Inc
   k. TRACO
   l. Trulite Glass & Aluminum Solutions. LLC
2. Nominal Size: 4-1/2-inches deep with 2” sightline
3. Glass Application: Center.
4. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
5. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.

D. Materials:
   1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

a. Sheet and Plate: ASTM B 209.
b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
d. Structural Profiles: ASTM B 308/B 308M.

2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
   a. Structural Shapes, Plates, and Bars: ASTM A 36/A .
   b. Cold-Rolled Sheet and Strip: ASTM A 1008/A.
   c. Hot-Rolled Sheet and Strip: ASTM A 1011/A.

2.3 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Division 08 Section "Door Hardware."

2.4 GLAZING

A. Glazing: Comply with Division 08 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers. Comply with Division 08 Section "Glazing."

C. Glazing Sealants: As recommended by manufacturer.

D. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L.

2.5 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.
   1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
   2. Reinforce members as required to receive fastener threads.
   3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system, fabricated from 300 series stainless steel.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

C. Concealed Flashing: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding flashing compatible with adjacent materials.

D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.6 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:
1. Profiles which are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
1. At exterior doors, provide compression weather stripping at fixed stops.
2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

E. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

F. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

G. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

A. General:
   1. Comply with manufacturer's written instructions.
   2. Do not install damaged components.
   3. Fit joints to produce hairline joints free of burrs and distortion.
   4. Rigidly secure non-movement joints.
   5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
   6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:
   1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or installing nonconductive spacers.
   2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed as specified in Section 07920 "Joint Sealants" to produce weather-tight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install glazing as specified in Section 08800 "Glazing."

F. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
   1. Exterior Doors: Install to produce weather-tight enclosure and tight fit at weather stripping.
   2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Field Quality-Control Testing: Perform the following test on aluminum-framed entrances.
   1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

C. Aluminum-framed entrances will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes fixed aluminum-framed windows for exterior locations.

B. Related Sections include the following:
   1. Division 08 Section "Aluminum Framed Entrances" for coordinating finish among aluminum fenestration units.
   2. Division 08 Section “Flashing and Sheet Metal” for flashing to be installed in conjunction with aluminum windows.
   3. Division 08 Section “Glazing” for glass types and glazing installation for aluminum windows.
   4. Division 07 Section “Thermal Insulation” for foam insulation to be installed in window framing.

1.3 DEFINITIONS

A. Performance grade number according to AAMA/WDMA 101/I.S.2/NAFS:
   1. Design pressure number in pounds force per square foot used to determine the structural test pressure and water test pressure.

B. Structural Test Pressure: For uniform load structural test, is equivalent to 150 percent of the design pressure.

C. Minimum Test Size: Smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified, and that are of minimum test size indicated below:
   1. Size indicated on Drawings.

B. Structural Performance: Provide aluminum windows capable of withstanding the effects of the following loads, based on testing units representative of those indicated for Project that pass AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Structural Test:

1. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.
   a. Basic Wind Speed: 120 mph.
   b. Importance Factor: 1.15.
   c. Exposure Category: D.
2. Deflection: Design glass framing system to limit lateral deflections of glass edges to less than 1/175 of glass-edge length or 3/4 inch, whichever is less, at design pressure based on testing performed according to AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Deflection Test or structural computations.

C. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces.

1.5 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window indicated.

B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, installation details, and the following:
   1. Mullion details, including reinforcement and stiffeners.
   2. Joinery details.
   3. Expansion provisions.
   4. Flashing and drainage details.
   5. Thermal-break details.
   6. Glazing details.
   7. For installed products indicated to comply with design loads, include structural analysis data prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of aluminum windows and used to determine the following:
      a. Structural test pressures and design pressures from wind loads indicated.
      b. Deflection limitations of glass framing systems.
   8. Include field verified non-adjustable opening dimensions, particularly as relate variable degree brake metal outside corner mullions and other critical dimensions.

C. Samples for Initial Selection: For units with factory-applied color finishes.
   1. Include similar Samples of hardware and accessories involving color selection.

D. Samples for Verification: For aluminum windows and components required, prepared on Samples of size indicated below.
   1. Main Framing Member: 12-inch- long, full-size sections of extrusions with factory-applied color finish.

2. Window Corner Fabrication: 12-by-12-inch- long, full-size window corner including full-size sections of extrusions with factory-applied color finish, weather stripping, and glazing.
3. Operable Window: Full-size unit with factory-applied finish.
4. Hardware: Full-size units with factory-applied finishes.
5. Weather Stripping: 12-inch- long sections.

E. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Product Test Reports: Based on evaluation of comprehensive tests by a qualified testing agency for each type, class, grade, and size of aluminum window. Test results based on use of downsized test units will not be accepted.

C. Field quality-control test reports.

D. Warranty: Special warranty specified in this Section.

1.7 COORDINATION

A. Coordinated selected color anodized aluminum finishes to assure color matching of aluminum windows with aluminum framed entrances specified in Division 08 Section “Aluminum Framed Entrances” and aluminum flashing Specified in Division 07 Section “Sheet Metal and Flashing” used in conjunction with aluminum framed entrances and windows.

B. Field verify opening dimensions particularly non-adjustable dimension such clearance between columns and column sizes at curved wall to assure proper fit of variable degree brake metal outside corner mullions.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.
1. Installer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of data for aluminum windows, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.

C. Source Limitations: Obtain aluminum windows through one source from a single manufacturer.

D. Product Options: Information on Drawings and in Specifications establishes requirements for aluminum windows' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

E. Fenestration Standard: Comply with AAMA/WDMA 101/I.S.2/NAFS, "North American Fenestration Standard Voluntary Performance Specification for Windows, Skylights and Glass Doors," for definitions and minimum standards of performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.
   1. Provide AAMA certified aluminum windows with an attached label.

F. Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated.

G. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to aluminum windows including, but not limited to, the following:
   1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   2. Review and discuss the finishing of aluminum windows that is required to be coordinated with the finishing of other aluminum work for color and finish matching.
   3. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for structural anchorage, glazing, flashing, weeping, sealants, and protection of finishes.
   4. Review and discuss the sequence of work required to construct a watertight and weather-tight exterior building envelope.
   5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.10 PROJECT CONDITIONS

A. Field Measurements: Verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating aluminum windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum windows which fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Failure to meet performance requirements.
      b. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
      c. Faulty operation of movable sash and hardware.
      d. Deterioration of metals, other materials, and metal finishes beyond normal weathering.
      e. Failure of insulating glass.
   2. Warranty Period:
      a. Window: Three years from date of Substantial Completion.
      b. Metal Finish: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength, not less than 16,000-psi minimum yield strength, and not less than 0.062-inch thickness at any location for the main frame and sash members.

B. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.
   1. Reinforcement: Where fasteners screw anchor into aluminum less than 0.125 inch thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, splined grommet nuts.
   2. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.

C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

E. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

2.2 WINDOWS

A. Rectangular Exterior Windows Basis-of-Design Product: Subject to compliance with requirements provide extruded aluminum Trifab® VG 451T Framing System windows including but not limited to 451T-VG-010 Variable Degree Break Metal Outside Corners as manufactured by Kawneer North America or comparable products by one of the following:
1. All Seasons Windows & Doors; All Seasons Commercial Division, Inc.
2. Boyd Aluminum Manufacturing.
3. Custom Window Company.
4. DeSCo Windows.
5. EFCO Corporation.
6. EXTECH Exterior Technologies, Inc.
7. Fleetwood Aluminum Products, Inc.
8. Gerkin Windows and Doors.
9. Graham Architectural Products Corp.
10. Mannix; a division of Interstate Window Corp.
11. Peerless Products Inc.
12. Thermal Windows, Inc.
13. TRACO.
14. Wausau Window and Wall Systems.
15. Winco Window Company.
16. Window Technologies, Inc.; Century Manufacturing, Inc.
17. YKK AP America Inc.

B. Circular Windows Basis-of-Design Product: Subject to compliance with requirements provide circular extruded aluminum Trifab® TF-VG-451T-SS-Center full round with a 12" radius as Manufactured by Kawneer North America or comparable product by one of the following:
1. All Seasons Windows & Doors; All Seasons Commercial Division, Inc.
2. Boyd Aluminum Manufacturing.
3. Custom Window Company.
4. DeSCo Windows.
5. EFCO Corporation.
6. EXTECH Exterior Technologies, Inc.
7. Fleetwood Aluminum Products, Inc.
8. Gerkin Windows and Doors.
9. Graham Architectural Products Corp.
10. Mannix; a division of Interstate Window Corp.
11. Peerless Products Inc.
12. Thermal Windows, Inc.
13. TRACO.
14. Wausau Window and Wall Systems.
15. Winco Window Company.
16. Window Technologies, Inc.; Century Manufacturing, Inc.
17. YKK AP America Inc.

C. Interior Aluminum Relite Basis-of-Design Product: Subject to compliance with requirements provide circular extruded aluminum Trifab® TF-VG-451T-SS-Center full as Manufactured by Kawneer North America or comparable product by one of the following:
1. All Seasons Windows & Doors; All Seasons Commercial Division, Inc.
2. Boyd Aluminum Manufacturing.

3. Custom Window Company.
4. DeSCo Windows.
5. EFCO Corporation.
6. EXTECH Exterior Technologies, Inc.
7. Fleetwood Aluminum Products, Inc.
8. Gerkin Windows and Doors.
9. Graham Architectural Products Corp.
10. Mannix; a division of Interstate Window Corp.
11. Peerless Products Inc.
12. Thermal Windows, Inc.
13. TRACO.
14. Wausau Window and Wall Systems.
15. Winco Window Company.
16. Window Technologies, Inc.; Century Manufacturing, Inc.
17. YKK AP America Inc.

D. Window Type: Fixed.

E. Air Infiltration: Maximum rate not more than indicated when tested according to AAMA/WDMA 101/I.S.2/NAFS, Air Infiltration Test.
1. Maximum Rate: 0.1 cfm/sq. ft. of area at an inward test pressure of 6.24 lbf/sq. ft..

F. Water Resistance: No water leakage as defined in AAMA/WDMA referenced test methods at a water test pressure equaling that indicated, when tested according to AAMA/WDMA 101/I.S.2/NAFS, Water Resistance Test.
1. Test Pressure: 20 percent of positive design pressure, but not more than 15 lbf/sq. ft..

2.3 GLAZING

A. Glass and Glazing Materials: Refer to Division 8 Section "Glazing" for glass units and glazing requirements applicable to glazed aluminum window units.

2.4 FABRICATION

A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

B. Thermally Improved Construction: Fabricate aluminum windows with an integral, concealed, low-conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.
1. Provide thermal-break construction that has been in use for not less than three years and has been tested to demonstrate resistance to thermal conductance and condensation and to show adequate strength and security of glass retention.

C. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections,

as indicated. Provide mullions and cover plates capable of withstanding design loads of window units.

D. Glazing Stops: Provide snap-on glazing stops coordinated with Division 8 Section "Glazing" and glazing system indicated. Provide glazing stops to match sash and ventilator frames.

2.5 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate, and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weather-tight window installation.
   1. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches of opening.
   2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weather-tight construction.

D. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

F. Fit variable degree brake metal outside corner mullions carefully around structural steel columns in accordance with approved shop drawings and manufacturer’s instruction. Fill void inside mullion with polyurethane foam as specified in Division 07 Section “Thermal Insulation.”

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
   1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Testing Services: Testing and inspecting of installed windows shall take place as follows:
   1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502, Test Method A by applying same test pressures required to determine compliance with AAMA/WDMA 101/I.S.2/NAFS in Part 1 "Performance Requirements" Article.
   2. Testing Extent: Three windows as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested immediately after installation.
   3. Test Reports: Shall be prepared according to AAMA 502.

C. Remove and replace noncomplying aluminum window and retest as specified above.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weather-tight closure. Lubricate hardware and moving parts.

B. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

C. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.

D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

E. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Work under this section includes the complete finish hardware requirements for the project. Quantities listed are for the contractor's convenience only and are not guaranteed. Items not specifically mentioned, but necessary to complete the work shall be furnished, matching the items specified in quality and finish.

B. Related Sections:
   1. Section 08110 Metal Doors and Frames
   2. Section 08410 Aluminum Doors and Frames

1.3 QUALITY ASSURANCE

A. Product Qualification:
   1. To assure a uniform high quality of materials for the project, it is intended that only specified items be furnished. Comparable products may be accepted upon prior approval of architect.
   2. Hardware to be new, free of defects, blemishes and excessive play. Obtain each kind of hardware (Mechanical latch and locksets, exit devices, hinges and closers) from one manufacturer except where specified.
   3. Fire-Rated opening in compliance with NFPA80. Hardware UL10C/UBC-7-2 (positive pressure) compliant for given type/size opening and degree of label. Provide proper latching hardware, non-flaming door closers, approved bearing hinges and smoke seal. Furnish openings complete.

B. Supplier Qualifications
   1. Hardware supplier will be a direct factory contract supplier who employs a certified architectural hardware consultant (AHC) available at all reasonable times during the course of the work for project hardware consultation to owner, architect and contractor.
   2. Supplier will be responsible for detailing, scheduling and ordering of finish hardware.
   3. Conduct pre-installation conference at jobsite. Initiate and conduct with supplier, installer and related trades. Coordinate materials and techniques and sequence complex hardware items and systems installation.
   4. Key Conference shall be initiated and conducted with owner to determine system, keyway(s) and structure.

C. Installer Qualifications:

1. Installer to have not less than 3 years experience specializing in installation of work in this section. Company must maintain qualified personnel trained and experienced in installing hardware.

1.4 REFERENCES

A. NFPA80 – Fire Doors and Windows

B. NFPA101 – Life Safety Code

C. NFPA105 – Smoke and Draft Control Door Assemblies

D. ANSI A117.1 Specifications for making Buildings usable by physically handicapped people.

1.5 SUBMITTALS

A. Hardware schedule: Submit 6 copies of schedule. Organize vertically formatted schedule into Hardware Sets with index of doors and headings, indication complete designations of every item required for each door or opening. Include the following:
   1. Type, style, function, size, quantity and finish of hardware items.
   2. Name, part number and manufacture of each item.
   3. Fastenings and other pertinent information.
   4. Explanation of abbreviations, symbols and codes contained in schedule.
   5. Door and frame sizes, materials and degrees of swing.

B. Product Data: Submit 4 copies for each product indicated.

C. Templates: Obtain and distribute templates for doors, frames, and other works specified to be prepared for installing door hardware.

D. Wiring/Riser diagrams: as required for electric hardware indicated.

E. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 1.

F. Keying Schedule: Prepared by or under the supervision of supplier, after receipt of the approved finish hardware schedule, detailing Owner's final keying instructions for locks.

G. Samples: Upon request submit material samples.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to project site under provisions of Division 1 and as specified herein.

B. Tag each item or package separately, with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver keys to Owner by registered mail.

1.7 WARRANTY

A. The finish hardware shall have a limited warranty against defects in workmanship and operation for a period of one year from date of substantial completions and the following items are as shown:
   1. Closers: Thirty years mechanical, two years electrical.
   2. Exit Devices: Three years
   3. Locksets: Seven years

PART 2 - PRODUCTS

2.1 MATERIAL AND FABRICATION

A. Provide all door hardware for complete work, in accordance with the drawings and as specified herein.

B. Provide items and quantities not specifically mentioned to ensure a proper and complete operational installation.

2.2 MANUFACTURERS:

A. Any item shown in the hardware schedule, but not listed below shall be supplied as shown unless otherwise approved by the Architect.

ITEM:	MANUFACTURER:	ACCEPTABLE SUB:
Hinges	(HAG) Hager	Ives,Stanley
Locks	(SCH) Schlage	None
Keying	(SCH) Schlage	None
Exit Devices	(VON) Von Duprin	None
Closers	(LCN) LCN	None
Silencers	(IVE) Ives	Hager, Trimco
Kickplates	(IVE) Ives	Hager, Trimco
Stops & Holders	(IVE) Ives	Hager, Trimco
Overhead Stops	(GLY) Glynn-Johnson	Rixon
Threshold	(NGP) National Guard	Pemko
Seals & Bottom	(NGP) National Guard	Pemko

2.3 HANGING

A. Conventional Hinges: Hinge open width minimum, but of sufficient throw to permit maximum door swing. Steel or stainless steel pins.
   1. Three hinges per leaf to 7 feet, 6-inch height. Add one for each additional 30 inches in height or any fraction thereof.
   2. Provide 4 ½ x 4 ½ for 1 ¾” thick doors up to 36”. Provide 5 x 4 ½ on doors over 36”.
   3. Exterior outswing doors to have non removable (NRP) pins.
   4. Pin tips, flat button, finish to match leaves

5. Interior doors over 36” – Heavy weight
6. Interior doors up to 36” – Standard weight

2.4 LOCKSETS, LATCHSETS, DEADBOLTS

A. Extra Heavy Duty Cylindrical Locks and Latches: as scheduled.
   1. ANSI A156.2 Series 4000, Grade 1 Strength and Operational requirements.
      a. UL listed for A label and lesser class single doors up to 4ft x 8ft.
   2. Meets A117.1 Accessibility Codes.
   3. Latch bolts shall be steel with minimum ½” throw, deadlocking on keyed and exterior functions. ¾” throw anti-friction latch bolt on pairs of fire doors.
   4. Lock case steel.
   5. Lock shall incorporate one piece spring cage and spindle.
   6. Locksets to be tested to exceed 3,000,000 cycles.
   7. Strikes: 16 gage curved steel, bronze or brass with 1” deep box construction, lips of sufficient length to clear trim and protect clothing.
   8. Provide seven year warranty.
   9. Lock Series and Design: Schlage ND series, “Rhodes” design.

2.5 EXIT DEVICES

A. General features:
   1. Independent lab-tested 1,000,000 cycles.
   2. Push-through touch pad design. No exposed touch bar fasteners, no exposed cavities when operated. Return stroke fluid dampeners and rubber bottoming dampeners, plus anti-rattle devices.
   3. ¾” throw deadlocking latchbolts.
   4. No exposed screws to show through glass doors.
   5. Non-handed basic device design with center case interchangeable with all functions, no extra parts required to effect change of function.
   6. Releasable with 32 lb. maximum pressure under 250 lb. load to the door.

2.6 KEYS, KEYING, AND KEY CONTROL

A. See Keying Requirements in this section.

2.7 CLOSERS

A. Surface Closers

   1. Full rack-and-pinion type cylinder with removable non-ferrous cover and cast iron body. Double heat-treated pinion shaft, single piece forged piston, chrome-silicon steel spring.
   2. ISO 2000 certified. Units stamped with date-of-manufacture code.
   3. Independent lab-tested 8,000,000 cycles.
   4. Thru-bolts at wood doors unless doors are provided with closer blocking. Non-sized, non-handed, and adjustable. Place closer inside building, stairs, and rooms.

5. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.
6. Opening pressure: Exterior doors 8.5 lb., interior doors 5 lb., labeled fire doors 15 lb.
7. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.
8. Extra-duty arms (EDA) at exterior doors scheduled with parallel arm units.
9. Exterior door closers: tested to 100 hours of ASTM B117 salt spray test, furnish data on request.
10. Exterior doors do not require seasonal adjustments in temperatures from 120 degrees F to – 30 degrees F, furnish data on request.
11. Non-flaming fluid will not fuel door or floor covering fires.

2.8 OTHER HARDWARE

A. Door stops: Provide stops to protect walls, casework or other hardware.
   1. Except as otherwise indicated, provide stops (wall, floor or overhead) at each leaf of every swinging door leaf.
   2. Where wall or floor stops are not appropriate, provide overhead holders.

B. Weatherstrip and Gasket
   1. Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled.
   2. Provide non-corrosive fasteners as recommended by the manufacturer for application indicated.

C. Thresholds
   1. Except as otherwise indicated, provide standard metal threshold unit of type, size and profile as detailed or scheduled.

D. Silencers
   1. Interior hollow metal frames, 3 for single doors, 4 for pairs of doors.

E. Kick Plates:
   1. Four beveled edges, .050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.

2.9 HARDWARE FINISH

A. Provide the following finishes unless noted differently in hardware groups.

Hinges	630 Stainless Steel
Locksets	626 Dull Chrome
Exit Devices	626 Dull Chrome
Closers	Alum 689 with SRI
Kickplates	Stainless Steel
Other hardware	626 Dull Chrome
Thresholds	ALUMINUM
Weatherstrip/sweeps	ALUMINUM

2.10 KEYING REQUIREMENTS

A. All keyed cylinders shall be subject to a new Schlage Everest C Masterkey system.

B. Furnish cylinders with construction cores. Following construction supply permanent keyed cores. Permanent cores to be interchangeable cores.

C. Cylinders to be furnished with visual key control with key code. Stamped on the face of the keys and marked on the back or side of the cylinders.

D. Key Quantities

6 each MKs
1 each Control Key
6 each Construction Keys
1 each Construction Control Key
3 each Change Keys per keyed alike group

PART 3 - EXECUTION

3.1 ACCEPTABLE INSTALLERS:

A. Factory trained, certified, and carries a factory-issued card certifying that person as a “Certified Installer”. Alternative: can demonstrate suitably equivalent competence and experience.

3.2 PREPARATION:

A. Ensure that walls and frames are square and plumb before hardware installation.

B. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes. Notify Architect of any code conflicts before ordering materials.

3.3 INSTALLATION

A. Install hardware per manufacturer’s instructions and recommendations. Do not install surface mounted items until finishes have been completed on substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation.

B. Locate floor stops not more than 4 inches from the wall.

C. Drill pilot holes for fasteners in wood doors and/or frames.

3.4 ADJUSTING

A. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.

B. Hardware damaged by improper installation or adjustment methods to be repaired or replaced to Owner's satisfaction.

3.5 DEMONSTRATION

A. Demonstrate electrical, electronic and pneumatic hardware system including adjustment and maintenance procedures

3.6 PROTECTION/CLEANING

A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion. Clean adjacent wall, frame and door surfaces soiled from installation/reinstallation process.

3.7 DOOR HARDWARE GROUPS

HW 1

1	EA	CONTINUOUS HINGE	790-900 83"		HAG
1	SET	PUSH/PULL BAR	9190-10"-NO	630	IVE
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP SRI	689	LCN
1	EA	FLUSH CEILNG MTG PLT	4040XP-18G SRI	689	LCN
1	EA	DOOR SWEEP	C627A	CL	NGP
1	EA	THRESHOLD	8425 MS/LA	AL	NGP
1	EA		WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		

DOOR IS PUSH/PULL. NO LOCKING. FUTURE AUTOMATIC OPERATORS AND ACTUATORS.

HW 2

1	EA	CONTINUOUS HINGE	790-900 83" CUT FOR EPT POWER TRANSFER	32D	HAG
1	EA	ELEC PANIC HARDWARE	EL-35A-NL-OP-388	626	VON
1	EA	RIM CYLINDER	20-057	626	SCH
1	EA	MORTISE CYLINDER	26-091 FOR KEY SWITCH	626	SCH
1	EA	DOOR PULL, 3/4" RND	8102 10" STD	630	IVE
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP SRI	689	LCN
1	EA	FLUSH CEILNG MTG PLT	4040XP-18G SRI	689	LCN
1	EA	DOOR SWEEP	C627A	CL	NGP
1	EA	THRESHOLD	8425 MS/LA	AL	NGP

1	EA	KEYSWITCH	653-04	630	SCE
1	EA	POWER SUPPLY	PS914 900-4RL CARD READER BY OTHERS	LGR	VON
1	EA		WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		

4RL BOARD IN POWER SUPPLY FOR FUTURE AUTOMATIC OPERATORS AND ACTUATORS.

OPERATIONAL DESCRIPTION
WHEN DOOR TO BE LOCKED KEY IN KEY SWITCH WILL RELEASE LATCH BOLT. ENTRY BY CARD.
WHEN DOOR TO BE UNLOCKED, KEY IN KEY SWITCH WILL RETRACT AND HOLD LATCH BOLT. DOOR WILL BE PUSH PULL.

HW 3

3	EA	HINGE	AB800 4.5 X 4.5 NRP	32D	HAG
1	EA	ENTRANCE/OFFICE LOCK	ND50RD SPA	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA SRI TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW 4

3	EA	HINGE	AB800 4.5 X 4.5	32D	HAG
1	EA	PRIVACY LOCK	ND40S SPA	626	SCH
1	EA	SURFACE CLOSER	4040XP SRI TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR SHOE	312V	AL	NGP
1	EA	THRESHOLD	425E MS/LA	AL	NGP

HW 5

3	EA	HINGE	AB850 4.5 X 4.5	32D	HAG
1	EA	STOREROOM LOCK WITH DEADBOLT	L948006L L583-363	626	SCH
1	EA	SURFACE CLOSER	4040XP SRI	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW 6

3	EA	HINGE	AB800 4.5 X 4.5	32D	HAG
1	EA	PASSAGE SET	ND10S SPA	626	SCH
1	EA	OH STOP	90S	630	GLY
1	EA	SURFACE CLOSER	4040XP SRI TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR SHOE	312V	AL	NGP
1	EA	THRESHOLD	425E MS/LA	AL	NGP

HW 7

3	EA	HINGE	AB800 4.5 X 4.5	32D	HAG
1	EA	STOREROOM LOCK	ND80RD SPA	626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE	630	VON
1	EA	OH STOP	90S	630	GLY
1	EA	SURFACE CLOSER	4040XP SRI TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR SHOE	312V	AL	NGP
1	EA	THRESHOLD	425E MS/LA	AL	NGP
			CARD READER BY OTHERS		
			POWER SUPPLY BY OTHERS		

OPERATIONAL DESCRIPTION
OUTSIDE LEVER FIXED. ENTRANCE BY KEY ONLY. INSIDE LEVER ALWAYS UNLOCKED.
INSIDE LEVER IS ALWAYS FREE FOR IMMEDIATE EGRESS.
ELECTRIC STRIKE IS RELEASED WHEN POWER IS APPLIED (FAIL SECURE).

HW 8

3	EA	HINGE	AB800 4.5 X 4.5	32D	HAG
1	EA	ENTRANCE/OFFICE LOCK	ND50RD SPA	626	SCH
1	EA	SURFACE CLOSER	4040XP SRI TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR SHOE	312V	AL	NGP
1	EA	THRESHOLD	425E MS/LA	AL	NGP

HW 9

1	EA	POCKET FRAME SET	1500		JOH
1	SET	DOOR PULL, 3/4" RND	PR 8102 6" J	630	IVE

STOP DOOR IN POCKET BEFORE PULLS HIT FRAME

HW 10

3	EA	HINGE	AB800 4.5 X 4.5	32D	HAG
1	EA	STOREROOM LOCK	ND80RD SPA	626	SCH
1	EA	OH STOP	90S	630	GLY
1	EA	SURFACE CLOSER	4040XP SRI TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW 11

3	EA	HINGE	AB800 4.5 X 4.5	32D	HAG
1	EA	PASSAGE SET	ND10S SPA	626	SCH
1	EA	SURFACE CLOSER	4040XP SRI TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR SHOE	312V	AL	NGP
1	EA	THRESHOLD	425E MS/LA	AL	NGP

HW 12

3	EA	HINGE	AB850 5 X 4.5 NRP	32D	HAG
1	EA	STOREROOM LOCK	L9080R 06L	630	SCH
1	EA	LOCK GUARD	LG12	630	IVE
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA SRI	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	DRIP CAP	16A	CL	NGP
1	EA	HEAD SEAL	706A	AL	NGP
2	EA	JAMB SEAL	706E	AL	NGP
1	EA	DOOR SWEEP	C627A	CL	NGP
1	EA	THRESHOLD	8425 MS/LA	AL	NGP

HW 13

3	EA	HINGE	AB800 4.5 X 4.5 NRP	32D	HAG
1	EA	PASSAGE SET	ND10S SPA	626	SCH
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA SRI	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	HEAD SEAL	706A	AL	NGP
2	EA	JAMB SEAL	706E	AL	NGP
1	EA	DOOR SWEEP	C627A	CL	NGP
1	EA	THRESHOLD	8425 MS/LA	AL	NGP

HW 14

3	EA	HINGE	AB800 4.5 X 4.5	32D	HAG
1	EA	PRIVACY LOCK	ND40S SPA	626	SCH
1	EA	OH STOP	90S	630	GLY
1	EA	SURFACE CLOSER	4040XP SRI TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR SHOE	312V	AL	NGP
1	EA	THRESHOLD	425E MS/LA	AL	NGP

HW 15

1	EA	MORTISE CYLINDER	26-091	626	SCH

CONFIRM CYLINDER TYPE REQUIRED FOR ROLL UP DOOR AND ACCESS PANELS.
CONFIRM QUANTITY OF ACCESS PANELS.

HW 16

3	EA	HINGE	AB850 5 X 4.5 NRP	32D	HAG
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	EL-98-NL-990	626	VON
1	EA	RIM CYLINDER	20-057	626	SCH
1	EA	MORTISE CYLINDER	26-091 FOR KEY SWITCH	626	SCH
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP SRI	689	LCN
1	EA	FLUSH CEILNG MTG PLT	4040XP-18G SRI	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	HEAD SEAL	706A	AL	NGP
2	EA	JAMB SEAL	706E	AL	NGP
1	EA	DOOR SWEEP	C627A	CL	NGP
1	EA	THRESHOLD	8425 MS/LA	AL	NGP
1	EA	KEYSWITCH	653-04	630	SCE
1	EA	POWER SUPPLY	PS914 900-4RL CARD READER BY OTHERS	LGR	VON

4RL BOARD IN POWER SUPPLY FOR FUTURE AUTOMATIC OPERATOR.

OPERATIONAL DESCRIPTION
WHEN DOOR TO BE LOCKED KEY IN KEY SWITCH WILL RELEASE LATCH BOLT. ENTRY BY CARD.
WHEN DOOR TO BE UNLOCKED, KEY IN KEY SWITCH WILL RETRACT LATCH BOLT. DOOR WILL BE PUSH PULL.

HW 17

6	EA	HINGE	AB800 4.5 X 4.5	32d	HAG
2	EA	ROLLER LATCH	ROL30A	626	IVE
2	EA	DUMMY TRM	ND170 SPA	626	SCH
2	EA	SILENCERS	SR64	Gry	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	EA	OVERHEAD STOP	450S	630	GLY

HW 18

3	EA	HINGE	AB800 4.5 X 4.5	32D	HAG
1	EA	STOREROOM LOCK	ND80RD SPA	626	SCH
1	EA	OH STOP	90H	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA SRI	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Windows.
   2. Doors.
   3. Glazed entrances.
   4. Interior borrowed lites (relites).

B. Related Sections:
   1. Division 08 Section “Wood Doors” for wood doors to receive glazing specified in this Section.
   2. Division 08 Section “Hollow Metal Frames” for hollow metal frames to receive glazing specified in this Section.
   3. Division 08 Section “Fiberglass Reinforced Plastic (FRP) Doors and Frames” for FRP doors to receive glazing specified in this Section.
   4. Division 08 Section "Aluminum Framed Entrances" for aluminum doors and frames to receive glazing specified in this Section.
   5. Division 08 Section "Aluminum Windows" for aluminum windows to receive glazing specified in this Section.
   6. Division 08 Section "Sectional Doors." for glazing in sectional overhead doors.

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit.

1.4 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to

the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
   1. Temperature Change: 120 deg. F, ambient; 180 deg. F, material surfaces.

1.5 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
   1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
   2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
   3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
   4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.6 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glass Samples: For each type of the following products; 12 inches square.
   1. Float glass
   2. Tempered float glass
   3. Reflective tinted glass.
   4. Insulating glass.

C. Sealant Samples for initial selection:
   1. Sealant manufacturer’s full color range of specified sealant for color selection by Architect.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installers, glass testing agency, sealant testing agency.

B. Product Certificates: For glass and glazing products, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for reflective tinted glass, coated glass, insulating glass, glazing sealants, and glazing gaskets.
   1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

D. Preconstruction adhesion and compatibility test report.

E. Warranties: Sample of special warranties.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

B. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

C. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

D. Source Limitations for Glass: Obtain reflective tinted float glass and insulating glass from single source from single manufacturer for each glass type.

E. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

F. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
   1. GANA Publications GANA's "Glazing Manual."
   2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
   3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
   4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

G. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

H. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

I. Pre-installation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for glazing during and after installation.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
   1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg. F.

1.11 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
   1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
   1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
   1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.

B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
   1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
   2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
   3. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg. F.
   4. Visible Lite Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.

2.2 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
   1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
   2. For uncoated glass, comply with requirements for Condition A.
   3. For coated vision glass, comply with requirements for Condition C (other coated glass).

C. Reflective Tinted Float Glass:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Azuria Glass as manufactured by PPG Industries, Inc. or comparable product by another manufacturer:
   2. Tint Color: Aqua-blue
   3. Visible Light Transmittance: 68%.
   4. Provide heat strengthened glass.

2.3 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
   1. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
   2. Spacer: Manufacturer's standard spacer material and construction.
   3. Desiccant: Molecular sieve or silica gel, or blend of both.

B. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Insulating-Glass Types" Article and in "Insulating-Laminated-Glass Types" Article.

2.4 GLAZING GASKETS

A. Dense Compression Gaskets:
   1. For aluminum doors and windows as recommended by the door and window frame manufacturer for the conditions indicate.
   2. For interior installation in wood doors and hollow metal frames Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from the following:
      a. Neoprene complying with ASTM C 864.
      b. EPDM complying with ASTM C 864.
      c. Silicone complying with ASTM C 1115.
      d. Thermoplastic polyolefin rubber complying with ASTM C 1115.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene, EPDM, silicone or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.
   1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

2.5 GLAZING SEALANTS

A. General:
   1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
      a. For aluminum entrance doors and windows, comply with door and window frame manufacturer’s recommendations.
   2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
      a. For aluminum entrance doors and windows, comply with door and window frame manufacturer’s recommendations.

3. Sealants used inside the weatherproofing system, shall have a VOC content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
1. Applications:
   a. At all locations recommended by aluminum entrance door and window frames manufacturer.
   b. At locations indicated on the Drawings.
   c. As locations requiring sealant for a weather-tight installation.

C. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.

2.6 GLAZING TAPES

A. Aluminum Entrance Doors and Window Frames: Install glazing tapes a locations and at type recommended by the aluminum entrance door and window manufacturer.

B. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; non-staining and non-migrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
1. AAMA 804.3 tape, for interior applications.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

C. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.7 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.8 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

2.9 MONOLITHIC-GLASS TYPES

A. Glass Type GL-1: Clear float glass.
1. Thickness: 6.0 mm.

B. Glass Type GL-2: Clear fully tempered float glass.
1. Thickness: 6.0 mm.
2. Provide safety glazing labeling.

2.10 INSULATING-GLASS TYPES

A. Glass Type GL-3: Clear insulating glass.
1. Overall Unit Thickness: 1 inch.
2. Thickness of Each Glass Lite: 6.0 mm.
3. Outdoor Lite: Heat-strengthened float glass.
4. Interspace Content: Air.
5. Indoor Lite: Float glass.

B. Glass Type GL-4: Clear, tempered, insulating glass.
1. Overall Unit Thickness: 1 inch.

2. Thickness of Each Glass Lite: 6.0 mm.
3. Outdoor Lite: Clear, fully tempered float glass.
4. Interspace Content: Air.
5. Indoor Lite: Clear fully tempered float glass.
6. Provide safety glazing labeling.

C. Glass Type GL-5: Clear, tempered, insulating glass.
1. Overall Unit Thickness: 5/8 inch.
2. Thickness of Each Glass Lite: 6.0 mm.
3. Outdoor Lite: Clear, fully tempered float glass.
4. Interspace Content: Air.
5. Indoor Lite: Clear, fully tempered float glass.
6. Provide safety glazing labeling.

D. Glass Type GL-6: Reflective tinted, insulating glass.
1. Overall Unit Thickness: 1- inch.
2. Thickness of Each Glass Lite:
   a. Outdoor Lite: 6 mm
   b. Indoor Lite: 6 mm
3. Outdoor Lite: Reflective tinted, heat strengthened float glass.
4. Interspaces Content: Air
5. Indoor Lite: Clear float glass.

E. Glass Type GL-7: See Division 08 Section “Sectional Doors.”

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
   1. Glazing installation for FRP doors shall be factory installed as specified in the Division 08 Section Fiberglass Reinforced Plastic (FRP) Doors and Frames.
   2. Glazing and glazing installation for sectional overhead doors shall be as Specified in Division 08 Section “Sectional Doors.”

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches.
   1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
   2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.6 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
   2. Suspension systems for interior gypsum ceilings, and soffits.

B. Related Requirements:
   1. Division 05 Section "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall furring studs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.

B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

C. Flat Hangers: Steel sheet, 1 by 3/16 inch by length required for conditions indicated.

D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch and minimum 1/2-inch- wide flanges.
   1. Depth: 3-inches unless indicated otherwise on the Drawings.

E. Furring Channels (Furring Members):
   1. Cold-Rolled Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
   2. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
      a. Minimum Base-Metal Thickness: 0.018 inch.

2.2 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.
   1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
   1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.
   1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
      a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
   2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
      a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
   3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
   4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
   5. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION

This Page Not Used

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Interior gypsum board.
   2. Flexible gypsum board for cylindrically curved surfaces.
   3. Smooth finishes.
   4. Texture finishes.

B. Related Requirements:
   1. Division 06 Section “Rough Carpentry” for wood framing systems that support gypsum board panels.
   2. Division 09 Section "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For the following products:
   1. Trim Accessories: Full-size Sample in 12-inch long length for each trim accessory indicated.
   2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. American Gypsum.
   2. CertainTeed Corp.
   3. Georgia-Pacific Gypsum LLC.
   4. Lafarge North America Inc.
   5. National Gypsum Company.
   6. PABCO Gypsum.
   7. Temple-Inland.
   8. USG Corporation.

B. Gypsum Wallboard (flat and large radius curves): ASTM C 1396/C 1396M.
   1. Thickness: 1/2 inch unless indicated otherwise.
   2. Long Edges: Tapered.

C. Gypsum Board, Type X (flat): ASTM C 1396/C 1396M.
   1. Thickness: 5/8 inch where indicated.
   2. Long Edges: Tapered.

D. Flexible Gypsum Board (curved): ASTM C 1396/C 1396M. Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.

1. Thickness: 1/4 inch.
2. Long Edges: Tapered.

E. Moisture- and Mold-Resistant Gypsum Board (flat): ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
1. Core: 1/2 inch.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
2. Shapes:
a. Cornerbead.
b. LC-Bead: J-shaped; exposed long flange receives joint compound.
c. Expansion (control) joint.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:
1. Interior Gypsum Board: Paper.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
1. Pre-filling: At open joints and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping or drying-type, all-purpose compound.
a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
   1. Thickness: As indicated on the Drawings.
   2. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

D. Acoustical Joint Sealant: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

E. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."

F. Vapor Retarder: As specified in Division 07 Section "Thermal Insulation."

2.7 TEXTURE FINISHES

A. Primer: As recommended by textured finish manufacturer.

B. Non-Aggregate Finish: Pre-mixed, vinyl texture finish for spray application.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. CertainTeed Corp.; ProRoc Easi-Tex Spray Texture.
      b. National Gypsum Company; Perfect Spray EM Texture.
      c. USG Corporation; BEADEX FasTex Wall and Ceiling Spray Texture.
   2. Texture:
      a. Smooth at locations to receive High Performance Coating Finish.
      b. Orange Peel at all other locations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.
   1. Special Inspection: Notify Owner's Representative 24 hour prior to completion of installation of sound attenuation blanket for inspection of sound attenuation blanket install prior to applying gypsum board.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
   1. Wallboard Type: Vertical surfaces including large radius curved surfaces unless otherwise indicated.

2. Type X: At all ceilings, at certain vertical locations indicated on the Drawings and where required for fire-resistance-rated assembly
3. Flexible Gypsum Board: At cylindrically curved surfaces with small radii. Apply double layer at curved assemblies.
4. Moisture- and Mold-Resistant Type: At locations indicated on the Drawings.

B. Single-Layer Application:
1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. Gypsum board orientation:
   a. On flat partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated.
   b. On cylindrically curved partitions/walls (large radius), apply gypsum panels horizontally (perpendicular to framing).
   c. Stagger abutting end joints not less than one framing member in alternate courses of panels.
   d. Dry Bending: Cylindrically curved gypsum boards with radii greater than 15 feet may be dry bent.
3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application for Cylindrically Curved Surfaces (small radii):
1. On partitions/walls, apply gypsum board indicated for base layers and face layers horizontally (perpendicular to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints. Stagger joints on opposite sides of partitions.
   a. Wet Bending: Cylindrically curved gypsum boards with radii less than 15 feet shall be wet bent in accordance with manufacturer's instruction and the following: the face and back papers shall be thoroughly moistened by evenly spraying water on the surface which will be in tension when the board is hung such that the water is allowed to soak into the core before application. The board shall be dried within 24 hours of wetting to prevent development of mold. Use fans and mechanical dehumidification to accelerate drying when conditions are not conducive to natural drying.
   b. Concave surfaces: Apply a stop at one of the curve to restrain one end or edge of the gypsum board during installation. Apply pressure to the unrestrained end or edge of the gypsum board forcing the field of the gypsum board into firm contact with the substrate (framing or layer) beneath. Fasten by working from the "stopped" end or edge. Hold the gypsum board tightly against the substrate while fasteners are being driven into the framing..
   c. Convex surfaces: Attach one end of the gypsum board to the framing with screws. Progressively push the gypsum board into contact with the substrate and fasten to subsequent framing members, working from the fixed end to the free end. Hold the gypsum board tightly against the substrate while the fasters are being driven into the framing.
2. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints at locations indicated on Drawings and according to ASTM C 840 as approved by Architect for specific visual effect.

C. Interior Trim: Install in the following locations:
   1. Cornerbead: Use at outside corners.
   2. LC-Bead: Use at exposed panel edges.

3.5 FINISHING GYPSUM BOARD

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

B. Pre-fill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Cylindrically Curved Gypsum Boards: At the edges of curved surfaces where they meet flat surfaces, snip one edge of the joint tape from the edge of the tape to the center of the tape at approximately ¾ inch intervals. Apply the uncut half of the tape to the curved surface and the cut half to the flat surface.
   1. Finish joints, fasteners, and accessories as indicated herein.

E. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
   1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
   2. Level 3: At panel surfaces that will be exposed to view with textured finish.
      a. Primer and its application to surfaces are specified in Division 09 Section "Interior Painting."
   3. Level 5: At gypsum board surfaces indicated to receive high performance coating..
      a. Primer and its application to surfaces are specified in Division 09 Section "High Performance Coatings."

3.6 APPLYING TEXTURE FINISHES

A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture free of starved spots or other evidence of thin application or of application patterns.

C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and over-spray to prevent damage according to texture-finish manufacturer's written recommendations.

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

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

END OF SECTION

SECTION 095113
ACOUSTICAL
PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for ceilings.

B. Related Requirements:
1. Division 09 Sections “Non-structural Metal Framing” and "Gypsum Board” for suspendend gypsum board ceilings.

1.3 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.

C. Samples for Initial Selection: For components with factory-applied color finishes.

D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
1. Acoustical Panel: 6-inch square samples of each type, color, pattern, and texture.
2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch long Samples of each type, finish, and color.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Suspended ceiling components.
2. Structural members to which suspension systems will be attached.
3. Size and location of initial access modules for acoustical panels.
4. Items penetrating finished ceiling including the following:
a. Lighting fixtures.

b. Air outlets and inlets.
c. Speakers.
d. Sprinklers.
e. Access panels.

B. Qualification Data: For testing agency.

C. Product Test Reports: For each acoustical panel ceiling, for tests performed by a qualified testing agency.

D. Evaluation Reports: For each acoustical panel ceiling suspension system, from ICC-ES.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Acoustical Ceiling Panels: Full-size panels equal to 2 percent of quantity installed.
2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.

B. Do not install acoustical ceiling components that cannot be clearly identified as meeting all specified performance criteria

1.9 WARRANTY

A. Warranty: Manufacturer's standard warranty indicating in the event of that manufacturer will deliver to the project site at their expense, new product, of the same or similar type and grade and in the amount equal to that which is determined to be defective. Warranty need not cover damage from vibrations, fire, water, freezing temperature, accident, or any form or abuse or exposure to abnormal conditions.
1. Warranty period: Thirty years from date of substantial completion.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.11 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
   1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.
   2. Areas to receive acoustical panel ceilings shall be free of dust and debris.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to the IBC and ASCE/SEI 7 including all State of Alaska Amendments.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
   2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL PANELS, GENERAL

A. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.

B. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.

C. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

2.3 ACOUSTICAL PANELS, 24-INCH BY 48-INCH (C2)

A. Basis-of-Design Product: Subject to compliance with requirements, provide Cortega Angled Tegular (703) as manufactured by Armstrong World Industries, Inc. or comparable product by one of the following:
   1. CertainTeed Corp.
   2. Chicago Metallic Corporation.
   3. Tectum Inc.
   4. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
   1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.

C. Color: White.

D. LR: Not less than 0.80.

E. NRC: Not less than 0.55.

F. CAC: Not less than 30.

G. Edge/Joint Detail: 15/16” Angled Tegular.

H. Thickness: 5/8 inch .

I. Modular Size: 24 by 48 inches.

J. Access: Lift and remove.

2.4 ACOUSTICAL PANELS, 24-INCH BY 24-INCH (C3)

A. Basis-of-Design Product: Subject to compliance with requirements, provide Cortega Angled Tegular (704) as manufactured by Armstrong World Industries, Inc. or comparable product by one of the following:
   1. CertainTeed Corp.
   2. Chicago Metallic Corporation.
   3. Tectum Inc.
   4. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
   1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.

C. Color: White.

D. LR: Not less than 0.80.

E. NRC: Not less than 0.55.

F. CAC: Not less than 30.

G. Edge/Joint Detail: 15/16” Angled Tegular.

H. Thickness: 5/8 inch .

I. Modular Size: 24 by 24 inches.

J. Access: Lift and remove.

2.5 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.

B. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch diameter wire.

D. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.

F. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

G. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

H. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in place.

2.6 METAL SUSPENSION SYSTEM

A. Metal Suspension System Basis of Design: Subject to requirements provide Prelude XL 15/16" exposed tee system metal suspension system as manufactured by Armstrong World Industries, Inc. or comparable system by manufacturer of 24-inch by 48-inch and 24-inch by 24-inch acoustical ceiling panels.
   1. Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; pre-painted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation; with pre-finished 02/11-inch- wide metal caps on flanges.
   2. Structural Classification: Intermediate duty system.
   3. End Condition of Cross Runners: Override (stepped) or butt-edge type.
   4. Face Design: Flat, flush.
   5. Cap Material: Steel cold-rolled sheet.
   6. Cap Finish: Painted white.
   7. Wall Moldings: Angle molding unless indicated otherwise.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
   3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
   4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
   6. Do not support ceilings directly from permanent metal forms or floor deck.
   7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
   8. Do not attach hangers to steel deck tabs.
   9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
   10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
   11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs.

D. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
   1. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
   2. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
   3. Install seismic clips as recommended by panel manufacturer's written instructions unless otherwise indicated.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 096513
RESILIENT BASE
AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Resilient base.
   2. Vinyl transition strips.
   3. Vinyl feature strips.

B. Related Sections:
   1. Division 09 Section "Resilient Flooring" for resilient floor coverings including vinyl plank flooring.
   2. Division 09 Section “Carpet Tile” for carpet tile floor coverings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.7 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F , in spaces to receive resilient products during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

A. Resilient Base:
   1. Manufacturers: Subject to compliance with requirements, provide products by Roppe Corporation, USA. or comparable products by one of the following:
      a. Allstate Rubber Corp.; Stoler Industries.
      b. Armstrong World Industries, Inc.
      c. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
      d. Endura Rubber Flooring; Division of Burke Industries, Inc.
      e. Estrie Products International; American Biltrite (Canada) Ltd.
      f. Flexco, Inc.
      g. Johnsonite.
      h. Mondo Rubber International, Inc.
      i. Musson, R. C. Rubber Co.
      j. Nora Rubber Flooring; Freudenberg Building Systems, Inc.
      k. PRF USA, Inc.
      l. VPI, LLC; Floor Products Division.

B. Resilient Base Standard: ASTM F 1861.
   1. Material Requirement: Type TS (rubber, vulcanized thermoset) or Type TP (rubber, thermoplastic).
   2. Manufacturing Method: Group I (solid, homogeneous) or Group II (layered).

3. Style: Cove (base with toe).

C. Minimum Thickness: 0.125 inch.

D. Height: 4 inches unless indicated otherwise.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed or preformed.

G. Inside Corners: Job formed or preformed.

H. Finish: Low luster.

I. Colors and Patterns: As selected by Architect from manufacturer’s full color line.

2.2 VINYL ADAPTERS AND TRANSITIONS

A. General: Provide transition strips or feature strips at all floor material transitions as recommended by the flooring manufactures and as indicated.

B. Vinyl Feature Strip: Flexible vinyl feature strip designed to transition between 1/8 inch thick flooring materials.
   1. Vinyl Feature Strip Basis of Design: Subject to compliance with requirements, provide #195 feature strip as manufactured by Roppe Corporation, USA, or comparable products by one of the following:
      a. Armstrong World Industries
      b. Burke Mercer Flooring Products
      c. Flexco
      d. Johnsonite; A Tarket Company
      e. Musson Rubber Co.
   2. Description:
      a. Transition strip shall be flexible and bendable to the curves indicated on the drawings.
      b. Transition strip shall provide transition between vinyl plank flooring and carpet tile.
   3. Profile and Dimensions: 1 inch wide by 1/8 inch high.
   4. Locations: Provide vinyl feature strip at areas indicated.
   5. Colors and Patterns: As selected by Architect from full range of industry colors.

C. Vinyl Transition Strip: Removable snap down vinyl transition strip design for joining carpet to tile.
   1. Vinyl Transition Strip Basis of Design: Subject to compliance with requirements, provide #154 snap-down edging as manufactured by Roppe Corporation, USA, or comparable products by one of the following:
      a. Armstrong World Industries
      b. Burke Mercer Flooring Products

c. Flexco
d. Johnsonite; A Tarket Company
e. Musson Rubber Co.

2. Profile and Dimensions: 1 9/64 inch wide by 7/16 inch high.
3. Locations: Provide vinyl at all transitions between:
   a. rubber or vinyl floor tile and carpet.
   b. vinyl plank flooring and carpet except where vinyl feature strip is indicated.
4. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are same temperature as the space where they are to be installed.
   1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:
1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
2. Inside Corners: Use straight pieces of maximum lengths possible.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Feature Strip: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:
1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products until Substantial Completion.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Rubber tile floor covering.
   2. Static-dissipative rubber tile floor covering.
   3. Vinyl plank flooring

B. Related Sections:
   1. Division 09 Section "Resilient Base and Accessories" for resilient base, feature strips, and other accessories installed with resilient floor coverings.
   2. Division 09 Section “Carpet Tile” for carpet tile.

1.3 PERFORMANCE REQUIREMENTS

A. Static-Dissipative Properties: Provide static dissipative floor tile with static-control properties indicated as determined by testing identical products per test method indicated by an independent testing and inspecting agency.
   1. Electrical Resistance: Test per ASTM F 150 with 100-V applied voltage.
      a. Average greater than 1 megohm and less than or equal to 1000 megohms when test specimens are tested surface to ground.
      b. Average no less than 1 megohm and less than or equal to 1000 megohms when installed floor coverings are tested surface to ground.
   2. Static Generation: Less than 300 V when tested per AATCC-134 at 20 percent relative humidity with conductive footwear.
   3. Static Decay: 5000 to 0 V in less than 0.25 seconds when tested per FED-STD-101C/4046.1.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each type of floor covering. Include floor covering layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

C. Samples for Initial Selection: For each type of floor covering indicated.

1. Floor Tile: 6-by-9-inch units.
2. Vinyl planks flooring: Manufacturer’s full range of colors, standard size plus four pieces of actual plank not less less than 8-inches long.

D. Samples for Verification: In manufacturer's standard size, but not less than 6-by-9-inch sections of each different color and pattern of floor covering required.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor covering to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.
2. Static-dissipative Rubber Maintenance Floor Tiles: Special floor tiles inscribed "Conductive floor. Do not wax."

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor covering installation indicated.

B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

C. Pre-installation Conference: Conduct conference at Project site.
1. Review methods and procedures related to static-control resilient floor coverings including, but not limited to, the following:
a. Examination and preparation of substrates to receive floor covering.
b. Installation.
c. Field quality-control testing.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store floor coverings and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.
   1. Floor Tile: Store on flat surfaces.

1.10 WARRANTY

A. Provide separate flooring manufacturer's standard warranty for each resilient flooring product providing for replacement of material that fails do to manufacturing defects including excessive wear. Warranty periods shall be as follows:
   1. Rubber floor tile:
      a. Manufacturer's defects: 1 year
      b. Commercial wear: 5 years
   2. Static-dissipative rubber tile floor covering.
      a. Manufacturer's defects: 1 year
      b. Commercial wear: 10 years
      c. Conductivity: 10 years
   3. Vinyl plank flooring:
      a. Manufacturer's defects: 1 year
      b. Commercial wear: 10 years

1.11 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 85 deg F, in spaces to receive floor coverings during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F .

C. Close spaces to traffic during floor covering installation.

D. Close spaces to traffic for 48 hours after floor covering installation.

E. Install floor coverings after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RUBBER FLOOR TILE

A. Rubber Sheet Floor Covering Basis of Design: Subject to compliance with requirements, provide 993 Textured Design Rubber Floor Tile as manufactured by Roppe Corporation, U.S.A., or comparable product manufactured by one of the following:
   1. Burke Mercer Flooring Products, Division of Burke Industries Inc.;
   2. Endura Rubber Flooring, a division of Burke Industries Inc.;
   3. Estrie Products International, American Biltrite (Canada) Ltd.;
   4. Flexco;
   5. Johnsonite;
   6. Mondo Rubber International, Inc.;
   7. Nora Rubber Flooring, Freudenberg Building Systems, Inc.;
   8. PRF USA Inc.; .
   9. R.C.A. Rubber Company (The).

B. Tile Standard: ASTM F 1344, Class I-A, homogeneous rubber tile, solid color.

C. Hardness: Manufacturer's standard hardness.

D. Wearing Surface: Textured.

E. Thickness: 0.125 inch.

F. Size: Manufacturer’s standard but not less than 19-11/16 inches by 19-11/16 inches..

G. Seaming Method: Standard.

H. Colors and Patterns: As selected by Architect from full range of industry colors.

2.2 STATIC-DISSIPATIVE RESILIENT FLOOR COVERINGS

A. Static-Dissipative Rubber Floor Tile (ESD Rubber Tile): ASTM F 1344; except in manufacturer's standard hardness when tested per ASTM D 2240 using Shore, Type A durometer.
   1. Hammered-Surface Textured Floor Tile: Class I-B (homogenous rubber, through-mottled pattern).
      a. Basis of Design Product: Subject to compliance with requirements, provide ESD Rubber Tile as manufactured by Roppe Corporation, U.S.A., or comparable product manufactured by one of the following::
         1) Nora Rubber Flooring, Freudenberg Building Systems, Inc.;
         2) PRF USA Inc.;
      b. Thickness: Not less than 0.08 inch.
      c. Size: Manufacturer’s standard but not less than 24 by 24 inches.
      d. Seaming Method: Standard.

e. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 VINYL PLANK FLOORING

A. Vinyl Plank Flooring Basis of Design: Subject to compliance with requirements, provide Northern Timbers vinyl planks flooring as manufactured by Roppe Corporation USA or a comparable product by one of the following::
1. Altro Group
2. Armstrong World Industries, Inc.
3. Burke Mercer Flooring Products, Division of Burke Industries Inc.
4. Flexco; Gerflor, Architectural Floor Systems, Inc.
5. Johnsonite
6. Mannington Mills, Inc.
7. Polyflor, Ltd., Distributed by Gerbert Limited
8. TOLI International

B. Properties:
1. Wear layer not less than 28 mil topped with UV cured ceramic bead finish.
2. Surface: Wood grain embossed.
3. Gauge: 1/8
4. Plank size: 4 -0nches by 36 inches.
5. Product Classification: ASTM F 1700 Solid Vinyl Tile; Class III, Type B.
6. Fire Test: ASTM E648, Critical Radiant Flux – Class 1, > .45 W per square centimeter.
7. Performance:
   a. Slip Resistance: > 0.60 per ASTM C 1028.
   b. Static Load: 2,000 PSI, < .005 inches per ASTM F 970.
   c. Resistance to Chemicals: No Change per ASTM F 925.
   d. Heat stability of Color: $\Delta E < 8$ Avg per ASTM F 1514.
   e. Light Stability of Color: $\Delta E < 8$ Avg per ASTM F 1515.
   f. Residual Indentation: 4.3% per ASTM F 1914.
   g. Dimensional Stability: < .020 inch / Inch foot per ASTM F 2199.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit floor covering and substrate conditions indicated.

C. Grounding Strips for Static-Dissipative Rubber Floor Tile: Provided or approved by manufacturer; type and size that maintains electrical continuity of floor covering system to ground connection.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor coverings.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of floor coverings.

B. Concrete Substrates: Prepare according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
   4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
      a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
      b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor coverings until they are same temperature as space where they are to be installed.
   1. Move floor coverings and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.

3.3 RUBBER FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
   1. Lay tiles square with room axis.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, non-staining marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 STATIC DISRUPTIVE RUBBER FLOOR TILE INSTALLATION, GENERAL

A. Install static-control resilient floor covering according to manufacturer's written instructions.

B. Embed grounding strips in static-control adhesive. Extend grounding strips beyond perimeter of static-control resilient floor covering surfaces to ground connections.

C. Scribe, cut, and fit floor coverings to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

D. Extend floor coverings into toe spaces, door reveals, closets, and similar openings. Extend floor covering to center of door openings.

E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor coverings as marked on substrates. Use chalk or other nonpermanent, non-staining marking device.

F. Install floor coverings on covers for telephone and electrical ducts, and similar items in installation areas. Maintain overall continuity of color and pattern with pieces of floor coverings installed on covers. Tightly adhere floor covering edges to substrates that abut covers and to cover perimeters.

G. Adhere floor coverings to substrates using a full spread of static-control adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.5 STATIC DISRUPTIVE RUBBER FLOOR TILE INSTALLATION

A. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so floor tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half floor tile at perimeter.
   1. Lay floor tiles square with room axis.

B. Match floor tiles for color and pattern by selecting floor tiles from cartons in same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed floor tiles.

C. In each space where conductive, solid vinyl floor tile is installed, install maintenance floor tile identifying conductive floor tile in location approved by Architect.

3.6 VINYL PLANK FLOORING INSTALLATION, GENERAL

A. Install vinyl plank flooring according to manufacturer's written instructions.

B. Adhere flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.7 VINYL PLANK FLOORING INSTALLATION

A. Lay flooring planks in direction indicated on the Drawings from approximate room center marks established with principal walls, discounting minor offsets, as required to assure that edge pieces against wall are at least 1-3/4 inches wide. Adjust as necessary to avoid using cut widths that equal less than one-half plank at perimeter.

B. Match plank flooring tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

C. Scribe, cut, and fit plank flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

D. Extend plank flooring into toe spaces, door reveals, closets, and similar openings. Extend plank flooring to center of door openings.

E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, non-staining marking device.

F. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

G. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.8 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor coverings.

B. Perform the following operations immediately after completing floor covering installation:
   1. Remove adhesive and other blemishes from floor covering surfaces.
   2. Sweep and vacuum floor coverings thoroughly.
   3. Damp-mop floor coverings to remove marks and soil.

C. Protect floor coverings from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover floor coverings until Substantial Completion.

END OF SECTION

This Page Not Used

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes modular, textured patterned loop carpet tile.

B. Related Requirements:
   1. Division 09 Section “Resilient Flooring” for rubber sheet and rubber tile flooring.
   2. Division 09 Section "Resilient Wall Base and Accessories" for resilient wall base, feature strip and other accessories installed with carpet tile.

1.3 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
      a. Review delivery, storage, and handling procedures.
      b. Review ambient conditions and ventilation procedures.
      c. Review subfloor preparation procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
   2. Include installation recommendations for each type of substrate.

B. Shop Drawings: Show the following:
   1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
   2. Carpet tile type, color, and dye lot.
   3. Type of subfloor.
   4. Type of installation.
   5. Pattern of installation.
   6. Pattern type, location, and direction.
   7. Pile direction.
   8. Type, color, and location of insets and borders.
   9. Type, color, and location of edge, transition, and other accessory strips.
   10. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
   1. Carpet Tile: Full-size Sample.
   2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- long Samples.

D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
   1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
   2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

1.10 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weather-tight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
   1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
   2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
   3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Carpet Tile Basis of Design: Subject to compliance with requirements provide City Fragments Modular Style Number GT100 carpet tile from the Beautiful Abandon Collection as manufactured Lees Carpets; Mohawk Group, or a comparable product by one of the following:
   1. Atlas Carpet Mills, Inc.
   2. Beaulieu Group LLC
   3. Bently Price Street, Inc.
   4. Couristan, Inc.
   5. Fortune Contract, Inc.
   6. Giulestan Carpet, Inc.
   7. Interface, LLC
   8. J&J Invision; J&J Industries, Inc.
   9. Mannington Mills, Inc.
   10. Masland contract; Dixie Group, Inc.
   11. Millican & Company
   12. PacificCrest Mills, Inc.
   13. Patcraft; a division of Shaw Industries, Inc.
   14. PhillyQueen; a division of Shaw Industries, Inc.
   15. Robertex Associates, Inc.
   16. Shaw Contract Group; a Berkshire Hathaway company

B. Colors: As selected by Architect from manufacturer’s full range.

C. Construction: Tufted

D. Surface Texture: Level multi-colored pigmented loop.

E. Gauge: 1/12.

F. Fiber Type: Manufacturer's premium nylon, passes GSA requirements for permanent stain resistance.

G. Face Weight: 20 oz. per square yard.

H. Density: 5496.

I. Pile Thickness: .131-inches.

J. Stitches: 11.4 Insert stitches per inch.

K. Dye Method: Solution dyed/yarn dyed.

L. Size: 24 by 24 inches.
1. Appearance Retention Rating: Severe traffic, 3.5 minimum according to ASTM D 7330.
2. Flooring Radiant Panel Test: Meets NFPA Class 1 when tested on accordance with ASTM E-648 glue down.
3. Flammability: Passes DOC-FF-1-70 Pill Test.
4. Smoke Density: NBS Smoke Chamber NFPA-258 – less than 450 flaming mode.
5. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
6. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
7. Resistance to Insects: Comply with AATCC 24.
8. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, non-staining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Metal Edge/Transition Strips: Extruded aluminum with mil finish of profile and width required by conditions indicated, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
   1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
   2. Subfloor finishes comply with requirements specified in Section 03300 "Cast-in-Place Concrete" for slabs receiving carpet tile.
   3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

B. Installation Direct glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, non-staining marking device.

G. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:
1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on all exposed interior substrates that are not to receive either factory finish, high performance coating, stain, clear transparent finish, or are specifically indicated to remain unpainted. Substrates to be painted include but are not limited to:
   1. Gypsum board.
   2. Interior metal fabrications.

B. Related Requirements:
   1. Division 02 Section “Pavement Markings” for application of markings to exterior pavement.
   2. Division 03 Section “Cast-in-Place-Concrete” for hardener and sealer for exposed concrete floor.
   3. Division 06 Section “Interior Architectural Woodwork” for finish of wood casework for transparent finish.
   4. Division 07 Section “Sheet Metal Flashing and Trim” for pre-finishing of aluminum sheet metal work.
   5. Division 08 Section “Flush Wood Doors” for finishing of wood doors.
   6. Division 08 Section “Hollow Metal Frames” for interior hollow metal work to receive paint finish
   7. Division 08 Section “Fiberglass Reinforced Plastic (FRP) Doors and Frames” for factory finishing of FRP doors and frames.
   8. Division 09 Section “High Performance Coatings” for surface preparation and the application of high performance coatings systems on exterior substrates and interior substrate scheduled to receive high performance coatings
   9. Division 09 Section “Gypsum Board” for gypsum board texture application prior to painting.
   10. Division 09 Section “Transparent Finishes” for finishing of interior architectural woodwork to not receive paint finish.

1.3 DEFINITIONS

A. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
1. Submit Samples on rigid backing, 8 inches square.

C. Product List: For each product indicated, include the following:
1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Paint: 5 percent, but not less than 1 gallon of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg. F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg. F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Behr Process Corporation.

2. Benjamin Moore & Co.
3. Benjamin Moore & Co. (Canada).
4. Bennette Paint Manufacturing Company, Inc.
5. Betonel Ltd.
6. BLP Mobile Paint Manufacturing.
7. California Paints.
8. Cloverdale Paint.
9. Color Wheel Paints & Coatings.
10. Columbia Paint & Coatings.
11. Conco Paints.
12. Coronado Paint.
13. Davis Paint Company.
14. Diamond Vogel Paints.
15. Dunn-Edwards Corporation.
16. Durant Performance Coatings.
17. Duron, Inc.
18. Envirocoatings Canada Inc.
19. Euclid Chemical Company.
20. Farrell-Calhoun.
21. Frazee Paint.
22. General Paint.
23. Hallman Lindsay Paints.
24. Hirshfield's, Inc.
25. ICI Paints.
26. ICI Paints (Canada).
27. Insl-x.
28. Kelly-Moore Paints.
29. Kwal Paint.
30. M.A.B. Paints.
31. McCormick Paints.
32. Microblend Technologies Inc.
33. Miller Paint.
34. Mills Paint.
35. PARA Paints.
36. Parex LaHabra Inc.
37. Parker Paint Mfg. Co. Inc.
38. PPG Architectural Finishes, Inc.
39. Pratt & Lambert.
40. Rodda Paint Co.
41. Scott Paint.
42. Sherwin-Williams Company (The).
43. Sico, Inc.
44. Southern Diversified Products, LLC.
45. Smith Paint Products.
46. Vista Paint.
47. Zinsser.

2.2 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Material Compatibility:
1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. Colors: As selected by Architect from manufacturer's full range.
1. Up to 20 percent of surface area will be painted with deep tones.

2.3 PRIMERS/SEALERS

A. Primer Sealer, Latex, Interior: MPI #50.

2.4 METAL PRIMERS

A. Primer, Alkyd, Anti-Corrosive, for Metal: MPI #79.

B. Primer, Galvanized, Water Based: MPI #134.

2.5 WATER-BASED PAINTS

A. Latex, Interior, Semi-Gloss, (Gloss Level 5): MPI #54.

2.6 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove non-complying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   1. Gypsum Board: 12 percent.

C. Texture Gypsum Board Substrates: Verify that finishing compound is properly applied and fully cured.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and re-prime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
   1. Use applicators and techniques suited for paint and substrate indicated.
   2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
   3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
   4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
   5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
   1. Contractor shall touch up and restore painted surfaces damaged by testing.
   2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Steel Substrates:
   1. Latex over Alkyd Primer System:
      a. Prime Coat: Primer, alkyd, anti-corrosive, for metal**,** MPI #79.
      b. Intermediate Coat: Latex, interior, matching topcoat.
      c. Topcoat: Latex, interior, gloss, (Gloss Level 5), MPI #54.

B. Galvanized-Metal Substrates:
   1. Latex over Waterborne Primer System:
      a. Prime Coat: Primer, galvanized, water based, MPI #134.
      b. Intermediate Coat: Latex, interior, matching topcoat.
      c. Topcoat: Latex, interior, gloss, (Gloss Level 5,), MPI #54.

C. Gypsum Board Substrates:
   1. Latex System:
      a. Prime Coat: Primer sealer, latex, interior, MPI #50.
      b. Intermediate Coat: Latex, interior, matching topcoat.
      c. Topcoat: Latex, interior, semi-gloss, (Gloss Level 5), MPI #54.

END OF SECTION

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SECTION 099310
STAINING AND
TRANSPARENT FINISHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes surface preparation and application of wood finishes on the following substrates:
   1. Interior Substrates:
      a. Exposed glued-laminated beams.
      b. Dressed lumber (finish carpentry).

B. Related Requirements:
   1. Division 06 Section “Interior Architectural Woodwork” for woodwork to receive transparent finishes.
   2. Division 08 Section “Flush Wood Doors” for finishing of wood doors.
   3. Division 09 Section "Interior Painting" for opaque interior paint finishes.
   4. Division 09 Section "High-Performance Coatings" for opaque exterior high-performance coating finishes.

1.3 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

D. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

E. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include preparation requirements and application instructions.

B. Samples for Initial Selection: For each type of product indicated.

C. Samples for Verification: For each type of finish system and in each color and gloss of finish indicated.
   1. Submit Samples on representative samples of actual wood substrates, 8 inches square or 8 inches.
   2. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:
   1. Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules.
   2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the product proposed for use highlighted.
   3. VOC content.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials[, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Stains and Transparent Finishes: **5** percent, but not less than of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg. F.
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 95 deg. F.

B. Do not apply finishes when relative humidity exceeds 85 percent; at temperatures less than 5 deg. F. above the dew point; or to damp or wet surfaces.

C. Do not apply exterior finishes in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide products by one of the following:
1. Behr Process Corporation.
2. Benjamin Moore & Co.
3. Benjamin Moore & Co. (Canada).
4. Bennette Paint Mfg. Co., Inc.
5. BLP Mobile Paint Manufacturing.
6. California Paints.
7. Cloverdale Paint.
8. Color Wheel Paints & Coatings.
9. Columbia Paint & Coatings.
10. Conco Paints.
11. Coronado Paint.
12. Davis Paint Company.
13. Diamond Vogel Paints.
14. Dunn-Edwards Corporation.
15. Durant Paints Inc.
16. Duron, Inc.
17. Euclid Chemical Company.
18. Farrell-Calhoun.
19. Frazee Paint.
20. General Paint.
21. Hallman Lindsay Paints.
22. Hirshfield's, Inc.
23. ICI Paints.
24. ICI Paints (Canada).
25. Insl-x.
26. Kelly-Moore Paints.
27. Kwal Paint.
28. Life Paint Corp.
29. M.A.B. Paints.
30. McCormick Paints.
31. Miller Paint.
32. Mills Paint.
33. PARA Paints.
34. Parex LaHabra Inc.
35. Parker Paint Mfg. Co. Inc.
36. PPG Architectural Finishes, Inc.
37. Pratt & Lambert.
38. Rodda Paint Co.
39. SaverSystems.
40. Sherwin-Williams Company (The).
41. Sico, Inc.
42. Target Coatings.

43. Vista Paint.
44. Zinsser.

2.2 MATERIALS, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Material Compatibility:
1. Provide materials for use within each finish system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a finish system, provide products recommended in writing by manufacturers of topcoat for use in finish system and on substrate indicated.

A. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior stains and finishes applied at project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24)].
1. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
2. Stains: VOC not more than 250 g/L.
3. Primers, Sealers, and Undercoaters: 200 g/L.

B. Stain Colors: As selected by Architect from manufacturer's full range.

C. Transparent finish Colors and Sheen: Clear, semi-gloss.

2.3 WOOD FILLERS

A. Wood Filler Paste: MPI #91.

2.4 PRIMERS AND SEALERS

A. Alkyd, Sanding Sealer, Clear: MPI #102.

2.5 STAINS

A. Stain, Semi-Transparent, for Interior Wood: MPI #90.

2.6 SOLVENT-BASED VARNISHES

A. Varnish, Interior, Flat (Gloss Level 1): MPI #73.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Interior Wood Substrates: 10 percent, when measured with an electronic moisture meter.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Proceed with finish application only after unsatisfactory conditions have been corrected.
   1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.
   1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each particular substrate condition and as specified.
   1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
   2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain and transparent finish manufacturers.

D. Interior Wood Substrates:
   1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
   2. Apply wood filler paste to open-grain woods, as defined in "MPI Architectural Painting Specification Manual," to produce smooth, glasslike finish.
   3. Sand surfaces that will be exposed to view and dust off.
   4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

A. Apply finishes according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
   1. Use applicators and techniques suited for finish and substrate indicated.
   2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
   3. Do not apply finishes over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

3.5 INTERIOR WOOD-FINISH-SYSTEM SCHEDULE

A. Wood substrates, interior sanding and running trim.
   1. Semitransparent Stain System:
      a. Prime Coat: Stain, semi-transparent, matching topcoat.
      b. Topcoat: Stain, semi-transparent, for interior wood, MPI #90.

B. Wood substrates, interior glued laminated beams.
   1. Alkyd Varnish System:
      a. Prime Coat: Alkyd, sanding sealer, clear, MPI #102.
      b. Intermediate Coat: Varnish matching topcoat.
      c. Topcoat: Varnish, interior, flat (Gloss Level 1), MPI #73.

END OF SECTION

SECTION 099600
HIGH-PERFORMANCE
COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes surface preparation and application of high-performance coating systems on the following substrates:
   1. Exterior Substrates:
      a. Steel.
      b. Galvanized metal.
   2. Interior Substrates:
      a. Gypsum board.

B. Related Requirements:
   1. Division 09 Section "Transparent Finishes" for special-use coatings and general field painting.
   2. Division 09 Section "Interior Painting" for special-use coatings and general field painting.

1.3 DEFINITIONS

A. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

B. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include preparation requirements and application instructions.

B. Samples for Verification: For each type of coating system and in each color and gloss of topcoat indicated.
   1. Submit Samples on rigid backing, 8 inches square.
   2. Step coats on Samples to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

C. Product List: For each product indicated, include the following:
   1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
3. VOC content.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Coatings: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg. F.
1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg. F.

B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg. F above the dew point; or to damp or wet surfaces.

C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Behr Process Corporation.
2. Benjamin Moore & Co.
3. Bennette Paint Mfg. Co., Inc.
4. Betonel Ltd.
5. BLP Mobile Paint Manufacturing Company, Inc.
6. Cloverdale Paint.
7. Color Wheel Paints & Coatings.
8. Columbia Paint & Coatings.
9. Conco Paints.
10. Coronado Paint.
11. Diamond Vogel Paints.

12. Dunn-Edwards Corporation.
13. Duron, Inc.
14. Euclid Chemical Company.
15. Farrell-Calhoun.
16. Frazee Paint.
17. General Paint.
18. Hirshfield's, Inc.
19. ICI Paints.
20. ICI Paints (Canada).
21. Insl-x.
22. Kelly-Moore Paints.
23. Kwal Paint.
24. M.A.B. Paints.
25. Microblend Technologies Inc.
26. Miller Paint.
27. Mills Paint.
28. PARA Paints.
29. Parex LaHabra Inc.
30. Parker Paint Mfg. Co. Inc.
31. PPG Architectural Finishes, Inc.
32. Pratt & Lambert.
33. Rodda Paint Co.
34. Scott Paint.
35. Sherwin-Williams Company (The).
36. Sico, Inc.
37. Vista Paint.
38. Zinsser.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and are listed in "MPI Approved Products List."

B. Material Compatibility:
   1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a coating system, provide products recommended in writing by manufacturers of topcoat for use in coating system and on substrate indicated.
   3. Provide products of same manufacturer for each coat in a coating system.

C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.

D. Colors:
   1. Exterior: As selected by Architect from manufacturer's full range.

2.3 INTERIOR PRIMERS/SEALERS

A. Primer Sealer, Latex, Interior: MPI #50.

2.4 METAL PRIMERS

A. Primer, Epoxy, Anti-Corrosive, for Metal: MPI #101.

2.5 EPOXY COATINGS

A. Epoxy, Gloss: MPI #77.

B. Epoxy-Modified Latex, Interior, Gloss (Gloss Level 6): MPI #115.

C. Epoxy, High-Build, Low Gloss: MPI #108.

2.6 SOURCE QUALITY CONTROL

A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:
   1. Owner will engage the services of a qualified testing agency to sample coating materials. Contractor will be notified in advance and may be present when samples are taken. If coating materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
   2. Testing agency will perform tests for compliance with product requirements.
   3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
   1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
      a. Gypsum Board: 12 percent.
      b. Wood: 15 percent.

B. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and re-prime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer[**.**][**but not less than the following:**]
   1. SSPC-SP 7/NACE No. 4, "Brush-Off Blast Cleaning."

E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.

G. Wood Substrates:
   1. Scrape and clean knots. Before applying primer apply coat of knot sealer recommended in writing by topcoat manufacturer for coating system indicated.
   2. Sand surfaces that will be exposed to view and dust off.
   3. Prime edges, ends, faces, undersides, and back sides of wood.
   4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
   1. Use applicators and techniques suited for coating and substrate indicated.
   2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
   3. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
   4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner reserves the right to engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
   1. Contractor shall touch up and restore coated surfaces damaged by testing.
   2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Steel Substrates:
   1. High-Build Epoxy System:
      a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
      b. Intermediate Coat: Epoxy, high-build, low gloss, MPI #108.
      c. Topcoat: Epoxy, gloss, MPI #77.

B. Galvanized-Metal Substrates:
   1. Epoxy System:
      a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
      b. Intermediate Coat: Epoxy, gloss, MPI #77.
      c. Topcoat: Epoxy, gloss, MPI #77.

3.7 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Gypsum Board Substrates:
   1. Epoxy-Modified Latex System:
      a. Prime Coat: Primer sealer, latex, interior, MPI #50.
      b. Intermediate Coat: Epoxy-modified latex, interior, gloss (Gloss Level 6), MPI #115.
      c. Topcoat: Epoxy-modified latex, interior, gloss (Gloss Level 6), MPI #115.

END OF SECTION

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Room-identification signs.

B. Related Requirements:
   1. Division 01 Section "Temporary Facilities and Controls" for temporary Project identification signs and for temporary information and directional signs.
   2. Division 02 Sections “Pavement Marking and Signs” for exterior traffic and ADA required parking signage.
   3. Division 23 “Heating, Ventilating and Air Conditioning” for labels, tags, and nameplates for HVAC systems and equipment.
   4. Division 26 Sections "Electrical Identification" for labels, tags, and nameplates for electrical equipment.

1.3 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

B. Illuminated: Illuminated by lighting source integrally constructed as part of the sign unit.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For panel and room identification signs.
   1. Include fabrication and installation details and attachments to other work.
   2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
   3. Show message list, typestyles, graphic elements**,** including raised characters and Braille, and layout for each sign at least half size.
      a. Architect shall submit message list, typestyles, graphic elements and Braille and layout for each sign to Owner for Owner’s approval prior to providing Architect’s approval of Shop Drawings.

C. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Panel Signs: Full-size Sample.
2. Room-Identification Signs: Full-size Sample.

D. Sign Schedule: Use same designations specified in sign schedule below.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
   a. Deterioration of finishes beyond normal weathering.
   b. Deterioration of embedded graphic image.
   c. Separation or delamination of sheet materials and components.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for signs.

2.2 SIGNS

A. Manufacturers: Provide panel signage as manufactured by one of the following:
1. ACE Sign Systems, Inc.
2. Advance Corporation.
3. Allen Industries Architectural Signage.

4. Allen Markings.
5. APCO Graphic, Inc.
6. ASE, Inc.
7. ASI Sign Systems, Inc.
8. Best Sign Systems, Inc.
9. Bunting Graphic, Inc.
10. Diskey Architectural Signage, Inc.
11. Fossil Industries, Inc.
12. InPro Incorporated (IPG).
13. Mohawk Sign Systems
14. Nelson-Harkins Industries.
15. Pobloki Sign Company, LLC.
16. Seton Identification Products.
17. Stampright Supersign.
18. Vista System.
19. Vomar Products, Inc.

B. Room-Identification Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
   1. Sign-Panel Perimeter: Finish edges smooth.
      a. Edge Condition: Square cut.
      b. Corner Condition in Elevation: Square.
   2. Mounting: Surface mounted to wall where indicated with concealed anchors. Surface mounted to glass with two-face tape.
   3. Text and Typeface:
      a. Accessible raised characters and Braille
      b. Font: Verdana
      c. Text height: Lower case 5/8".
      d. Content: Variable content as scheduled below.
      e. Colors: As selected by Architect from manufacturer's full color line. Finish raised characters to contrast with background color, and finish Braille to match background color.
      f. Text justification: Left unless indicated otherwise in schedule.
   4. Sign Size: Size signs to accommodate braille and raised character text with top, bottom, and right margins of ½" and left margin of not less than ½".
      a. Not less than 12 inches wide and 1-1/4 inches high.

2.3 PANEL-SIGN MATERIALS

A. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
   1. Use concealed fasteners and anchors unless indicated to be exposed.
   2. Sign Mounting Fasteners:

a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly, unless otherwise indicated.

2.5 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
1. Fabricate signs to accommodate text,
2. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
3. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
4. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
5. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
6. Internally brace signs for stability and for securing fasteners.
7. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

2.6 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Verify that anchor inserts are correctly sized and located to accommodate signs.

D. Verify that electrical service is correctly sized and located to accommodate signs.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
   1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
   2. Install signs so they do not protrude or obstruct according to the accessibility standard.
   3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
   4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Room-Identification Signs: Install in locations on walls as indicated and according to accessibility standard.

C. Mounting Methods:
   1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
      a. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

3.4 SIGNAGE SCHEDULE

A. Room Identification Sign Schedule:

Door Number	Sign Text	Justification

101-1	Visitor Entrance	Center
101-2	Welcome to the Homer Harbormaster's Office	Center
103-1	Authorized Personnel Only	Center
104-1	Keep Door Closed	Center
105-1	International symbols for Women and Accessibility	Center
106-1	International symbol for Men And Accessibility	Center
107-1	Janitor Authorized Personnel Only	Center
108-1	Conference	Left
109-1	IT Systems	Left
110-1	Harbor Master	Left
111-1	Authorized Personnel Only	Center
114-1	Operations	Left
114-1	Administration	Left
115-1	Deputy Harbor Master	Left
116-1	Keep Door Closed	Center
118-1	Administration	Left
118-1	Lockers Rest Rooms To Garage	Left
119-1	Meeting Room	Left
119-1	Authorized Personnel Only	Center
119-2	Meeting Room	Left
122-1	International symbols for Women, Men, and Accessibility	Center
123-3	Garage	Left
123-1	Keep Door Closed	Center

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Phenolic-core toilet compartments configured as toilet enclosures.

B. Related Sections:
   1. Division Section "Toilet, Bath, and Laundry Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.
   1. Show locations of cutouts for compartment-mounted toilet accessories.
   2. Show locations of centerlines of toilet fixtures.

C. Samples for Initial Selection: For each type of unit indicated. Include Samples of hardware and accessories involving material and color selection.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of toilet compartment, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Comply with requirements in GSA's CID-A-A-60003, "Partitions, Toilets, Complete."

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 450 or less.

C. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1 for toilet compartments designated as accessible.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Castings: ASTM B 26/B 26M.

B. Aluminum Extrusions: ASTM B 221.

C. Steel Sheet: Commercial steel sheet for exposed applications; mill phosphatized and selected for smoothness.
   1. Electrolytically Zinc Coated: ASTM A 879/A 879M, 01Z .
   2. Hot-Dip Galvanized: ASTM A 653/A 653M, either hot-dip galvanized or galvannealed.

D. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.

E. Stainless-Steel Castings: ASTM A 743/A 743M.

2.2 PHENOLIC-CORE UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Accurate Partitions Corporation.
   2. American Sanitary Partition Corporation.
   3. Ampco, Inc.
   4. Bobrick Washroom Equipment, Inc.
   5. Bradley Corporation; Mills Partitions.
   6. Flush Metal Partition Corp.
   7. General Partitions Mfg. Corp.

8. Global Steel Products Corp.
9. Knickerbocker Partition Corporation.
10. Metpar Corp.
11. Partition Systems Incorporated of South Carolina.
12. Rockville Partitions Incorporated.
13. Sanymetal; a Crane Plumbing company.
14. Shanahan's Limited.
15. Tex-Lam Manufacturing, Inc.
16. Weis-Robart Partitions, Inc.
17. Young Group Ltd. (The); Fabricated Products Division; DesignRite Partitions.

B. Toilet-Enclosure Style: Floor mounted, overhead braced .

C. Door, Panel, and Pilaster Construction: Solid phenolic-core panel material with melamine facing on both sides fused to substrate during panel manufacture (not separately laminated), and with eased and polished edges and no-sightline system. Provide minimum 3/4-inch thick doors and pilasters and minimum 1/2-inch thick panels.

D. Pilaster Shoes and Sleeves (Caps): Fabricated from stainless-steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.

E. Brackets (Fittings):
1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

F. Phenolic-Panel Finish:
1. Facing Sheet Finish: One color and pattern.
2. Color and Pattern: As selected by Architect from manufacturer's full range.

2.3 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.
1. Material: Stainless steel.
2. Hinges: Manufacturer's standard paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
3. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.

B. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-

type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

2.4 FABRICATION

A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

B. Door Size and Swings: Unless otherwise indicated, provide 24-inch-wide, in-swinging doors for standard toilet compartments and 36-inch-wide, out-swinging doors with a minimum 32-inch- (wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
   1. Maximum Clearances:
      a. Pilasters and Panels: 1/2 inch.
      b. Panels and Walls: 1 inch.
   2. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than two brackets attached near top and bottom of panel.
      a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
      b. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION

SECTION 102800
TOILET AND
BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Public-use washroom accessories.
   2. Custodial accessories.
   3. Installation of Owner furnished accessories.

B. Owner-Furnished Material:
   1. Paper Towel Dispensers
   2. Soap Dispensers.

C. Related Sections:
   1. Division 06 Section “Rough Carpentry” for wood blocking for attachment of washroom and shower room accessories.
   2. Division 10 “Toilet Compartments” for toilet partitions to receive washroom accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:
   1. Construction details and dimensions.
   2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
   3. Material and finish descriptions.
   4. Features that will be included for Project.
   5. Manufacturer's warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
   1. Identify locations using room designations indicated.
   2. Identify products using designations indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

1.7 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
   1. Coordinate blocking and support straps with work specifies in Sections “Rough Carpentry.”

1.8 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.

D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.

E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Basis-of-Design Products: Subject to compliance with requirements, provide product specified below manufactured by Bobrick Washroom Equipment, Inc., or comparable product by one of the following:
1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bradley Corporation.
4. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
5. Tubular Specialties Manufacturing, Inc.

B. Toilet Tissue (Roll) Dispensers Basis of Design Product: Bobrick B-3888, recessed multi-roll dispenser..

C. Grab Bars Basis of Design Product: Bobrick B-5806 by lengths as indicated on drawings.

D. Toilet Seat Cover Dispense Basis of Design: Bobrick B-221 surface mounted seat cover dispenser.

E. Sanitary Napkin Vendor Basis of Design: Bobrick B-37063 25 recessed napkin/tampon vendor.

F. Soap Dispensers (OFCI): KUTOL wall mounted bag in box model #9950ZPL, surface mounted vertical soap dispenser

G. Paper Towel Dispensers (OFOI): Georgia Pacific en Motion battery powered automatic surface mounted paper towel dispenser., surface mounted paper towel dispenser capable of dispensing 400 C-fold or 525 multi-fold paper towels

H. Sanitary Napkin Disposals: Bobrick surface mounted sanitary napkin disposal with leak proof plastic receptacle.

I. Mirror Units: Bobrick Basis of Design Product: B-165, size as indicated on drawings.

2.3 UNDERLAVATORY GUARDS

A. Manufacturers: Subject to compliance with requirements, provide under-lavatory meeting ADAG requirements by one of the following:
1. Plumberex Specialty Products, Inc.
2. Truebro by IPS Corporation.

3. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
4. Material and Finish: Antimicrobial, molded plastic, white.

2.4 CUSTODIAL ACCESSORIES

A. Basis-of-Design Products: Subject to compliance with requirements, provide product specified below or comparable product by one of the following:
1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.
5. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
6. Tubular Specialties Manufacturing, Inc.

B. Shelf with Mop and Broom Holder Basis of Design: Bobrick B-239X34 three anti-slip mop holders, four hooks, satin finish stainless steel.

2.5 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and re-supplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories including Owner furnished accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
1. Connect Owner furnished Paper Towel Dispenser to power as required by manufacturer’s instructions.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Knock down metal lockers.
   2. Locker benches.

1.3 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of metal locker and bench.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker, and bench.

B. Shop Drawings:
   1. For metal lockers.
      a. Include plans, elevations, sections, details, and attachments to other work.
      b. Show locker trim and accessories.
      c. Include locker identification system and numbering sequence.
   2. For bench.
      a. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver metal lockers and bench until spaces to receive them are clean, dry, and ready for their installation.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.9 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures.
      b. Faulty operation of latches and other door hardware.
   2. Damage from deliberate destruction and vandalism is excluded.
   3. Warranty Period for Knocked-Down Metal Lockers: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain metal lockers, locker bench, and accessories from single source from single locker manufacturer.

B. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

2.2 KNOCK DOWN LOCKERS

A. Knock Down Lockers Basis of Design Products: Subject to compliance with requirements provide Invincible II™ metal knocked down lockers as manufactured by Penco Products, Inc., or comparable products by one of the following:
1. Art Metal Products.
2. ASI Storage Solutions Inc.
3. DeBourgh Mfg. Co.
4. General Storage Systems Ltd.
5. Hadrian Manufacturing Inc.
6. List Industries Inc.
7. Lyon Workspace Products, LLC.
8. Olympus Lockers & Storage Products, Inc.
9. Republic Storage Systems Company.
10. Shanahan's Limited.

B. Perforated Doors: One piece; fabricated from 0.090-inch nominal-thickness steel sheet with manufacturer's standard diamond perforations; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges and latch point (bottom) and right-angle single bend at remaining edges for box lockers.
1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches wide; welded to inner face of doors.

C. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
1. Tops and Bottoms: 0.060-inch minimum nominal thickness, with single bend at edges.
2. Backs: 0.048-inch minimum nominal thickness.
3. Shelves: 0.060-inch minimum nominal thickness, with double bend at front and single bend at sides and back.

D. Unperforated Sides and Finished End Panels: Fabricated from 0.060-inch minimum nominal-thickness steel sheet.
1. Installed with concealed fasteners.

E. Frames: Channel formed; fabricated from 0.060-inch minimum nominal thickness steel sheet or 0.097-inch minimum nominal thickness steel angles; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.

F. Reinforced Bottoms: Structural channels or angles, formed from 0.060-inch minimum nominal-thickness steel sheet; welded to front and rear of side-panel frames.

G. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
1. Hinges: Manufacturer's standard, steel, continuous or knuckle type.
2. No few than three hinges for doors over 48 inches high.

H. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.

1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks, built-in cylinder locks, or padlocks; positive automatic latching and prelocking.
   a. Latch Hooks: Equip doors 48 inches and higher with three latch hooks and doors less than 48 inches high with two latch hooks; fabricated from 0.120-inch nominal-thickness steel sheet; welded to full-height door strikes; with resilient silencer on each latch hook.
   b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a pre-locking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.

I. Locks: User provided Combination padlocks.

J. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch high.

K. Hooks: Manufacturer's standard ball-pointed type, aluminum or steel; zinc plated.

L. Coat Rods: Manufacturer's standard.

M. Continuous Zee Base: 4 inches high; fabricated from 0.075-inch minimum nominal-thickness steel sheet.

N. Filler Panels: Fabricated from 0.048-inch nominal-thickness steel sheet.

O. Boxed End Panels: Fabricated from 0.060-inch minimal nominal-thickness steel sheet.

P. Materials:
1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
2. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with A60 zinc-iron, alloy (galvannealed) coating designation.
3. Expanded Metal: ASTM F 1267, Type II (flattened), Class I, 3/4-inch steel mesh, with at least 70 percent open area.

Q. Finish: Baked enamel or powder coat.
1. Color: As selected by Architect from manufacturer's full range.

2.3 LOCKER BENCHES

A. Provide bench units with overall assembly height of 17-1/2 inches.

B. Bench Tops: Manufacturer's standard one-piece units, with rounded corners and edges.
1. Size: Minimum 9-1/2 inches wide by 1-1/4 inches thick.

2. Laminated clear hardwood with one coat of clear sealer on all surfaces and one coat of clear lacquer on top and sides.

C. Fixed Pedestals: Manufacturer's standard supports, with predrilled fastener holes for attaching bench top and anchoring to floor, complete with fasteners and anchors, and as follows:
1. Tubular Steel: 1-1/4-inch- diameter steel tubing, with 0.1265-inch- thick steel flanges welded at top and base; with baked-enamel finish; anchored with exposed fasteners.
a. Color: Match metal lockers.

D. Materials:
1. Steel Tube: ASTM A 500/A 500 M, cold rolled.

2.4 FABRICATION

A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.

B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.

C. Equipment: Provide each locker with an identification plate and the following equipment:
1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.
2. Coat Rods: For each compartment of each locker.

D. Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds flush.

E. Accessible Lockers: Fabricate as follows:
1. Locate bottom shelf no lower than 15 inches above the floor.
2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.

F. Continuous Base: Formed into channel or zee profile for stiffness, and fabricated in lengths as long as practical to enclose base and base ends of metal lockers; finished to match lockers.

G. Recess Trim: Fabricated with minimum 2-1/2-inch face width and in lengths as long as practical; finished to match lockers.

H. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

2.5 ACCESSORIES

A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.

B. Anchors: Material, type, and size required for secure anchorage to each substrate.
1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls**,** and elsewhere as indicated, for corrosion resistance.
2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install lockers level, plumb, and true; shim as required, using concealed shims.
1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
2. Anchor single rows of metal lockers to walls near top and bottom of lockersof lockers and to floor.

B. Knocked-Down Lockers: Assemble with standard fasteners, with no exposed fasteners on door faces or face frames.

C. Equipment:
1. Attach hooks with at least two fasteners.
2. Attach door locks on doors using security-type fasteners.
3. Identification Plates: Identify metal lockers with identification indicated on Drawings.
a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
b. Attach plates to upper shelf of each open-front metal locker, centered, with a least two aluminum rivets.

D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
1. Attach recess trim to recessed metal lockers with concealed clips.

2. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
3. Attach sloping-top units to metal lockers, with closures at exposed ends.
4. Attach boxed end panels using concealed fasteners to conceal exposed ends of non-recessed metal lockers.
5. Attach finished end panels using fasteners only at perimeter to conceal exposed ends of non-recessed metal lockers.

E. Fixed Locker Benches: Provide no fewer than two pedestals for each bench, uniformly spaced not more than 72 inches apart. Securely fasten tops of pedestals to undersides of bench tops, and anchor bases to floor.
1. Provide shims of material matching legs to compensate for sloped floor. Install benches level and true.

3.3 ADJUSTING

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.

3.4 PROTECTION

A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Fire-protection cabinets for the following:
      a. Portable fire extinguishers.

B. Related Requirements:
   1. Division 10 Section "Fire Extinguishers" for fire extinguishers to be installed in cabinets.

1.3 PRE-INSTALLATION CONFERENCE

A. Pre-installation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to fire-protection cabinets including, but not limited to, the following:
      a. Schedules and coordination requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semi-recessed-, or surface-mounting method and relationships of box and trim to surrounding construction.

B. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish required.

D. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semi-recessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.6 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 FIRE-PROTECTION CABINET

A. Fire Extinguisher Cabinets Basis of Design: Subject to requirements provide Ambassador Series, Model 1816 fire extinguisher cabinets as manufactured by JL Industries, Inc. a division of the Activar Construction Products Group or comparable product by one of the following:
1. American Specialties, Inc.
2. Fire-End & Croker Corporation.
3. GMR International Equipment, Inc.
4. Guardian fire Equipment, Inc.
5. Kidde Residential and Commercial Division.
6. Larsens Manufacturing Company.
7. Modern Metal Products, Division of Technico, Inc.
8. Moon American
9. Nystrom, Inc.
10. Potter Roemer, LLC
11. Strike First Corporation of American

B. Cabinet Type: Suitable for fire extinguisher.

C. Cabinet Construction: Non-rated.

D. Recessed Cabinet:
1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

E. Cabinet Trim Material: Steel sheet.

F. Door Material: Steel sheet.

G. Door Style: Fully glazed panel with frame

H. Door Glazing: Acrylic sheet.

1. Acrylic Sheet Color: Clear transparent acrylic sheet.

I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide manufacturer's standard consistent with basis of design product
2. Provide manufacturer's standard hinge consistent with basis of design product permitting door to open 180 degrees.

J. Accessories:
1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.
   a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER"
      1) Location: Applied to cabinet glazing.
      2) Application Process: Pressure-sensitive vinyl letters.
      3) Lettering Color: White.
      4) Orientation: Vertical.

K. Materials:
1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
   a. Finish: Factory primed for field painting.
2. Transparent Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), 3 mm thick, with Finish 1 (smooth or polished).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where cabinets will be installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below:
1. Fire-Protection Cabinets: 54 inches above finished floor to top of cabinet.

B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semi-recessed fire-protection cabinets.
2. Provide inside latch and lock for break-glass panels.
3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

B. Related Requirements:
   1. Division 10 Section "Fire Protection Cabinets."

1.3 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to fire extinguishers including, but not limited to, the following:
      a. Schedules and coordination requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

1.5 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.7 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Failure of hydrostatic test according to NFPA 10.
      b. Faulty operation of valves or release levers.
   2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
   1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated and manufactured by one of the following:
   1. American Specialties, Inc.
   2. Fire-End & Croker Corporation.
   3. GMR International Equipment, Inc.
   4. Guardian fire Equipment, Inc.
   5. Kidde Residential and Commercial Division.
   6. Larsens Manufacturing Company.
   7. Modern Metal Products, Division of Technico, Inc.
   8. Moon American
   9. Nystrom, Inc.
   10. Potter Roemer, LLC
   11. Strike First Corporation of American

B. Fire Extinguishers Features:
   1. Valves: Manufacturer's standard.
   2. Handles and Levers: Manufacturer's standard.
   3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B**,** and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

C. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 2-A:10-B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.3 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or black baked-enamel finish.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.
   1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
   1. Install Fire Extinguishers in all fire extinguisher cabinets specified in Division 10 Section “Fire Extinguisher Cabinets.”
   2. Mounting Brackets: At all location indicated to receive fire extinguisher without cabinets install mounting brackets such that top of fire extinguisher shall 54 inches above finished floor.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION

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SECTION 122113
HORIZONTAL
LOUVER BLINDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Horizontal louver blinds with aluminum slats.

B. Related Requirements:
   1. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting horizontal louver blinds and accessories.
   2. Division 08 Section “Aluminum Windows” for aluminum windows to receive horizontal louver blinds.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show fabrication and installation details for horizontal louver blinds.

C. Samples for Initial Selection: For each type and color of horizontal louver blind.
   1. Include similar Samples of accessories involving color selection.

D. Window-Treatment Schedule: For horizontal louver blinds. Show blind width and length for each individual window lite. Include confirmation that dimensions have been field verified.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of horizontal louver blind.

B. Product Test Reports: For each type of horizontal louver blind, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For horizontal louver blinds to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Horizontal Louver Blinds: Full-size units equal to 5 percent of quantity installed for each size, color, texture, pattern, and gloss indicated, but no fewer than two units.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver horizontal louver blinds in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings and/or Blind Schedule. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Between (inside) jamb installation: Take field measures as required to verify precise fabrication dimensions as specified in Article “Horizontal Louver Blind Fabrication below.
   2. Outside of jamb installation: Take field measures as required to verify precise fabrication dimensions as specified in Article “Horizontal Louver Blind Fabrication,” below.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain horizontal louver blinds from single source from single manufacturer.

2.2 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Hunter Douglas Contract.

2. Levolor Contract; a Newell Rubbermaid company.
3. Springs Window Fashions.

B. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radius corners.
   1. Width: 1 inch.
   2. Thickness: Manufacturer's standard but not less than 0.006 inch.
   3. Spacing: Manufacturer's standard.
   4. Finish: Ionized antistatic, dust-repellent, baked polyester finish] [Reflective finish on outside-facing surface of slat to enhance reflection of solar energy.
   5. Features:
      a. Lift-Cord Rout Holes: Minimum size required for lift cord and located near back (outside) edge of slat to maximize slat overlap and minimize light gaps between slats.
      b. Perforated Slats: Openness factor of 6 to 7 percent.

C. Head-rail: Formed steel or extruded aluminum; long edges returned or rolled. Head-rails fully enclose operating mechanisms on three sides.
   1. Capacity: One blind per head-rail unless otherwise indicated.
   2. Ends: Manufacturer's standard.
   3. Manual Lift Mechanism:
      a. Lift-Cord Lock: Variable; stops lift cord at user-selected position within blind full operating range.
   4. Manual Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
      a. Tilt: Full.
      b. Operator: Clear-plastic wand.
      c. Over-Rotation Protection: Manufacturer's detachable operator or slip clutch to prevent over rotation of gear.
   5. Manual Lift-Operator and Tilt-Operator Lengths: Manufacturer's standard.
   6. Manual Lift-Operator and Tilt-Operator Locations: Manufacturer's standard unless otherwise indicated.
   7. Integrated Head-rail/Valance: Curved face.

D. Bottom Rail: Formed-steel or extruded-aluminum tube that secures and protects ends of ladders and lift cords and has plastic- or metal-capped ends.
   1. Type: Manufacturer's standard.

E. Lift Cords: Manufacturer's standard braided cord.

F. Ladders: Evenly spaced across head-rail at spacing that prevents long-term slat sag.
   1. Type: Braided cord.

G. Valance: Manufacturer's standard.

H. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
   1. Type: Overhead.

2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by blind manufacturer for weight and size of blind.

I. Side Channels and Perimeter Light Gap Seals: Manufacturer's standard.

J. Colors, Textures, Patterns, and Gloss:
1. Slats: As selected by Architect from manufacturer's full range.
2. Components: Provide rails, cords, ladders, and materials exposed to view matching or coordinating with slat color unless otherwise indicated.

2.3 HORIZONTAL LOUVER BLIND FABRICATION

A. Product Safety Standard: Fabricate horizontal louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
1. Between (Inside) Jamb Installation: For blinds to be installed on exterior aluminum windows (except circular window and sidelites at aluminum framed entrances, and as otherwise indicated on the Drawings) provide width equal to jamb-to-jamb dimension of opening in which blind is installed less 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch. Provide length equal to bottom of head-to-top of sill dimension of opening in which blind is installed less 1/4 inch, plus or minus 1/8 inch.
2. Outside of Jamb Installation: For blinds to be installed on interior relites with hollow metal frames, provide width equal to outside of jamb to outside of jamb dimension plus 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch. Provide blind length (not including valence or head rail) equal to top of head-to-to bottom of sill dimension plus 1/4 inch length unbroken across full width of relite without breaks at mullions.

C. Concealed Components: Non-corrodible or corrosion-resistant-coated materials.
1. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.

D. Mounting and Intermediate Brackets: Designed for removal and reinstallation of blind without damaging blind and adjacent surfaces, for supporting blind components, and for bracket positions and blind placement indicated.

E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to brackets and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.

F. Color-Coated Finish:
1. Metal: For components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances and other conditions affecting performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install horizontal louver blinds on all exterior aluminum windows except circular aluminum window and aluminum framed entrance sidelites between (inside) jambs Install horizontal louver blinds at all interior hollow metal relites outside of jambs. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.
   1. Locate so exterior slat edges are not closer than 1 inch from interior faces of glass and not closer than 1/2 inch from interior faces of glazing frames through full operating ranges of blinds.
   2. Install mounting and intermediate brackets to prevent deflection of head-rails.
   3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.

3.3 ADJUSTING

A. Adjust horizontal louver blinds to operate free of binding or malfunction through full operating ranges.

3.4 CLEANING AND PROTECTION

A. Clean horizontal louver blind surfaces after installation according to manufacturer's written instructions.

B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer and in a manner that ensures that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.

C. Replace damaged horizontal louver blinds that cannot be repaired in a manner approved by Architect before time of Substantial Completion.

END OF SECTION

This Page Not Used

PART 1 - GENERAL

1.1 DESCRIPTION

A. Description: This section describes specific requirements, products and methods of execution relating to fire protection for the project.

B. Scope: Provide a system of fire protection, complete and operational, in accordance with the contract documents and the applicable codes and standards to protect the areas noted.

D. Provide wet pipe sprinkler systems to provide required hazard level protection and area coverage as noted on the Fire Protection Plans.

1.2 Provide fire protection in accordance with the minimum provisions of the following codes and standards.

A. 2009 International Fire Code

B. 2009 International Building Code

C. NFPA 13, Installation of Sprinkler Systems.

D. NFPA 13A, Inspection, Testing, and Maintenance of Sprinkler Systems.

E. NFPA 70, National Electric Code.

1.3 SUB**MITTALS AND APPROVALS**

A. Review and Approvals Required: Obtain written review and approval of the entire fire protection system design and arrangement from the following authority.

1. Insurance Service Office of Alaska. (Review)

2. State of Alaska Fire Marshal. (Approval)

3. Contracting Agency. (Approval)

4. Mechanical Engineer. (Review after approvals and ISO Review are received)

B Contractor is advised that the fire protection system is design/build, the submittal to Contracting Agency and submittals to and approvals from referenced authorities are completely under Contractor's control. Any delays or additional costs to the project that are incurred shall be borne by Contractor without additional cost or time. Any occupancy delay occurring to Owner and impact, if any, shall likewise be borne by the Contractor.

C. Submittals.

1. Provide complete fire protection system construction drawings and hydraulic calculations for the entire project.

2. Obtain and verify the high and low static water pressure and the residual pressure at full flow at the point of connection to the water utility system or at a nearby point acceptable to the approval authority. Obtain data from site engineer or system network design calculations of reliability acceptable to the approval authority. Use this data in hydraulic flow calculations, and include it with submittal of calculations. It is the Contractor's responsibility to coordinate with site water system installation by other trades and to ensure final water supply to building provides adequate pressure and flow rate.

3. Location of finished sprinkler heads is important to Architectural details. Therefore, Contractor may submit shop drawings indicating sprinkler head locations and types of sprinklers proposed prior to submitting complete shop drawings or he may submit one completed shop drawing. However, neither submittal will guarantee that Contractor's selected sprinkler head locations will be acceptable, and required revisions shall be at Contractor's expense, even if additional heads are required. Submittals from Contractor must first be coordinated with other trades and work. Submittals will be assumed to have been thus coordinated. If future conflicts occur, costs necessary to correct the conditions shall be borne by Contractor without additional cost of Owner.

4. Include the following on the shop drawings:

    a. Name of owner and occupant and Building Permit number.

    b. Location, including street address, and lot, block, and subdivision.

    c. Point of compass.

    d. Ceiling construction.

    e. Full height cross section.

    f. Location of fire walls.

    g. Location of partitions.

    h. Occupancy of each area or room.

    i. Location and size of blind spaces and closets.

    j. Any questionable small enclosures in which no sprinklers are to be installed.

    k. Size of city main in street, pressure and whether dead-ended or circulating and if dead-end, direction and distance to nearest circulating main, city main test results.

    l. Make, type, and orifice size of sprinkler.

m. Number of sprinklers on each riser and/or each system by floors and total area protected by each system on each floor.

n. Make, type, model and size of alarm or dry pipe valve.

o. Kind and location of alarm bell.

p. Cutting lengths of pipe (on center to center dimensions).

q. Crosses, riser nipples and size.

r. Type of hangers, inserts and sleeves.

s. Control valves, checks, drain pipes and test pipes.

t. Provisions for flushing.

u. Pipe runs shall identify individual sections to be above or below ceiling.

v. Reflected ceiling plan showing proposed location of sprinkler heads to other products.

w. Name, address and telephone number of Contractor installing fire protection systems.

5. Submit six copies of fire protection construction drawings reviewed by the Insurance Services Office of Alaska (ISO) and approved by the Contracting Agency for further approvals as specified. Include all correspondence with ISO.

1.4 COORDINATION REQUIRED

A. Check dimensions indicated on the architectural or structural drawings, and verify dimensions at the site before fabricating any portion of the system. Any discrepancies in piping and head locations resulting from failure to so verify shall be corrected to provide proper coordination of all trades without additional cost to the Owner.

B. Coordinate work with that of other crafts to insure that adequate space is provided for fire protection work, including requirements for accessibility and serviceability. Locate sprinkler heads to avoid conflict with light fixtures and other installed equipment. Adjust final location of piping and heads in field to accomplish these requirements for coordination.

1.5 FINAL INSPECTION AND APPROVAL

A. After installation is complete, provide a letter certifying that the sprinkler system complies with all requirements for a fully sprinklered building.

1.6 ACCEPTABLE SUBCONTRACTORS

A. Furnish the services of a qualified and approved fire protection subcontractor to provide the work of this specification section.

B. Subcontractor minimum qualifications include:

1. Maintain a complete engineering, sales, installation, and service organization that has operated within Alaska for at least three years prior to bid date of this project.

2. Maintain a complete stock of replacement parts.

3. Have available 24 hour emergency service.

4. Demonstrate satisfactory completion of five projects of similar size and scope in the state of Alaska. Provide references.

5. Bids by wholesalers, contractors, or any firm whose principle business is not that of manufacturing and/or installing fire protection system not acceptable.

1.7 FRAMED BUILDING FLOOR PLAN

A. Provide complete building floor plan to show the location of flow switches, valves, alarms, and other primary fire protection devices for quick reference by the fire department during emergency situations. Define sprinkler zones, boundaries, and indicate zone numbers.

B. Enclose the plan in metal picture frame with 1/8" rigid clear plastic cover. Consult Architect for color selection of frame. Minimum 1" frame width.

C. Locate framed plan adjacent to the fire alarm graphic annunciator or where directed by Contracting Agency.

1. 8 MAINTENANCE INFORMATION AND INSTRUCTION

A Include instruction charts describing operation and proper maintenance of fire protection devices.

B. Include publication entitled: Care and Maintenance of Sprinkler Systems, NFPA No. 13A.

1.9 ANNUAL MAINTENANCE AGREEMENT PROPOSAL

A. Provide, upon request, a cost proposal for performing annual maintenance.

B. or sprinkler systems, include the cost of performing all maintenance recommended by NFPA No. 13A.

PART 2 - PRODUCTS

2.1 GENERAL

Provide only products which are a standard product of a manufacturer regularly engaged in the manufacture of fire protection equipment.

2.2 LABELS AND APPROVALS FOR PRODUCTS

Products shall be UL or F.M. listed, labeled, and specifically approved for the fire protection application where they are used.

2.3 PIPE AND FITTINGS

A. Water Systems: Piping systems currently recognized by NFPA 13 may be used if listed for the intended service by UL and/or F.M.

2.4 VALVES

A. Valves shall be UL listed and labeled and specifically approved for the fire protection application where they are used. Maximum working pressure 175 psi non-shock cold water.

2.5 SPRINKLER HEADS

A. General: Except as noted, provide fast response sprinklers of temperature rating required, solder or bulb type. Additional requirements as follows:

1. Finished Areas: Chrome plated with white satin enamel escutcheon to match ceiling finish when applicable. Grinnell Model F950 or F980, Reliable Mode G or F1, or approved equal.

2. Unfinished Areas: Same as for finished areas, except plain finish on both sprinklers and escutcheon plate if applicable. Unfinished areas include mechanical rooms, fan rooms, penthouses, and storage rooms where no ceiling is installed. Unless otherwise approved, consider all other areas as finished.

B. Special Locations and Sprinkler Head Requirements:

1. Rest rooms and lobbies. Provide concealed sprinklers, solder or bulb type, screwed type cover plate and sprinkler cup assemblies, Grinnell Model F976, Reliable Model F4FR, or approved equal.

2. Vestibule Entry Area: Provide concealed dry pendant head sprinklers. Grinnell Model C, Reliable Model G3. Insulate sprinkler piping in ceiling.

3. Extended coverage heads are allowed as approved per code.

C. Manufacturers: Reliable, Grinnell, or approved equal.

2.6 FIRE DEPARTMENT CONNECTION

A. Siamese Connection: Cast brass body and trim having two individual 2-1/2" double female snoot inlets with rigid end NPT x pin lug hose thread swivels, plugs, and chain; outlet size as noted on plan; exposed parts polished brass; horizontal flush mounting; Potter Roemer 5020 series, or approved.

B. Provide appropriate lettering on escutcheon plate to properly identify connection.

C. Provide hose threads to match the threads of the local fire department.

2.7 SPRINKLER ALARM VALVE ASSEMBLIES

A. Furnish sprinkler alarm valve assemblies, appropriate to the system, complete with trimmings and accessories for proper alarm initiation and interface with fire alarm system. Include inlet and discharge pressure gauges, main drain, retard chamber assembly, and inspectors test connection.

B. Alarm Gong.

1. Furnish a 10" diameter electric 115 VAC powered alarm bell in the location as shown on the drawings. Arrange for installation of all wiring and conduit between alarm bell and alarm valve assembly and pay for this associated cost.

2.8 WATER FLOW DETECTORS

A. Furnish flow switches or water flow detectors installed at the locations shown on the drawings and as required for a complete and operating system. Furnish switches compatible with fire alarm system.

B. Electrical connection is described in Division 16 work.

C. Manufacturer: Notifier Company vane type water flow detector, Series WFD or approved.

2.9 VALVE TAMPER SWITCHES

A. Furnish supervision of each manual shutoff valve compatible with fire alarm system.

B. Electrical connection is described in Division 16 work.

C. Manufacturers: Potter Electrical Signal Co. Model OSYS-B or approved.

2.10 RESERVE SPRINKLER CABINET

A. Furnish a sprinkler cabinet with reserve sprinklers for each type installed per NFPA-13A. Provide two sprinkler wrenches.

B. Locate near sprinkler alarm valve or as noted on plan.

2.11 INSPECTORS TEST CONNECTIONS

A. Provide inspectors test connections for complete system testing as required for final approval by inspecting authority.

PART 3 - EXECUTION

3.1 Install all work in accordance with codes and standard practices for this type of work.

3.2 Conceal piping when possible. Coordinate with the other trades to take timely advantage of available space above ceilings, in pipe and duct spaces, and elsewhere.

3.3 Install access doors where "fire protection" valves, switches, or other controlling or monitoring devices are concealed. Label doors for quick location and recognition of concealed device. Refer to Section 15050 for door specification.

3.4 Advise Contracting Agency immediately of any conflicts between the plans and specifications. Clearly explain problem, limits of problem, and proposed solution.

3.5 Discharge inspectors test piping to approved floor drains as noted on plans.

3.6 FLUSHING AND TESTING

A Coordinate with flushing requirements for water service piping.

B. Arrange for proper witnessing of all tests as required by codes and authorities.

C. Perform tests in accordance with applicable codes. Test piping at minimum 200 psig hydrostatic for two hours. Flush as required by NFPA.

D. Furnish a letter of certification stating that testing and flushing have been performed in accordance with the applicable codes and standards. Itemize codes and standards complied with.

END OF SECTION 211300

PART 1 - GENERAL

1.1 DESCRIPTION

A Description: This section describes specific requirements, products, and methods of execution which are typical through-out the plumbing work of this project. Additional requirements for the specific systems will be found in the sections specifying those systems, and supersede these requirements.

1.2 JOB CONDITIONS

A Obtain approval from Structural Engineer prior to cutting any structural elements or furring members.

B. Structural Interferences: Should structural members prevent the installation of piping, ducting or equipment, notify the General Contractor before proceeding. Consider changes in position of equipment, piping, or ducting, if decided upon before any adjacent connections have been made as part of the contract at no additional cost.

C. Coordinate with structural and architectural work to determine acceptable locations for beam openings, sleeves and supports which are required but may not be specifically shown on the plans. Schedule installation of sleeves and special supports in a manner timely to the work of other crafts. Anticipate offsets necessary for proper coordination with other work, and route systems appropriately.

1.3 DIMENSION AND FIT

A. Cut materials accurately from measurements taken on the job site.

B. Do not spring or bend pipe to fit conditions or to make up joints.

1.4 SERVICEABILITY OF PRODUCTS

A. Provide products with the proper orientation of serviceable components to access space provided.

B. Coordinate installation of piping, ductwork, equipment, system components, and other products to allow proper service of items requiring periodic maintenance or replacement.

C. Locate all products to provide proper serviceability.

1.5 ACCESSIBILITY OF PRODUCTS

A. Arrange work to provide access to serviceable and/or operable products. Lay out work to optimize net usable access space within confines of space available.

B. Furnish access doors with flush mounted frame for ceilings, walls and floors for access to traps, valves, dampers, automatic devices, and all serviceable or operable equipment in concealed spaces unless otherwise specified under other divisions of these specifications. Arrange for installation of the access doors by the appropriate trades.

C. Access doors may not specifically be shown on the drawings. Coordinate requirements with reflected ceiling plans. Sizes required are determined by specific component or piece of equipment serviced. Indicate locations on shop drawings to clarify sizes and coordination of access panels with types of ceilings, walls and floors.

1. 6 ROUTING

A. Route pipelines parallel with building lines, and as high as possible, except where underground or shown otherwise on the plans.

B. Route piping to clear doors, windows, and other openings and to avoid all other pipes and ducts, light fixtures, and similar products.

C. Conceal pipes above ceilings and in walls and shafts where routed through finished areas, unless otherwise indicated on plans.

D. Priority: In general, graded pipes, and electrical raceways have priority of routing. Route other work elsewhere, over or under, as necessary. Order of priority does not reduce requirement for all trades to fully coordinate work. Sprinkler piping shall follow other work in the priority of routing.

PART 2 - PRODUCTS

2.1 Furnish new, unused, and undamaged products of current standard manufacture, and of latest design and best quality.

2.2 Where more than one type of material is specified, the Contractor may choose which type; however, he must state which types of material he proposes to use in his submittal.

2.3 PIPE AND FITTINGS

A. Steel Pipe.

1. Threaded: Schedule 40, ASTM A53, Type E or S, Grade B, or ASTM A120, American Standard pipe thread.

B. Copper Pipe.

1. ASTM B88, Type “M”, "L" or "K" copper with sweat fittings.

2. Solder joints using 95/5 tin antimony solder for systems operating below 180EF.

3. Solder joints using 430 silver solder or 95/5 for systems designed for 180EF. or above and in any systems containing glycol.

4. Type “M” copper shall not be installed in exposed areas where the tubing may be exposed to external damage.

C. Plastic Pipe.

1. Plastic pipe may be used where specified, or listed as an option for a particular system.

D. Pex Tubing:

1. ASTM F876 Standard Specification for Crosslinked Polyethylene (PEX) Tubing. ASTM F877, Standard Specification for Crosslinked Polyethylene (PEX) Plastic Pipe Hot and Cold Water Distribution Systems.

2.4 VALVES

A. Select valves of the best quality and type suited for the specific service and piping system used. Minimum working pressure rating 125 psig steam or 150 psig W.O.G.

B. Gate Valves, Two Inches and Smaller: Bronze body and trim, rising stem, solid wedge.

C. Gate Valves, 2-1/2" and Larger: Iron body, bronze trim, rising stem, flanged.

D. Globe Valve Two Inches and Smaller: Teflon disc, bronze body, bronze trim.

E. Globe Valve 2-1/2" and Larger: Iron body, bronze trim, flanged, bronze disc for hot water, Buna-N disc for cold water.

F. Swing Check Valves Two Inches and Smaller: Bronze body, horizontal swing, Y-pattern, renewable disc.

G. Swing Check Valves 2-1/2" and Larger: Iron body, horizontal swing, bolted bonnet, renewable seat and disc, flanged.

H. Non-Slam Check Valves: Iron body, bronze seat and disc, stainless steel spring and set screws, wafer or globe style.

I. Ball Valves Two Inches and Smaller: 150 psi steam, 400 W.O.G., brass body, brass ball, Teflon seats, two-piece construction, full port, no reduced port.

J. Substitution of Ball Valves Allowed.

1. Ball valves may be used in lieu of gate valves in the domestic water.

K. Drain Valves: Hose end gate valve or ball valve with hose connection adapter. Do not use sillcocks in lieu of drain valves.

L. Square Head Cocks: All brass V-plug type.

M. Valves Specified Elsewhere: Provide special valves such as motor-operated valves, relief valves, temperature regulating valves, etc., as specified under the individual system, or as indicated on the drawings.

2.5 UNIONS

A. Union for Steel Pipe: Ground joint malleable iron.

B. Union for Copper Pipe: Cast bronze or brass.

C. Union Between Dissimilar Metals: Dielectric type, designed and advertised to be unaffected by heat, cold, or fluid in pipe.

2.6 THERMOMETERS

A. Nine inch industrial type cast aluminum case, black finish stainless steel frame, front with double strength glass window. Scale shall have white background with black embossed figures and markings. Range selection to suit operating conditions.

2.7 TRAP PRIMER

A. Precision Plumbing Products "Prime-Rite", J.R. Smith 2699, or equal, complete with distribution unit and number of primer line connections as required.

2.8 BACKFLOW PREVENTERS

A. Reduced pressure principle: Device with two spring loaded check valves with a differential pressure relief valve located between the check valves, inlet and outlet shut off valves, rated to 175 psig water working pressure and 140EF,

B. Double check: Device with two spring loaded check valves, inlet and outlet shutoff valves. rated to 150 psig water working pressure and 140EF

C. Devices shall meet the requirements of USC Foundation of Cross Connection Control and Hydraulic Research, AWWA Standard C506-78 and ASSE Standard 1013.

2.9 MISCELLANEOUS

A. Escutcheons: Nickel or chrome plate with screws or springs for holding plate in position.

PART 3 - EXECUTION

3.1 EQUIPMENT MOUNTING

A. Install mounting accessories, supports, hanger expansion joints, adapters and any other appurtenances to adapt fixtures and equipment supplied to the conditions of use indicated.

B. Independently support piping at equipment, such as pumps, air separator, heat exchanger, expansion tank, duct mounted coils, and boilers, so that no weight is supported by the equipment.

C. At wall attached fixtures and equipment weighing less than 50 pounds, provide backing plates of at least 1/8 x 10 inch sheet steel or 2 x 10 inch fire retardant treated wood securely built into the structural walls.

3.2 LABELING AND TAGGING

A. Tag valves with heat resistant laminated dark plastic labels engraved with white lettering 1/4" high indicating fluid in pipe and a P (plumbing), H (heating), G (gas), A (air), or F (fire) numbers. Securely fasten to the valve stem or bonnet with beaded chain. Provide a framed, typewritten directory under glass, and install where directed. Install tags prior to substantial completion of project. Refer to Section 15010, General Provisions.

B. Label equipment with heat resistant laminated dark plastic labels having engraved white lettering 1/2" high and fastened in place with rivets or screws. Examples: "PUMP PMP-1," "WATER HEATER NO. 1," "EXHAUST FAN EF-2," etc.

C. Label access doors the same as for valve tags above. Lettering to indicate item accessed through door. Secure with rivets.

3.3 TYPICAL PIPING

A. Install insulating couplings or unions to prevent electrolysis between dissimilar metals, when use of dissimilar metals cannot be avoided in one system.

B. Close openings in pipes with appropriate caps, plugs, or covers during storage and progress of the work.

C. Install valves with stems vertical wherever possible, and in no case with stems below the horizontal.

D. Ream ends of pipe to full diameter.

E. Reduce pipe sizes using reducing tees or reducing fittings. Bushings not permitted except on tanks and similar equipment.

F. Install escutcheons on pipes passing through walls, floors and ceilings in finished areas and where piping is in counters, closets, or cabinets, and subject to view when doors are open. Cover the pipe sleeve and secure plate in position.

G. Test piping in accordance with accepted trade standards if not specified elsewhere.

3.4 THREADED PIPE

A. Cut pipe threads true and of depth to make up properly without leaks.

B. Make connections to show at least two threads and not more than four threads when tight.

C. Make up joints with Teflon tape only, as recommended by tape manufacturer, or as specified in specific piping sections. Use Teflon past for any pipe connections used for a gauge or gas valve.

END OF SECTION 220000

PART 1 - GENERAL

1.1 DESCRIPTION

A. Related Work Specified Elsewhere.

1. Plumbing General Requirements: Section 220000.
2. Domestic Water Piping & Specialties: Section 221100.
3. Waste & Vent piping & Specialties: Section 221300.
4. Plumbing Fixtures and Trim: Section 224000.

B. Description.

1. This section describes specific requirements, products and methods of execution which relate to the insulation of ducts, pipes and other surfaces of the mechanical installation.

2. Insulation is provided for the following purposes:

a. Energy conservation.
b. Control of condensation.
c. Safety of operating personnel.

PART 2 - PRODUCTS

2.1 Furnish new, unused, and undamaged products of current standard manufacture, and of latest design and best quality.

2.2 Where more than one type of material is specified, the Contractor may choose which type; however, he must state which types of material he proposes to use in his submittal.

2.3 FIRE RATING OF MATERIALS

A. Provide insulation products used aboveground in building with burning characteristics not to exceed the following, rated according to NFPA 255 "Method of Test of Surface Burning Characteristics of Building Materials": Flame Spread 25, Fuel Contributed 50, Smoke Developed 50.

B. Insulation specified for use underground and aboveground away from the building, might have other burning characteristics. Use such products only where specifically required.

2.4 FIBERGLASS INSULATION

A. Pipe insulation products as follows:

1. Thermal conductivity K = 0.24 at 100EF. mean temperature.

2. Factory applied vapor-barrier flame retardant all service jacket and tape, with permeability rating = 0.02 perms.

3. Provide insulation sections with Knauf 3-M developed closure system or pressure sensitive adhesive on both overlap seam and mating jacket surface.

4. Fitting insulation materials may include:

   a. Mitered segments of pipe insulation.

   b. Compressed glass fiber blanket, with an outer coating of insulating/finishing cement.

   c. Insulating/finishing cement.

   d. Insulating cement with an outer coating of insulating/finishing cement.

   e. Pre-molded PVC factory-made fitting covers.

   f. Insulating/finishing cement to be asbestos free.

2.5 METAL JACKETING

A. 27 gauge (U.S. Standard) heavy corrugated aluminum.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION AND WORKING CONDITIONS

A. Do not apply insulation materials until surfaces to be covered are clean and dry and foreign material, such as rust, dirt, etc., is removed.

B. Keep insulation clean and dry during installation and during the application of any finish.

C. Do not install the insulation on pipe fittings, and pipe joints until the piping is tested and approved.

D. Do not apply under conditions of excessive humidity or at temperatures below 50EF. or above 100EF.

3.2 TECHNIQUE FOR APPLICATION TO PIPES

A. Close longitudinal joints of pipe insulation firmly and butt insulation sections firmly together. Stagger all joints.

B. Neatly and smoothly adhere all laps and butt strips.

C. Replace insulation having loose joints or laps.

D. Where insulated pipes are run through sleeves and other openings, provide continuous insulation.

3.3 TECHNIQUE FOR APPLICATION TO PIPE FITTINGS, UNIONS AND VALVES

A. Insulate fittings, unions, valves and flanges to the same thickness as the pipe insulation, as required by the specific system service.

B. Any of the following methods of insulation is acceptable.

1. Blanket Wrap: Wrap the fitting with compressed glass fiber blanket. Wire the blanket securely in place, then cover with a smooth layer of insulating/finishing cement. Cover with glass mesh tape, adhering it with an adhesive coating.

2. Fabricated Segments: Cut mitered segments from pipe insulation that has the same wall thickness as adjacent pipe insulation, to form a cover which will fit snugly around the fitting. Wire the segments firmly in place and seal the joints with insulating/finishing cement. Apply adhesive coating and wrap with glass mesh tape, then apply another layer of the same coating over the whole assembly.

3. Cement: Apply insulating or insulating/finishing cement, molding it to the contour of the fitting. When area is large apply an under layer of cement, wrap this with glass mesh tape, then apply an outer layer of cement. If the insulation is not concealed, the exposed surface of insulating/finishing cement to have a final glass mesh tape wrap embedded in adhesive.

C In each of the listed methods, to protect the insulation against contact damage, apply an adhesive coating when the cement is completely dry and hard, then wrap with glass mesh tape. Apply another coating of adhesive over the whole assembly.

D. If pre-molded PVC fitting covers are provided, glass mesh tape is not required.

3.4 COLD PIPE INSULATION REQUIREMENTS

A. Insulate piping for domestic cold water, vents through roof, and any other cold pipes, using one inch thickness fiberglass

B. Provide a complete vapor barrier throughout the whole system including fittings, unions, valves, and flanges. Use only vapor barrier adhesives and coatings. Stapling of jacket not permitted.

C. Cover ends of insulation sections with an adhesive coating at intervals of not more than 21 feet. Insulate accessories, valves, flanges, etc.

3.5 HOT PIPE INSULATION REQUIREMENTS

A. Insulate domestic hot water and circulating pipes, and other hot pipes, using one inch thickness fiberglass for pipe sizes through 2", and 1-1/2" thickness fiberglass for pipe sizes 2-1/2" and larger.

B. Staples may be used to seal jacket.

C. Do not insulate unions, valves and flanges.

D. Cover insulation on fittings with pre-molded PVC fitting covers.

3.6 SPECIAL PIPE AND EQUIPMENT INSULATION REQUIREMENTS

A. Insulate plumbing vents from 1 foot below the heated space.

B. Insulate exposed waste and hot water pipes below handicapped lavatories.

END OF SECTION 220700

PART 1 - GENERAL

1.1 DESCRIPTION

A. Related Work Specified Elsewhere.

1. Plumbing General Requirements: Section 220000.
2. Plumbing Insulation: Section 220700.
3. Plumbing Fixtures and Trim: Section 224000.

B. Description: This section describes specific requirements, products, and methods of execution relating to the domestic water distribution system for the project.

C. Scope: The work of this section includes: Water distribution work inside the structure. This section does not include provision of the outside water source, water treatment equipment, or water using apparatus, although the work of this section does include the interface connections at all of these related items.

1. 2 APPLICABLE CODES

2009 Uniform Plumbing Code. (Including local amendments)

1.3 CONNECTION TO WATER SOURCE

Provide connection and coordinate incidental services to interface properly the water distribution system with the water source. Provide appropriate materials, compatible joints, dielectric unions, supports, and other products for the proper connection at the source.

PART 2 - PRODUCTS

2.1 Furnish new, unused, and undamaged products of current standard manufacture, and of latest design and best quality.

2.2 Where more than one type of material is specified, the Contractor may choose which type; however, he must state which types of material he proposes to use in his submittal.

2.3 PIPE AND FITTINGS ABOVEGROUND

A. Inside Structures.

1. Type "L" hard drawn copper tubing, wrought solder type fittings, 95/5 tin-antimony or lead-free silver bearing solder.

2.4 PIPE AND FITTINGS BELOWGROUND

A. Inside Structures.

1. Type "K" copper, wrought solder type fittings, 95/5 tin antimony solder.

2. 150 psig ductile iron mechanical joint type piping and fittings.

3. Pex tubing may be used where allowed by code.

B. Outside Structures.

1. Type "K" soft copper, wrought solder type fittings, Silfos.

2. 150 psig ductile iron mechanical joint piping and fittings.

2.5 DOMESTIC HOT WATER CIRCULATING PUMP

A. Pump of the size, type and capacity as scheduled on drawings.

B. Pump all bronze or stainless steel construction.

PART 3 - EXECUTION

3.1 GENERAL

A. Make all joints in accordance with fitting manufacturer's recommendations.

B. At all fixtures except tank type water closets, install and connect hot water on left and cold water on right, as viewed when facing the fixture.

3.2 TESTING

A. Test all water piping hydrostatically at 100 psig or 150% of working pressure, whichever is greater, for a period of four hours. Observe piping during this period and repair leaks.

B. Air Test.

1. In general, air testing is not acceptable. In the event of conditions that would subject the pipe to freezing, however, an equivalent air pressure test may be used after obtaining approval from the Contracting Agency.

2. Make the air test by attaching an air compressor testing apparatus to any suitable opening, and after closing all other inlets and outlets to the system, force air into the system until there is uniform gauge pressure of 100 pounds per square inch, or 150% of working pressure, but not more than 150 psig. The air pressure shall be held without introduction of additional air for a period of at least eight hours. Locate leaks by applying soap solution to joints. Repair leaks.

C All testing must be witnessed by the City of Homer Inspectors or will be rejected. Testing certification shall be included in operation and maintenance manuals.

3.3 STERILIZATION OF DOMESTIC WATER SYSTEMS

A. Sterilize each unit of completed supply line and distribution system with chlorine before acceptance for domestic operation.

B. Accomplish sterilization as described below or by the system prescribed by the American Water Works Association Standard C-601. Apply the amount of chlorine to provide a dosage of not less than 50 parts per million. Provide chlorine manufactured in conformance to the following standards:

1. Liquid Chlorine: Federal Specification BB-C-120.

2. Hypochlorite: Federal Specification O-C-114a, Type 11, Grade B, or Federal Specification O-X-602.

C. Introduce the chlorinating material to the water lines and distribution system after piping system has been thoroughly flushed. After a contact period of not less than 24 hours, flush the system with clean water until the residual chlorine content is not greater than 1.0 part per million.

D. Open and close all valves in the lines being sterilized several times during the above chlorination.

E. Certify in writing that sterilization has been completed in accordance with these requirements.

END OF SECTION 221100

PART 1 - GENERAL

1.1 DESCRIPTION

A. Related Work Specified Elsewhere.

1. Plumbing General Requirements: Section 220000.
2. Plumbing Insulation: Section 220700.
3. Plumbing Fixtures and Trim: Section 224000.

B. Description.

1. This section describes specific requirements, products, and methods of execution relating to the transfer of liquid waste for the project. The work of this section includes providing the following:

   a. Liquid waste pipes and fittings.

      1) Soil and waste water.
      2) Building sewer.

   b. Plumbing vents, including their termination.

   c. Connections at points of collection or handling.

      1) At plumbing fixtures and trim.

1.2 APPLICABLE CODE

2009 Uniform Plumbing Code. (Including any adopted amendments by the “Governing Authority”)

PART 2 - PRODUCTS

2.1 SOIL, WASTE, VENT PIPE UNDERGROUND INSIDE STRUCTURE (INCLUDES TO FIVE FEET FROM BUILDING PERIMETER)

A. Cast iron soil pipe with Tyseal neoprene gaskets or ABS pipe with drain waste & vent fittings.

2.2 SOIL, WASTE, AND VENT SEWER PIPE ABOVEGROUND IN STRUCTURE

A. Cast iron, ABS or PVC pipe and drain waste and vent fittings.

2.3 VENTS

A. Cast iron, ABS or PVC pipe with drain waste and vent fittings.

PART 3 - EXECUTION

3.1 INSTALLATION OF UNDERGROUND PIPING

Install pipe and fittings to required grade with hubs and bottom half section in properly compacted soil.

3.2 INSTALLATION OF ABOVEGROUND PIPING

Refer to section 220000 Plumbing General Requirements..

3.3 GRADING

Grade horizontal runs of pipe in building and under floor slab at 1/4" per foot downward in direction of flow. If it is absolutely impossible to maintain a grade of 1/4" per foot, 4" and larger piping may slope to a minimum grade of not less than 1/8" per foot.

3.4 SUPPORTING

Support horizontal runs of ABS pipe in building at intervals not to exceed 5'-0" and at each change of direction. Provide a support at the base of vertical risers with intermediate supports as required. Brace all piping systems adequately to prevent motion, per manufacturer's recommendations.

3.5 CLEANOUTS

Provide cleanouts in an accessible location at base of risers in soil, waste and drain piping and at each change in direction in horizontal runs of pipe over 135 degrees. In long straight runs, provide a cleanout at least every 75 feet.

3.6 VENTING

A. Provide a vent for each trap or as shown on the drawings.

B. Extend each vent vertically to a point not less than six inches above the extreme overflow level of the fixture served before offsetting horizontally. Whenever two or more vent pipes converge, extend each such pipe at least six inches in height above the top of the plumbing fixture it serves before being connected to any other vent.

3.7 VENTS THROUGH ROOF

A. Extend vents through the roof a minimum distance of ten inches, and terminate at least 15' horizontally from operable windows, doors, or air intakes, and at least three feet above such openings.

B. Increase all vents two pipe sizes but not necessarily over three inches where they pass through the ceiling.

3.8 TESTING

A. Test pipes in accordance with the requirements of Chapter 3 of the Uniform Plumbing Code.

B. Test systems with water, except in cases where to do so would adversely subject the piping to damage from freezing. Obtain approval from Contracting Agency if air test is to be substituted for water test.

C. Repair leaks and retest system, repeating this process until piping system is free of leaks.

D. All testing shall be witnessed by a City of Homer Inspector or will be rejected. Testing certification shall be included in operation and maintenance manuals.

END OF SECTION 221300

PART 1 - GENERAL

1.1 DESCRIPTION

A. Related Work Specified Elsewhere.

1. Plumbing General Requirements: Section 220000.
2. Plumbing Insulation: Section 220700.
3. Domestic Water Piping & Specialties: Section 221100.
4. Waste & Vent Piping & Specialties Section 221300.

B. Description: This section describes certain components of domestic plumbing system, including related specific requirements, products, and methods of execution. Plumbing water, waste and vent piping, and other primary distribution components of the plumbing system are included with related work specified elsewhere.

C. Scope: Provide the products specified and shown.

1.2 STANDARDS

A. American National Standard A117.1, Specifications for Making Buildings and Facilities Accessible and Usable by Physically Handicapped People.

B. Americans with Disabilities Act (ADA).

PART 2 - PRODUCTS

2.1 Furnish new, unused, and undamaged products of current standard manufacture, and of latest design and best quality.

2.2 Where more than one type of material is specified, the Contractor must state which types of material he proposes to use in his submittal.

2.3 CLEANOUTS

A. Floor Cleanouts: Furnish top adjustable to the finished floor. Provide options for tiled or carpeted floor as appropriate. Do not use carpet maker nickel-bronze top where exposed.

B. Standard Top: Round scoriated nickel bronze.

C. Wall Cleanouts: Countersunk plugs, with smooth round access cover, perma-coated steel or polished stainless steel.

D. Line cleanouts may be used in the crawl space.

2.4 FIXTURES

A. Furnish fixtures as listed on drawings.

B. Traps, Stops, and Supplies.

1. Furnish tailpiece, traps, stops, and supplies for fixtures and floor drains, as applicable.

2. P-Traps: 17 gauge chrome-plated tube type or cast brass. ABS traps may be used in concealed areas.

3. Supplies: Flexible, chrome-plated, 7538 series, or hose type supply lines.

4. Stops: Removable key type, 2302 series.

C. Handicapped Fixtures.

1. Furnish fixtures in compliance with the appropriate standard listed in Part 1.

2. Furnish fixtures operable with one hand without grasping, pinching, or twisting of the wrist, and requiring not more than five pounds of operating force.

3. Insulate exposed waste and hot water lines below lavatories per Section 15180, Insulation.

PART 3 - EXECUTION

3.1 Store fixtures and trim above ground in a covered location not subject to accidental damage by traffic or other construction activities. Handle fixtures and trim carefully to avoid chipping, denting, scratching, or other damage. Replace damaged items with same item in new condition.

3.2 Provide permanent metal and wire positioners and supports to secure fixtures and piping rigidly in proper alignment without sway or side play.

3.3 Anchor fixtures securely to withstand applied vertical load of not less than 250 pounds on the front of the fixture, without noticeable movement.

3.4 Install fixtures plumb, level, and flush to the finished Architectural surface so that the maximum gap between the fixture and the surface does not exceed 3/16". Caulk the edge of the joint between fixture and surface with a waterproof caulking compound.

3.5 Adjust functional components for proper operation in accordance with manufacturer's recommendations, or as otherwise directed.

3.6 Thoroughly clean fixtures and trim.

END OF SECTION 224000

PART 1 - GENERAL

1.1 DESCRIPTION

A Description: This section describes specific requirements, products, and methods of execution which are typical through-out the mechanical work of this project. Additional requirements for the specific systems will be found in the sections specifying those systems, and supersede these requirements.

1.2 JOB CONDITIONS

A Obtain approval from Structural Engineer prior to cutting any structural elements or furring members.

B. Structural Interferences: Should structural members prevent the installation of piping, ducting or equipment, notify the General Contractor before proceeding. Consider changes in position of equipment, piping, or ducting, if decided upon before any adjacent connections have been made as part of the contract at no additional cost.

C. Coordinate with structural and architectural work to determine acceptable locations for beam openings, sleeves and supports which are required but may not be specifically shown on the plans. Schedule installation of sleeves and special supports in a manner timely to the work of other crafts. Anticipate offsets necessary for proper coordination with other work, and route systems appropriately.

1.3 DIMENSION AND FIT

A. Cut materials accurately from measurements taken on the job site.

B. Do not spring or bend pipe to fit conditions or to make up joints.

1.4 SERVICEABILITY OF PRODUCTS

A. Provide products with the proper orientation of serviceable components to access space provided.

B. Coordinate installation of piping, ductwork, equipment, system components, and other products to allow proper service of items requiring periodic maintenance or replacement.

C. Locate all products to provide proper serviceability.

1.5 ACCESSIBILITY OF PRODUCTS

A. Arrange work to provide access to serviceable and/or operable products. Lay out work to optimize net usable access space within confines of space available.

B. Furnish access doors with flush mounted frame for ceilings, walls and floors for access to traps, valves, dampers, automatic devices, and all serviceable or operable equipment in concealed spaces unless otherwise specified under other divisions of these specifications. Arrange for installation of the access doors by the appropriate trades.

C. Access doors may not specifically be shown on the drawings. Coordinate requirements with reflected ceiling plans. Sizes required are determined by specific component or piece of equipment serviced. Indicate locations on shop drawings to clarify sizes and coordination of access panels with types of ceilings, walls and floors.

1. 6 ROUTING

A. Route pipelines and ductwork parallel with building lines, and as high as possible, except where underground or shown otherwise on the plans.

B. Route piping and ducts to clear doors, windows, and other openings and to avoid all other pipes and ducts, light fixtures, and similar products.

C. Conceal pipes and ducts above ceilings and in walls and shafts where routed through finished areas, unless otherwise indicated on plans.

D. Priority: In general, graded pipes, and electrical raceways have priority of routing. Route other work elsewhere, over or under, as necessary. Order of priority does not reduce requirement for all trades to fully coordinate work. Sprinkler piping shall follow other work in the priority of routing.

PART 2 - PRODUCTS

2.1 Furnish new, unused, and undamaged products of current standard manufacture, and of latest design and best quality.

2.2 Where more than one type of material is specified, the Contractor may choose which type; however, he must state which types of material he proposes to use in his submittal.

2.3 PIPE AND FITTINGS

A. Steel Pipe.

1. Threaded: Schedule 40, ASTM A53, Type E or S, Grade B, or ASTM A120, American Standard pipe thread.

B. Copper Pipe.

1. ASTM B88, Type “M”, "L" or "K" copper with sweat fittings.

2. Solder joints using 95/5 tin antimony solder for systems operating below 180EF.

3. Solder joints using 430 silver solder or 95/5 for systems designed for 180EF. or above and in any systems containing glycol.

4. Type “M” copper shall not be installed in exposed areas where the tubing may be exposed to external damage.

C. Plastic Pipe.

1. Plastic pipe may be used where specified, or listed as an option for a particular system.

2.4 VALVES

A. Select valves of the best quality and type suited for the specific service and piping system used. Minimum working pressure rating 125 psig steam or 150 psig W.O.G.

B. Gate Valves, Two Inches and Smaller: Bronze body and trim, rising stem, solid wedge.

C. Gate Valves, 2-1/2" and Larger: Iron body, bronze trim, rising stem, flanged.

D. Globe Valve Two Inches and Smaller: Teflon disc, bronze body, bronze trim.

E. Globe Valve 2-1/2" and Larger: Iron body, bronze trim, flanged, bronze disc for hot water, Buna-N disc for cold water.

F. Swing Check Valves Two Inches and Smaller: Bronze body, horizontal swing, Y-pattern, renewable disc.

G. Swing Check Valves 2-1/2" and Larger: Iron body, horizontal swing, bolted bonnet, renewable seat and disc, flanged.

H. Non-Slam Check Valves: Iron body, bronze seat and disc, stainless steel spring and set screws, wafer or globe style.

I. Ball Valves Two Inches and Smaller: 150 psi steam, 400 W.O.G., brass body, brass ball, Teflon seats, two-piece construction, full port, no reduced port.

J. Substitution of Ball Valves Allowed.

1. Ball valves may be used in lieu of gate valves in the domestic water.

K. Drain Valves: Hose end gate valve or ball valve with hose connection adapter. Do not use sillcocks in lieu of drain valves.

L. Square Head Cocks: All brass V-plug type.

M. Valves Specified Elsewhere: Provide special valves such as motor-operated valves, relief valves, temperature regulating valves, etc., as specified under the individual system, or as indicated on the drawings.

2.5 UNIONS

A. Union for Steel Pipe: Ground joint malleable iron.

B. Union for Copper Pipe: Cast bronze or brass.

C. Union Between Dissimilar Metals: Dielectric type, designed and advertised to be unaffected by heat, cold, or fluid in pipe.

2.6 THERMOMETERS

A. Nine inch industrial type cast aluminum case, black finish stainless steel frame, front with double strength glass window. Scale shall have white background with black embossed figures and markings. Range selection to suit operating conditions.

2.7 BACKFLOW PREVENTERS

A. Reduced pressure principle: Device with two spring loaded check valves with a differential pressure relief valve located between the check valves, inlet and outlet shut off valves, rated to 175 psig water working pressure and 140EF,

B. Double check: Device with two spring loaded check valves, inlet and outlet shutoff valves. rated to 150 psig water working pressure and 140EF

C. Devices shall meet the requirements of USC Foundation of Cross Connection Control and Hydraulic Research, AWWA Standard C506-78 and ASSE Standard 1013.

2.8 MISCELLANEOUS

A. Escutcheons: Nickel or chrome plate with screws or springs for holding plate in position.

PART 3 - EXECUTION

3.1 EQUIPMENT MOUNTING

A. Install mounting accessories, supports, hanger expansion joints, adapters and any other appurtenances to adapt fixtures and equipment supplied to the conditions of use indicated.

B. Independently support piping at equipment, such as pumps, air separator, heat exchanger, expansion tank, duct mounted coils, and boilers, so that no weight is supported by the equipment.

C. At wall attached fixtures and equipment weighing less than 50 pounds, provide backing plates of at least 1/8 x 10 inch sheet steel or 2 x 10 inch fire retardant treated wood securely built into the structural walls.

3.2 LABELING AND TAGGING

A. Tag valves with heat resistant laminated dark plastic labels engraved with white lettering 1/4" high indicating fluid in pipe and a P (plumbing), H (heating), G (gas), A (air), or F (fire) numbers. Securely fasten to the valve stem or bonnet with beaded chain. Provide a framed, typewritten

directory under glass, and install where directed. Install tags prior to substantial completion of project. Refer to Section 15010, General Provisions.

B. Label equipment with heat resistant laminated dark plastic labels having engraved white lettering 1/2" high and fastened in place with rivets or screws. Examples: "PUMP PMP-1," "WATER HEATER NO. 1," "EXHAUST FAN EF-2," etc.

C. Label access doors the same as for valve tags above. Lettering to indicate item accessed through door. Secure with rivets.

3.3 TYPICAL PIPING

A. Install insulating couplings or unions to prevent electrolysis between dissimilar metals, when use of dissimilar metals cannot be avoided in one system.

B. Close openings in pipes with appropriate caps, plugs, or covers during storage and progress of the work.

C. Install valves with stems vertical wherever possible, and in no case with stems below the horizontal.

D. Ream ends of pipe to full diameter.

E. Reduce pipe sizes using reducing tees or reducing fittings. Bushings not permitted except on tanks and similar equipment.

F. Install escutcheons on pipes passing through walls, floors and ceilings in finished areas and where piping is in counters, closets, or cabinets, and subject to view when doors are open. Cover the pipe sleeve and secure plate in position.

G. Test piping in accordance with accepted trade standards if not specified elsewhere.

3.4 THREADED PIPE

A. Cut pipe threads true and of depth to make up properly without leaks.

B. Make connections to show at least two threads and not more than four threads when tight.

C. Make up joints with Teflon tape only, as recommended by tape manufacturer, or as specified in specific piping sections. Use Teflon past for any pipe connections used for a gauge or gas valve.

END OF SECTION 230000

PART 1 - GENERAL

1.1 DESCRIPTION

A. Related Work Specified Elsewhere.

1. Mechanical General Requirements: Section 230000.
2. Hydronic Piping & Specialties: Section 232100.
4. Testing, Adjusting &Balancing: Section 230593.

B. Description of Section: This section describes specific requirements, products and methods of execution which relate to the isolation of all mechanical systems for limitation of transmission of vibration and sound to acceptable levels.

C. Scope: Isolate mechanical equipment and piping, except fire, soil, waste, vents, and rain leaders by providing springs, bases, supports, and other specified vibration isolation items as required to prevent noise and vibration from exceeding the limits specified. Provide a balanced set of isolators for each piece of equipment.

1.2 SUBMITTALS

A. Submit for review the following data relating to equipment isolation.

1. Drawings of bases, showing dimensions, individual isolator selected for each support point, details of the mounting bracket for the isolators, location for equipment mounting bolts.

2. Detailed calculation showing the weight distribution for each isolator as calculated (not averaged).

3. Size, type, load and static deflection for each isolator.

4. Number and color code of each isolator to show its location. Mark this code number and color on the drawings, on each isolator and on each base to insure that the isolators are placed in the proper location. Clearly mark isolators to show their undeflected height and static deflection so that after installation and adjustment, their load may be verified to insure the loading is within proper range and proper isolation is attained.

B. Submit for review the following data relating to sound control.

1. Sound power level data for fans, compressors, and other noise producing equipment. Include sound power base reference level and description of test sensing locations.

2. Attenuator performance data.

1.3 ADDITIONAL ENGINEERING REQUIRED

A. Provide the following services:

1. Select and furnish vibration isolators which meet the requirements of the specifications and drawings.

2. Furnish installation drawings, coordination, supervision and instruction for correct installation.

3. Coordinate selection of the piping supports with the equipment supports to maintain uniformly efficient isolation throughout each system while accommodating vibration, expansion and contraction without causing excessive stresses at any equipment connection or at any portion of the piping.

4. Review shop drawings and insure that the procedures for setting and adjusting isolation devices are in accord with recommendations.

5. At the end of the job, make a final inspection of the project and submit a report certifying that isolators are installed as shown on the shop drawings and are free to work properly and that the deflections are as specified.

B. The Contractor shall be responsible to ensure that equipment isolated by equipment manufacturers meet the requirements of the drawings and specifications. Several manufacturers have an adequate engineering and testing facility and competent personnel available to provide the required services.

C. Manufacturers: Vibration Mountings and Controls, Inc., Mason Industries, Inc., Amber/Booth, Consolidated Kinetics Corporation, or approved equal.

1.4 GENERAL PERFORMANCE OF EQUIPMENT

Select each piece of mechanical equipment for installation on this project to minimize vibration and noise level. Take particular care upon delivery of equipment to evaluate the acoustical performances as well as mechanical function before installation.

1.5 LIMITS OF VIBRATION

A. Statically and dynamically balance rotating machinery, fans and pumps, etc. Do dynamic balancing at the operating speed of the motor. Balance rotors without sheave and with the keyway one-half filled. Balance sheaves separately with half filled key and operating set screws. This may be accomplished at factory, if certified by manufacturer. Rebalance in field as required.

B. Select and isolate equipment to limit vibration levels to the following maximum displacements at the RPM listed.

MAXIMUM ALLOWABLE DISPLACEMENT PEAK TO PEAK, MILS	EQUIPMENT RPM

5.5	200
3.5	300
2.5	400
2.0	500
1.8	600
1.5	700
1.4	800
1.2	900
1.0	1000
.9	1200
.6	1800
.5	2000
.35	3000
.3	3600

C. In general, vibration testing is not required; however, if the vibration level in any space appears to exceed the limits of vibration specified, or if requested at specific locations by the Contracting Agency, provide the following tests:

1. After the job is in operation and the systems have been tested and balanced, measure the in-place vibration displacement at each bearing of each piece of equipment in the building which appears to display excessive vibration.

2. Provide the services of an independent consultant with an IRD 600, or equal, vibration analyzer to make this measurement.

3. Tabulate the data, and include in the table the equipment identification, location, displacement peak to peak in mils on each bearing radially in the X and Y axes (perpendicular to the shaft) and axially parallel to the shaft.

4. The cost of these tests will be reimbursed to the Contractor by the Owner if the results of the tests show that the specified limits of vibration have not been exceeded.

D. If the peak to peak levels are exceeded, repair or replace the equipment at no additional cost to Owner.

1.6 LIMITS OF NOISE

A. Select equipment and provide isolation and sound attenuation to limit the noise of each space, during normal building operation, to not exceed the following levels:

AREA	NC LEVEL
General offices, project rooms, main lobby.	40
Executive offices.	35
Waiting areas, private corridors,	40

lounges, work rooms, game room.	
Public toilet, storage rooms, lobbies, public corridors, and other general public areas.	45

B. Refer to Section 15850, Balancing and Testing, for sound testing requirements.

1.7 SOUNDPROOFING

Soundproof ductwork and pipe openings through acoustic barrier walls identified on the architectural drawings.

1.8 WARRANTY

At the end of the one year warranty period, rebalance or repair all equipment which exceeds the limits of sound and vibration specified.

PART 2 - PRODUCTS

2.1 SPRING ISOLATORS

A. General

1. Select springs for an additional 50% capacity before reaching the bottomed out position.

2. Size isolators for a single piece of equipment for approximately equal static spring deflection. Minimum allowable spring static deflection one inch unless noted otherwise.

3. Furnish springs manufactured so that the ends of the spring remain parallel to each other during deflection.

4. Furnish springs with a diameter of 0.8 of the load operating height.

B. Un- housed Base Mounted Type Spring

1. Freestanding and laterally stable spring with neoprene acoustical friction pad between the base plate and the support. Assembly shall include leveling bolt, nut, cap screw and height saving bracket. Multiple spring assemblies to accommodate rated capacity at required deflection.

2. Manufacturers: Vibration Mountings Series AS, AL, AW, AM, or AD; Mason Industries Type SLF or approved.

C. Restrained Base Mounted Type Springs

1. All-directional 1 g. seismic spring within a cast iron housing with neoprene cushion. Assembly shall include leveling bolt with nut, cap screw, adjustable rebound plate, steel base plate drilled for mounting bolts, spring inspection ports and height saving bracket. Furnish written certification as to meeting the 1 g. load rating.

2 Manufacturers: Vibration Mounting AWMR, Mason Industries SSLFH, or approved.

D. Limit Stop Base Mounted Type Springs.

1. Free standing spring with neoprene acoustical friction pad which incorporates neoprene vertical limit stops. Assembly shall include leveling bolt, nut, and cap screw. Multiple spring assemblies to accommodate rated capacity at required deflection. Mountings installed outdoors shall hot dipped galvanized.

2. Manufacturers: Vibration Mountings Type AWR, Mason Industries, Type SLR or approved.

E. Hanger Type Springs.

1. Furnish steel spring box type flexible hangers with neoprene in-shear element.

2. Use hanger boxes with sufficient clearance between the rod and the box to permit tipping the rod 15 degrees off the vertical without contact between the rod or rods and the spring or box.

3. Size hanger for a minimum of 1-1/4" static deflection.

4. Manufacturers: Vibration Mounting's Series RSH-30A, Mason Industries Type 30N, or approved.

2.2 NEOPRENE BASE PADS

A. Neoprene waffle on doubled ribbed with steel bearing plate.

B. Select pads with sufficient area for loading not to exceed 60 psi.

C. Manufacturers: Vibration Mountings Shear-Flex Flex Plate, Type A, B, or C; Mason Industries Style WMW, WML, or WM, or approved.

2.3 RESTRAINED NEOPRENE BASE PADS

A. Steel housing enclosing EPDM or neoprene element with cadmium plated cap screws and washers.

B. Select pads with sufficient area for proper loading, not to exceed 60 durometer reading.

C. Manufactures: Mason Industries Type RBA or RCA, or approved.

2.4 EQUIPMENT BASES

A. Structural Steel, General

1. For each piece of equipment, Furnish a fabricated base to include equipment and motor without overhang of equipment or motor.

2. Use structural WF members to form perimeter framing, with minimum beam depth equal to 1/12 the longest span, except that for maximum spans less than seven feet, use six inch deep beams; and for spans greater than eight feet, do not exceed eight inches. Use diagonal WF braces equal to one-half the depth of the perimeter beam whenever the longest beam exceeds six feet.

3. Mount isolated motor driven equipment with its motor on a common base of sufficient rigidity to maintain permanent alignment.

4. Attach equipment which does not have sufficient strength to permit its mounting on independent isolators to a suitable structural steel frame base or concrete inertia base.

B. Structural Steel with Concrete Inertia Base

1. Furnish structural steel base with reinforced concrete fill where shown on the drawings.

2. Weld 1/2" reinforcing steel at six inches on center both ways to base frame.

3. Fill base with 3000 psi concrete mixed to ASTM C94 standards.

4. Furnish base with preset imbedded anchor bolts and pipe sleeves for equipment attachment.

5. Use T-shape where necessary to conserve weight and size.

6. Manufacturers: Vibration Mountings Type WPF, Mason Industries Type K or approved.

2.5 FLEXIBLE CONNECTORS

A. Furnish flexible connectors with ductile iron threaded or floating flanges, braided metal rated for 150 psig and 240° F.

B. Manufacturers: Mason Industries, Metraflex, or approved.

2.6 SEISMIC RESTRAINTS

A. General

1. Furnish snubbers and seismic restraints for pipes, ductwork and equipment whose weight exceeds 300 pounds including contents and base to maintain in a captive position.

2. Devices shall not short circuit vibration isolators or transmit vibration or noise.

3. Devices shall be fabricated from angle iron, steel plate, metal tubing or other structural shapes in a welded assembly incorporating neoprene pads or washers.

B. Furnish 1 g. all - directional seismic snubbers with replaceable neoprene bushings for non-critical mechanical equipment as noted. Furnish written documentation as to meeting the 1 g. load rating. Mason Industries Type Z-1225 or approved.

C. Furnish 4 g. all-directional seismic restraints with replaceable 3/4" neoprene element for critical mechanical equipment as noted. Restraint shall be assembled with factory preset clearances between resilient and steel surfaces of 1/8" to 1/4". Mason Industries Type Z-1011 approved.

D. Hung Equipment, Ductwork, and Pipes: See Drawings.

PART 3 - EXECUTION

3.1 GENERAL PROCEDURES

A. Select isolators in accordance with the equipment weight distribution to allow for required static deflection of the isolators in relation to the span of the building structure supporting the equipment, considering the allowable deflection and weight of the structure.

B. Install isolators so they can be easily removed for replacement.

C. Mount all equipment level.

D. Install all isolators per manufacturer's instructions.

E. Remove space blocks and similar devices intended for temporary protection during shipping or installation.

3.2 AIR HANDLING EQUIPMENT

A. Install un-housed base mounted type spring isolators to suit installation and as shown on the drawings. Install hanger type isolators for suspended units.

B. Vaneaxial Fans: Install two horizontal thrust restraints, one on each side of the fan at the centerline of thrust.

C. Internally Isolated Fans: Install entire fan assembly on neoprene base pads bolted to the housekeeping pad or floor with isolation bolts and washers as recommended by the fan

manufacturer.

D. Install flexible connectors between duct and fan or other sound or vibration initiating equipment. Use 12 ounce neoprene fabric per Section 15800, Air Distribution. Allow a four inch minimum gap between duct and equipment with sufficient slack so that the installation is not tight.

3.3 AIR COMPRESSORS AND RECIPROCATING EQUIPMENT

A. Isolate equipment using restrained neoprene base pads.

3.4 BOILERS

A. Isolate equipment using neoprene base pads.

3.5 COILS, UNIT HEATERS AND OTHER HEATING UNITS

A. Isolate suspended units using hanger type springs.

3.6 PIPES

A. Install hanger type spring isolators for the first three pipes supports away from isolated equipment to which piping is connected having deflections equal to that of the equipment isolation. Install flexible pipe connectors where pipes connect to isolated equipment.

B. Size supports for horizontal pipes 2-1/2" and larger, which is spring isolated, for a minimum starting deflection of 3/4" with the pipe filled.

C. Where pipes two inches and smaller are isolated, use either Potter Roemer or Stoneman #S100, S500, S200 or S600 isolators or support the pipes on its insulation with a sheet metal shield, using a section of 6# density insulation under the hanger.

D. Size vertical pipe supports with deflection capability equal to four times the anticipated expansion or contraction. Install temporary anchors as required to permit preadjustment of springs in the risers, to fix direction of pipe movement and final operating deflection of the springs.

3.6 SOUNDPROOFING OF PIPE PENETRATIONS THOUGH WALLS AND FLOORS

A. Use metal sleeve sized with one inch annular clearance between pipe or pipe insulation and inside of sleeve.

B. Grout sleeve tightly to full thickness of wall or slab if sleeve is not cast in concrete.

C. Pack clearance between pipe or pipe insulation and inside of sleeve to full depth with 3/4 PCF fiberglass.

D. Seal both ends airtight with 1/2" thickness John-Manville "Duxseal" or approved.

3.7 SOUNDPROOFING OF DUCT PENETRATIONS

A. Use metal sleeves sized with 1/2 inch annular clearance around duct.

B. Grout sleeve full thickness of wall or slab if sleeve is not cast in concrete.

C. Pack clearance between duct and sleeve to full depth with 3/4 PCF fiberglass.

D. Seal both ends airtight with 1/2" thickness John-Manville "Duxseal" or approved.

3.8 EARTHQUAKE ANCHORS

A. Adequately anchor non-isolated equipment weighing more than 100 pounds to resist lateral earthquake forces. Tank weights shall include contents.

B. Total lateral (earthquake) force is 2.75 times the equipment weight acting laterally in any direction through the equipment center of gravity for spring isolated equipment. Provide adequate backing at structural attach points to accept the forces involved. Use procedure specified in International Building Code under "Earthquake Regulations" for fixed equipment.

C. Do not exceed 1.5 inches maximum lateral displacement due to the computed earthquake force.

D. In lieu of calculations, floor mounted equipment weighing less than 2000 pounds may have one 6" x 6" x 3/8" x 18 inch steel angle bolted to the floor with four 5/8 inch diameter bolts placed on each of four sides of the equipment.

3.9 SEISMIC RESTRAINTS

A. Install seismic snubbers and restraints for pipes, ductwork, and equipment where weight exceeds 300 pounds including contents and base.

1. Install all directional seismic snubbers for the following base mounted items: Air handling units, pumps, water heater. At Contractor's option, restrained base mounted type spring isolators bolted to the floor slab or housekeeping pad may be installed in lieu of unhoused type spring isolators plus seismic snubbers. Similarly, internally isolated fans shall have seismic snubbers.

B. Locate snubbers and restraints as close to the isolators as possible. Install with factory set clearances.

C. Install snubbers and restraints with 1/4" nominal clearance to equipment. Install the brackets as close to the equipment as possible, but not in contact with the equipment when in normal operation.

D. Install cables for hung equipment, ductwork, and pipes three inches and larger.

1. Attach pipe cables to structural members where available and to equipment

supports if structural members are not accessible. Install with sufficient slack to avoid short circuiting the vibration isolators.

2. Locate cables at the first hanger near the equipment and at every hanger thereafter, as required by UMC.

END OF SECTION 230548

PART 1 - GENERAL

1.1 DESCRIPTION

A. Related Work Specified Elsewhere.

1. Hydronic Piping & Specialties: Section 232100.
2. Air Distribution: Section 233000

B. Description: This section describes general requirements and methods of execution relating to the testing and balancing of the mechanical systems provided on this project.

C. Scope.

1. Furnish the services of a qualified and approved Balancing and Testing Agency to perform the work of this specification section.

2. The work of this section includes but is not necessarily limited to:

a. Testing and balancing mechanical systems.

b. Providing a final report.

3. The work of this section does not include:

a. Adjusting burners for proper combustion operation.

b. Domestic water distribution system adjustment.

c. Liquid waste transfer system adjustment.

1.2 APPLICABLE STANDARDS

A. SMACNA Manual for the Balancing and Adjustment of Air Distribution Systems.

B. American Air Balancing Council (AABC) Recommended Procedures.

1.3 QUALIFICATION OF BALANCING AND TESTING AGENCY

A. Subcontractor minimum qualifications include:

1. Maintain a complete service organization that has operated within Alaska for at least three years prior to bid date of this project.

2. Demonstrate satisfactory completion of five projects of similar size and scope in the state of Alaska. Provide references, if requested.

1.4 TIMING OF WORK

A. Do not begin balancing and testing until the mechanical systems are completed and in full working order.

B. Schedule the testing and balancing work in cooperation with other trades.

C. Complete and submit the final testing and balancing report before the date of final project completion.

PART 2 - PRODUCTS

2.1 Submit qualifications of Testing and Balancing Agency.

2.2 Submit list of all testing equipment complete with copies of latest calibration certificates.

PART 3 - EXECUTION

3.1 INSTRUMENTS

A. Maintain instruments used in an accurately calibrated condition and in good working order. Use instruments with the following minimum performance characteristics.

B. Air Measurement Instruments: Direct reading in cubic feet per minute or feet per minute velocity, 2% accuracy.

C. Static Pressure Instruments: Direct reading in inches water gauge, 2% accuracy.

D. RPM Instruments: Direct reading in revolutions per minute, 1/2% accuracy, or revolution counter accurate within two counts per 100.

E. Temperature Readout: Direct reading in degrees F., ∀1EF.

F. Pressure Readout: Direct reading in inches of water, feet of water or psi, in accordance with range required. 1/2% accuracy.

3.2 GENERAL PROCEDURES FOR ALL SYSTEMS

A In cooperation with the control manufacturer's representative, coordinate adjustments of automatically operated dampers and valves, including the controlling thermostats, to operate as specified, indicated, and/or noted.

B. Use manufacturer's ratings on equipment to make required calculations.

C. MAKE FINAL ADJUSTMENTS FOR EACH SPACE PER HEATING COMFORT REQUIREMENT. State reason for variance from design cfm, i.e., "too noisy", "too drafty", temperature spread, etc.

3.3 REQUIREMENTS FOR ALL AIR HANDLING SYSTEMS

A. Verify that system is free of debris, that inlets and outlets are not obstructed, and that filters are clean.

B. Identify each diffuser, grille, and register as to specific location and area.

C. Identify and list diffusers, grilles, registers, and other equipment tested.

D. In readings and tests of diffusers, grilles, and registers, include required and tested velocity and required and tested air quantity after adjustments. If test apparatus is designed to read the air quantity directly, velocity readings may be omitted. Identify test apparatus used. Identify wide open runs.

E. Adjust diffusers, grilles, and registers to minimize drafts and excess noise in all areas.

F. Maintain relative space-to-space pressure and temperature relations implied or stated on drawings.

G. Perform pitot traverse of main ductwork to determine airflow and record. Utilize airflow measuring systems where provided, in lieu of pitot traverse.

3.4 BALANCING LOW PRESSURE CONSTANT VOLUME DUCTWORK

A. Analyze system and identify major branches. Tabulate design air quantity for each branch.

B. Select the branch which appears to be the longest run from the fan or to have the highest static pressure requirement. Adjust the other branch dampers or the fan to establish 100% design airflow through the selected branch.

C. Adjust the air quantity through each air inlet (exhaust or return systems) or outlet (supply systems) on the selected branch to be proportionately within ∀10% with at least one balancing damper serving an inlet or outlet left wide open.

D. Proceed to another branch and balance each inlet or outlet to be proportionately within ∀10%, again leaving at least one inlet or outlet wide open. Repeat this process until all inlets or outlets are balanced proportionately.

E. After inlets or outlets have been balanced proportionately, balance each branch together to be proportionately within ∀10%, leaving at least one branch damper wide open.

F. Adjust the fan to provide ∀10% of design air quantity.

G. Secure each branch and inlet or outlet damper and mark the balanced position of each quadrant.

3.5 CONSTANT VOLUME FAN ADJUSTMENT

A. Balance ductwork before making final fan adjustment.

B. Read and record motor amperage and voltage on each phase leg. Reduce fan RPM if necessary so that motor running amperage does not exceed motor name plate amperage. Record final amperage, voltage and RPM.

C. Read and record system suction and discharge static pressures.

D. Record airflow.

E. Read and adjust system for minimum design cfm outside air, as shown.

F. Read and record entering and leaving air temperatures (db heating) across coils.

G. Read and record static pressure drop across each filter and coil bank.

3.6 BALANCING REPORT

A. Compile the test data and submit eight copies for forwarding to the Contracting Agency for analysis at the time of substantial completion.

B. Include a complete list of all test equipment used, including apparatus manufacturer's name, model number, serial number, and date last calibrated.

C. Include complete identification of all elements. Identify by terminal unit number, room name and number, air outlet or inlet symbol, orientation in room, baseboard symbol, etc., to clearly and positively identify the location of each element.

D. Include test data specified in addition to test data recommended in the applicable standards referenced in Part 1. Tabulate name plate data of balanced equipment and of the associated motors.

E. Tabulate data separately for each system. Describe balancing method used for each system if different than specified.

F. Include at the front of the report a summary of problems encountered, deviations from design, remaining problems, recommendations, and comments.

G. If problems are encountered preventing a full and complete balance, issue a preliminary report of all deficiencies, problems and such. Deliver report to Contracting Agency.

END OF SECTION 230593

PART 1 - GENERAL

1.1 DESCRIPTION

A. Related Work Specified Elsewhere.

1. Mechanical General Requirements: Section 230000.
2. Hydronic Piping & Specialties: Section 232100.
3. Air Distribution: Section 233000.

B. Description.

1. This section describes specific requirements, products and methods of execution which relate to the insulation of ducts, pipes and other surfaces of the mechanical installation.

2. Insulation is provided for the following purposes:

a. Energy conservation.
b. Control of condensation.
c. Safety of operating personnel.

PART 2 - PRODUCTS

2.1 Furnish new, unused, and undamaged products of current standard manufacture, and of latest design and best quality.

2.2 Where more than one type of material is specified, the Contractor may choose which type; however, he must state which types of material he proposes to use in his submittal.

2.3 FIRE RATING OF MATERIALS

A. Provide insulation products used aboveground in building with burning characteristics not to exceed the following, rated according to NFPA 255 "Method of Test of Surface Burning Characteristics of Building Materials": Flame Spread 25, Fuel Contributed 50, Smoke Developed 50.

B. Insulation specified for use underground and aboveground away from the building, might have other burning characteristics. Use such products only where specifically required.

2.4 FIBERGLASS INSULATION

A. Pipe insulation products as follows:

1. Thermal conductivity K = 0.24 at 100EF. mean temperature.

2. Factory applied vapor-barrier flame retardant all service jacket and tape, with permeability rating = 0.02 perms.

3. Provide insulation sections with Knauf 3-M developed closure system or pressure sensitive adhesive on both overlap seam and mating jacket surface.

4. Fitting insulation materials may include:

   a. Mitered segments of pipe insulation.

   b. Compressed glass fiber blanket, with an outer coating of insulating/finishing cement.

   c. Insulating/finishing cement.

   d. Insulating cement with an outer coating of insulating/finishing cement.

   e. Premolded PVC factory-made fitting covers.

   f. Insulating/finishing cement to be asbestos free.

B. Ductwork insulation products as follows:

1. Average thermal conductivity K = 0.27 @ 75EF. mean temperature.

2. Factory-applied vapor barrier flame retardant Foil Reinforced Kraft (FRK) or all service jacket and tape, with permeability rating = 0.02 perms, 1 pcf density.

3. In finished areas and mechanical rooms where ducts are exposed, use rigid board insulation, 3 pcf density.

4. Maintain a complete vapor barrier throughout all ductwork insulation applications.

2.5 METAL JACKETING

A. 27 gauge (U.S. Standard) heavy corrugated aluminum.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION AND WORKING CONDITIONS

A. Do not apply insulation materials until surfaces to be covered are clean and dry and foreign material, such as rust, dirt, etc., is removed.

B. Keep insulation clean and dry during installation and during the application of any finish.

C. Do not install the insulation on pipe fittings, and pipe joints until the piping is tested and approved.

D. Do not apply under conditions of excessive humidity or at temperatures below 50EF. or above 100EF.

3.2 TECHNIQUE FOR APPLICATION TO PIPES

A. Close longitudinal joints of pipe insulation firmly and butt insulation sections firmly together. Stagger all joints.

B. Neatly and smoothly adhere all laps and butt strips.

C. Replace insulation having loose joints or laps.

D. Where insulated pipes are run through sleeves and other openings, provide continuous insulation.

3.3 TECHNIQUE FOR APPLICATION TO PIPE FITTINGS, UNIONS AND VALVES

A. Insulate fittings, unions, valves and flanges to the same thickness as the pipe insulation, as required by the specific system service.

B. Any of the following methods of insulation is acceptable.

1. Blanket Wrap: Wrap the fitting with compressed glass fiber blanket. Wire the blanket securely in place, then cover with a smooth layer of insulating/finishing cement. Cover with glass mesh tape, adhering it with an adhesive coating.

2. Fabricated Segments: Cut mitered segments from pipe insulation that has the same wall thickness as adjacent pipe insulation, to form a cover which will fit snugly around the fitting. Wire the segments firmly in place and seal the joints with insulating/finishing cement. Apply adhesive coating and wrap with glass mesh tape, then apply another layer of the same coating over the whole assembly.

3. Cement: Apply insulating or insulating/finishing cement, molding it to the contour of the fitting. When area is large apply an under layer of cement, wrap this with glass mesh tape, then apply an outer layer of cement. If the insulation is not concealed, the exposed surface of insulating/finishing cement to have a final glass mesh tape wrap embedded in adhesive.

C In each of the listed methods, to protect the insulation against contact damage, apply an adhesive coating when the cement is completely dry and hard, then wrap with glass mesh tape. Apply another coating of adhesive over the whole assembly.

D. If pre-molded PVC fitting covers are provided, glass mesh tape is not required.

3.4 TECHNIQUE FOR APPLICATION TO DUCTWORK

A. Impaling Over Pins: Install insulation with edges tightly butted. Impale rigid board insulation on pins welded on the duct and secure with speed clips. Trim off pins close to speed clip. Space pins as required to hold insulation firmly against duct surface, but not less than one pin per square foot. Seal joints and speed clips with glass fabric set in adhesive. Provide metal angle at corners to protect edges of insulation. Pins secured to duct with adhesive not acceptable.

B. Other Method of Securement: If the welded pin method is impossible, secure the insulation to the duct with adhesive. Cover the entire surface of the metal with adhesive when applying to the underside of horizontal ducts. Application to top and sides may be in strips with a minimum of 50% coverage. Additionally secure insulation with No. 16 galvanized wire on not

more than 12" centers. Provide metal angle at corners to protect edges of insulation. Seal joints as above.

3.5 COLD PIPE INSULATION REQUIREMENTS

A. Insulate piping for domestic cold water, vents through roof, and any other cold pipes, using one inch thickness fiberglass

B. Provide a complete vapor barrier throughout the whole system including fittings, unions, valves, and flanges. Use only vapor barrier adhesives and coatings. Stapling of jacket not permitted.

C. Cover ends of insulation sections with an adhesive coating at intervals of not more than 21 feet. Insulate accessories, valves, flanges, etc.

3.6 HOT PIPE INSULATION REQUIREMENTS

A. Insulate domestic hot water and circulating pipes, and other hot pipes, using one inch thickness fiberglass for pipe sizes through 2", and 1-1/2" thickness fiberglass for pipe sizes 2-1/2" and larger.

B. Staples may be used to seal jacket.

C. Do not insulate unions, valves and flanges.

D. Cover insulation on fittings with pre-molded PVC fitting covers.

3.7 SPECIAL PIPE AND EQUIPMENT INSULATION REQUIREMENTS

A. Insulate plumbing vents from 1 foot below the heated space.

B. Insulate exposed waste and hot water pipes below handicapped lavatories.

3.8 DUCT INSULATION REQUIREMENTS

A. Insulate outside air, exhaust air, supply air and return air ducts for thickness and type as follows:

1. Outside air, two inch rigid fiberglass where exposed or flexible fiberglass where concealed.

2. Exhaust air, one inch rigid fiberglass where exposed or flexible fiberglass where concealed, back five feet from building discharge or as shown on drawings.

3. Supply air, one inch fiberglass. Provide insulation where shown on the drawings or per medium pressure duct schedule, per Section 15800, Air Distribution.

4. Return air, one inch rigid fiberglass, back five feet from mixing box, or as shown on drawings.

END OF SECTION 230700

PART 1 - GENERAL

1.1 DESCRIPTION

A. Related Work Specified Elsewhere.

1. Mechanical General Requirements: Section 230000.
2. Air Distribution: Section 233000.
3. Testing, Adjusting &Balancing: Section 230593.

B. Description: This section describes specific requirements, products, and methods of execution relating to the system of temperature controls.

C. Scope: Furnish and install the materials and or equipment to properly control all mechanical equipment furnished under this contract.

1. Temperature Control System shall be provided.

b. Electronic Control Devices: The subcontractor shall furnish and install all "terminal" controls. Typically, these controls will include room thermostats, radiation controls, unit ventilator dampers, control valves, etc.

1.2 ADJUSTMENT

Upon completion of the project, adjust and validate all thermostats, controllers, valves, damper operators, relays, etc., provided under this section. Place controls in proper operating order, and then demonstrate to the satisfaction of the Contracting Agency that all of the control systems perform the sequences specified and are functioning in perfect operating order. Work with the Balancing and Testing Agency to set up each system for proper operation.

1.3 INSTRUCTION

A. Prepare and submit operation and maintenance manuals, covering the function and operation of the control system on the project for use by operating and maintenance personnel.

1.4 WARRANTY

Upon acceptance of the building by the Contracting Agency or use of the equipment by the Owner for its intended purpose, whichever occurs first, a warranty period of one year commences. The warranty consists of a commitment by the temperature control contractor to provide, at no additional cost to the Owner, parts and labor as required to repair or replace such parts of the temperature control system that prove inoperative or faulty due to defective materials, control system design, or installation practices. This warranty excludes routine maintenance.

PART 2 - PRODUCTS

2.1 Furnish new, unused, and undamaged products of current standard manufacture, and of latest design and best quality.

2.2 Where more than one type of material is specified, the Contractor may choose which type; however, he must state which types of material he proposes to use in his submittal.

2.3 Furnish electronic operated controls.

2.4 MISCELLANEOUS DEVICES

A. Dampers.

1. Furnish two position dampers of the single or multiple blade type as required by the sequence of operation.

C. Thermostats.

1. Room Thermostats: Line or low voltage, two position devices as indicated on the plans. Furnish standard manufacturing configurations of single or multi-stage, as well as heating/cooling arrangements as required to provide an operable system. All thermostats shall bear the "Energy Star Label".

PART 3 - EXECUTION

3.1 COORDINATION

Coordinate this work with the work of other trades, and make arrangements for the complete and proper accomplishment of all related work.

3.3 SYSTEMS CONTROLLED

Provide complete automatic control system to provide specified sequence of operation and as indicated on the contract drawings.

END OF SECTION 230600

PART 1 - GENERAL

1.1 DESCRIPTION

A. Related Work Specified Elsewhere.

1. Mechanical General Requirements: Section 230000.

B. Description: This section describes specific requirements, products, and methods of execution relating to the provision of Fuel Gas Systems for the project.

C. Scope: Provide products, including above and below ground piping, connections to gas burning apparatus, and work at the gas source to provide a complete system.

1.2 APPLICABLE CODES

A. Provide products and installation in strict accordance with the following:

1. 2009 International Fuel Gas Code. (Including all local amendments)

1.3 CONNECTION TO UTILITY COMPANY GAS REGULATOR

Coordinate with the utilities contractor to establish the precise meter location, and to properly integrate their work with the other work of the project. Provide the connection at the gas regulator outlet using appropriate materials, compatible joints, supports, and all other products for proper interface. Verify that the piping has been inspected, tested, and approved before connecting to the outlet of the regulator assembly.

PART 2 - PRODUCTS

2.1 Furnish new, unused, and undamaged products of current standard manufacture, and of latest design and best quality.

2.2 Where more than one type of material is specified, the Contractor may choose which type; however, he must state which types of material he proposes to use in his submittal.

2.3 PIPING ABOVEGROUND

A. Low Pressure (Under 14" Water Column Pressure): Schedule 40 black steel pipe with black malleable iron fittings, threaded or welded black steel piping and fittings.

2.4 MISCELLANEOUS PRODUCTS IN CONTACT WITH GAS

A. Provide connectors, valves, and other appurtenances of a type designated and approved for handling the fuel gas used.

B. Products shall be AGA and UL labeled for the use intended.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Arrange products to be readily accessible for inspection, testing, and shutting off gas supply.

B. Install pipe and fittings clean and free from cuttings, burrs, and defects in structure or threading, and thoroughly brushed and scale blown.

C. Do not install any building service low pressure piping in concrete, in masonry, or below grade.

D. Provide connection at gas consuming appliances. Connect gas appliances and fixtures with connectors, gas cocks, and dirt legs in accordance with the requirements of the gas utility company and appliance manufacturer's instructions.

3.2 TESTING

A. Test gas piping before connection to gas source. Do not enclose or conceal any untested portion of the gas system.

B. Test piping in accordance with the International Fuel Gas Code.

END OF SECTION 231100

PART 1 - GENERAL

1.1 DESCRIPTION

A. Related Work Specified Elsewhere.

1. Mechanical General Requirements: Section 230000.
2. Mechanical Insulation: Section 230700.

B. Description: The section describes specific requirements, products, and methods of execution for the liquid heat transfer system throughout the project. The heating and cooling systems are specified elsewhere.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Water Systems (Copper or Steel Option).

1. Type L copper pipe, wrought copper fittings, 430 silver solder or 95/5 solder.

2. Steel Pipe Two Inches and Smaller: Schedule 40 black steel threaded pipe, cast iron fittings, Teflon tape on threads as a sealer, applied as recommended by tape manufacturer.

3. Steel Pipe 2-1/2" and Larger: Welded pipe and fittings.

B. Glycol Systems (Copper or Steel Option).

1. Type "L" copper pipe, wrought copper fittings, 430 silver solder or 95/5 solder.

2. Steel Pipe: All welded pipe and fittings. No threaded pipe allowed.

C. Emergency Generator Exhaust System.

1. Schedule 80 black steel welded pipe with long turn radius elbows.

2.2 PIPE PROTECTION SADDLES

A Shop fabricate or purchase manufactured saddles specifically designed for the use intended.

B. Furnish saddles where roller type pipe support is used, or where the pipe hanger is installed outside insulation for protection of insulating jacket.

2.3 UNIT HEATERS AND CABINET UNIT HEATERS

A. Furnish unit heaters and cabinet unit heaters of the types, capacities and performance shown in schedule on drawings.

B. Furnish cabinet unit heaters with throwaway filters and three speed fans with capacity based on medium speed.

C. Manufacturers: Trane, Ted Reed Thermal (T.R.T.), Sterling, Airtherm, Dunham-Bush, McQuay, American Air Filter, Sterling, or approved.

2.4 BASEBOARD RADIATION

A. Furnish baseboard radiation of the types, capacities, performance, and enclosure as scheduled and shown on drawings. 14 gauge steel cabinets. Furnish cabinets located below window walls with joints centered on each vertical mullion with each section of cabinet individually removable. Furnish access doors and locate valves to be accessible through doors.

B. Manufacturers: Sterling, Trane, Vulcan, Dunham-Bush, Rittling, or approved.

2.5 PUMPS

A. Furnish pumps of size, type and capacity shown on the drawings, with motors non-overloading throughout the possible operating pump curve. Furnish pump curve with submittal data marked to show operating point.

PART 3 - EXECUTION

3.1 TESTING AND CLEANING

A. Clean the complete new system thoroughly as follows:

1. Pressure flush the piping to remove black magnetic iron oxide and mill scale from the system.

2. Flush piping with a trisodium phosphate solution, per chemical manufacturer's recommendations, to remove grease. Pump solution through system at 180°F. for four hours. Flush with clean water. Use caution to add chemical to water and not water to chemical.

3. Repeat this process until the system is clean to the satisfaction of the Contracting Agency.

B. Hydrostatically test the system at 100 psi with no pressure drop over a four hour period, with system stabilized at design temperature.

C. Observe the system for leaks, faulty circulation, sufficient clearance for expansion and contraction of piping, etc., during all of the foregoing operations. Note and repair

deficiencies.

D. Exercise proper care during cleaning and flushing of systems to insure no damage done to any equipment, valves, fittings, or work of other trades involved in this project. Restore any system, components thereof, or work of other trades, so damaged, to new or original condition at no additional cost to the Owner.

E. All testing must be witnessed by a City of Homer Inspector or will be rejected. Testing certification to be included in operation and maintenance manuals.

3.2 Thoroughly clean the exterior of equipment at the completion of the work and touch up paint where finished surfaces have been damaged.

3.3 In systems containing glycol, provide only products specifically designed and approved for continuous operation with the glycol solution specified.

3.4 Install valves and other serviceable products for baseboard radiation, cabinet unit heaters, etc., in a manner to be operable and adjustable through access doors if the cabinet is not removable.

3.5 Install pressure and temperature test plugs on supply and return lines of heating and cooling coils, heat exchangers, pumps, three-way valves, other heat transfer equipment, and as shown on the drawings.

3.6 Install thermometers in separable wells on supply and return lines of heat exchangers and elsewhere as shown on the drawings. Install thermometers to be clearly visible and easily read from a standing position on the floor.

3.7 Fully coordinate and work directly with the Balancing and Testing Agency so that all systems are in correct operating order. Make corrections and adjustments as required by the Balancing and Testing Agency in a timely manner.

3.8 Install an expansion compensator at one end of each run of baseboard radiation pipe and element greater than 20 feet. Install anchor and alignment guides per manufacturer's recommendations.

3.9 Install all equipment in accordance with the manufacturer's recommendations.

3.10 Align pump and motor for base mounted pumps after piping is installed and when the system is operating at normal temperature.

3.11 Water Treatment: Upon start-up of the heating system whether for temporary or permanent use, after proper flushing and cleaning, implement the initial treatment. Provide additional water treatment during the construction phase to ensure the required level as recommended by the water treatment system manufacturer or supplier.

END OF SECTION 232100

PART 1 - GENERAL

1.1 DESCRIPTION

A. Related Work Specified Elsewhere.

1. Mechanical General Requirements: Section 230000.
2. Mechanical Insulation: Section 230700.
3. Testing, Adjusting &Balancing: Section 230593.
4. Controls and Instrumentation: Section 230900.

B. Description: This section describes specific requirements, products, and methods of execution relating to the project air distribution systems.

C. Provide air distribution systems as shown and specified for a complete and operating installation.

1.2 Provide air distribution work in accordance with the minimum provisions of the following codes and standards.

A. 2009 International Mechanical Code. (Including any all local amendments)

B. 2009 International Building Code. (Including all local amendments)

C. NFPA 90A Installation of Air Conditioning and Ventilating Systems.

D. NFPA 90B Warm Air Heating and Air Conditioning.

E. SMACNA HVAC Duct Construction Standards - Metal and Flexible.

F. SMACNA- Duct Liner Application Standard.

G. SMACNA- Fire Damper Guide.

H. AMCA Standard 210/ASHRAE Standard 51 Laboratory Methods of Testing Fans for Rating.

I. AMCA Publications 261 Directory of Licensed Products.

J. AMCA Standard 300 Reverberant Room Method for Sound Testing of Fans.

K. AMCA Standard 330 Laboratory Methods of Testing In-Duct Sound Power Measurement Procedure for Fans.

L. AMCA Standard 500 Test Methods for Louvers, Dampers, and Shutters.

M. UL 555 Standard for Safety Fire Dampers and Ceiling Dampers.

N. UL 555S Leakage Rated Dampers for Use in Smoke Control Systems.

1.3 FIRE AND SMOKEPROOFING

Construct and seal penetrations through floors and fire rated partitions to prevent the passage of fire and smoke. Determine the location of fire partitions before enclosing any ductwork. Obtain clarification from the Contracting Agency if unclear. Advise Contracting Agency of any fire dampers not shown on the drawings.

PART 2 - PRODUCTS

2.1 Furnish new, unused, and undamaged products of current standard manufacture, and of latest design and best quality.

2.2 Where more than one type of material is specified, the Contractor must state which types of material he proposes to use in his submittal.

2.3 FANS

A. General Requirements for Fans.

1. Furnish fans of size, type, and capacity scheduled on the drawings. Furnish fans constructed to AMCA Standards, AMCA listed and labeled.

2. Bearings:

   a. At field assembled unit fans, 400,000 hour bearings (AFBMA L-50) selected at maximum fan RPM.
   b. At factory assembled package units one horsepower and larger, 200,000 hour bearings (AFBMA L-50) selected at maximum fan RPM.
   c. At packaged equipment 3/4 horsepower and smaller, manufacturer's standard bearings.
   d. Arrange equipment for easy access to lubrication fittings. Furnish with extended grease lines to motor side.

3. Balance fans statically and dynamically at factory. Wheel and shaft balanced as a unit.

4. Factory paint fan housing, fan wheel (except aluminum), frame and support brackets with prime coat and enamel finish coat at factory after properly preparing surfaces.

5. Arrange fans to be cleanable and wheel, bearings, shaft, and drive to be removable. Furnish plug type cleanout doors or split fan housing. Gasket joints and bolt airtight. Bearing supports in fans larger than 11" shall be bolted construction for wheel removal. Welding of bearing supports not acceptable.

6. Provide fans with vibration isolators when scheduled to be internally spring isolated.
7. Assemble fans at factory, and test with permanent motor for proper operation, alignment, and balance.

8. Include sound power level data with fan submittals. If sound power level of substitute fan is greater than that of fan shown by 3 dBA, the substituted fan will not be approved.

B. Belt Drives (All Belt Driven Fans).

1. Provide V-belt drive with sufficient belts to prevent slipping at start-up. Select drive for 1.5 service factor.

2. On each fan 7-1/2 HP and smaller, provide variable pitch drive sheave with adjustable pitch diameter. Select drive sheave and fan pulley combination to provide fan RPM with drive adjusted to near midspan. Furnish motor adjustment to set belt tension.

3. Provide belt guard with hinged tachometer cap.

C. Centrifugal Fans.

1. Refer to General Requirements for Fans.

2. Provide belt drive as specified above.

3. Manufacturers: Loren Cook, Trane, Greenheck or approved.

2.4 FAN ACCESSORIES

A. Flexible Fan Connectors.

1. Furnish at inlet and discharge of each fan, unless internally isolated.

2. Material suitable to withstand the pressure and temperature encountered.

3. Manufacturer: Duro-Dyne Corporation Durolon, or approved.

2.5 AIR HANDLING UNITS

A. Furnish units of size, configuration, and capacity scheduled on drawings.

B. Fans.

1. Refer to General Requirements for Fans.

2. Provide belt drives as specified elsewhere.

3. Provide vibration isolators and flexible fan connection inside unit when fan is scheduled to be internally spring isolated. Vibration isolators, base, flexible connections, and seismic restraints shall comply with requirements the International Building Code.

C. Cabinet Construction.

1. The cabinet panels constructed from galvanized steel with a minimum thickness of 16 gauge. Panels adequately reinforced for the maximum anticipated static pressure involved. Panel joints bolted and caulked to insure the air-tightness of the cabinet. The base of the cabinet constructed from structural channels and angles to insure rigidity. Exterior factory baked enamel finish.

2. Casings rated for static pressure as follows:

   Class A - total S.P. of 0" to 3" maximum W.G.
   Class B - total S.P. of 3" to 5" maximum W.G.
   Class C - total S.P. of over 5" maximum W.G.

   All per AMCA Standard 99-1401-66.

3. The interior of the cabinet insulated with a minimum of 1 inch thick, 1.5 pound density fiberglass insulation applied with mechanical fasteners 12" on center.

D. Coil Sections.

1. Sized as required to hold coil.

2. Coil type, capacity, and configuration as shown and scheduled.

3. At cooling coils, provide watertight drain pan with drain to floor drain.

E. Filter Section.

1. Sized as required to hold filter type, arrangement, and elements shown and specified. Velocity shall not exceed 350 FPM.

2. Refer to filter requirements specified elsewhere in this section.

F. Mixing Box Section.

1. Blades provided with extruded vinyl or rubber edge seals. Blade ends to be sealed with aluminum "arc" seals. The external frame shall be of heavy gauge welded steel with 1/4" plate bearing bars and bronze or turcite insert bearings. Linkage shall be externally arranged for opposed-blade action.

2. Damper leak rate not to exceed 6 cfm per square foot of damper at 4.0" W.G. pressure.

3. Size dampers for maximum velocity of 1200 fpm.

G. Manufacturers: Trane, McQuay, York, or approved.

2.6 DUCTWORK

A. Low Pressure Ductwork Systems.

1. Definition: Ductwork systems where duct pressures do not exceed 2-inch W.G. maximum static pressure and duct velocity does not exceed 2000 FPM.

2. Ductwork Construction.

a. Galvanized steel sheets in accordance with SMACNA HVAC Duct Construction Standards for 1" W.G. pressure class.
b. Tape joints and seams with 4" wide Nashua #357 duct tape.

3. Rectangular Ducts.

a. Other approved joint construction of equivalent mechanical strength and air tightness to SMACNA standard methods may be used.
b. Where special rigidity or stiffness is required, construct ducts of metal, two gauge numbers heavier.
c. Ducts larger than 96" require special field study for gauging and supporting methods. (Furnish shop drawings for supporting and construction requirements.)

4. Round Ducts.

a. Fabricate round ducts from steel sheets of the following U.S. Gauge thickness, using the seam method shown.
b. Ducts up to 14" diameter are 26 gauge. Longitudinal or spiral seam. Exposed ducts shall be spiral seam.
c. Ducts 15" through 26" diameter 24 gauge. Longitudinal or spiral seam. Exposed ducts shall be spiral seam.
d. Ducts 27" through 36" diameter 22 gauge. Spiral lock seam.
e. Ducts 37" through 50" diameter 20 gauge. Spiral lock seam.
f. Ducts 51" through 60" diameter 18 gauge. Longitudinal or spiral lock seam.
g. Ducts 61" through 84" diameter 16 gauge. Longitudinal or spiral lock seam.

5. Transitions.

a. Fabricate tapered transitions at changes in duct size and at connections to fans and other equipment.
b. Offset shall not be more than 20E on diverging flow and 30E on converging flow unless shown otherwise on the drawings.

6. Elbows and Turning Vanes.

a. Where turning vanes are not installed, fabricate elbows with centerline radius equal to 1-1/2 times the width of the duct at the turn.
b. Turning Vanes: In all 90E turns in ducts where 1-1/2 radius elbows are not used, provide double radius turning vanes per SMACNA Figure 203:

1) Ducts 19" and Smaller: Use small double vanes with an inner radius of two inches and an outer radius of one inch mounted on 2-1/8" centers.
2) Duct 19" and Over: Use large double vanes with an inner radius of 4-1/2" and an outer radius of 2-1/4" mounted on 3-1/4" centers.

7. Flexible Duct.

a. Do not use flexible duct unless shown on the drawings.

b. At diffuser connections.

1) Furnish duct listed as UL-181 Class I air duct and constructed in compliance with NFPA 90A.
2) Minimum length 10', maximum length 14', unless shown otherwise. Install with not more than one 90 degree full radius bend.
3) Make joints with Nashua brand duct tape and 1/2" wide positive locking straps.
4) Minimum net sound insertion loss for duct as follows:

2.7 DUCT ACCESSORIES

A. Air Volume Controls.

1. Furnish air volume dampers or other control devices as shown at each low pressure duct main and branch for The Balancing and Testing Agency to adjust the system to produce the air quantities shown. Locate all dampers as far away from the outlet as possible.

2. Volume Dampers.

a. Rectangular Ducts Eight Inches and Less: Flat sheet, single leaf damper with a continuous rod; damper leaf two gauges heavier than the duct where installed. Duro-Dyne KL-7.
b. Round Ducts Eight Inches and Less: Flat sheet, single leaf damper two gauges heavier than the duct where installed. Duro-Dyne KS-145L for insulated ducts.
c. Rectangular Ducts Larger than Eight Inches: Opposed blade damper with blades mounted in a separate channel frame installed in duct. Equal to Ruskin CD-35 with Duro-Dyne KP-22 operator.
d. Round Ducts Over Eight Inches: Flat sheet, single leaf damper with a continuous rod; damper leaf two gauges heavier than the duct where installed. Duro-Dyne KL-7.
e. Provide Duro-Dyne damper rod clips, KP-25, 26 or 27.
f. All quadrants accessible and lockable. Furnish through ceiling damper operators for installations where quadrant is inaccessible behind non-removable ceilings.

3. Extractors not allowed.

B. Gravity Backdraft Dampers.

1. Furnish backdraft dampers counterbalanced to desired static pressure setting. Wide open static pressure drop not to exceed 0.05" W.G.

2. Damper blades aluminum with vinyl or neoprene applied to tops of blades. Where dampers are exposed to outside temperature, provide neoprene edged blades.

3. Damper frames extruded aluminum; Zytel bearings.

4. Assembly designed for operation at -20EF.

5. Ruskin model selected for velocity used.

C. Fire Dampers.

1. Folding blade type dampers with no part of blade in air stream.

2. Dampers UL labeled and constructed in accordance with NFPA 90A.

3. Fire dampers for medium pressure systems shall be rated for 10" W.G. minimum.

4. Sleeve gauge shall be at least equal to gauge of the duct as defined by appropriate SMACNA duct construction standard and described in NFPA 90A when one or more of the following duct sleeve connections are used: plain "S" slip, hemmed "S" slip, standing "S" slip, reinforced standing "S" slip, inside slip joint, and double "S" slip. In lieu of above mentioned "S" slip type connections Ruskin's UL classified Drivemate No. 14880 breakaway connection may be used per manufacturer's UL instructions.

5. Manufacturers: Ruskin, Air Balance, or approved.

D. Smoke Dampers and Combination Fire Smoke Dampers

1. Multiple blade type with fusible link and spring operator, powered open by integral electric or pneumatic operator. Each damper shall be 1-1/2 hour fire rated under UL 555, and shall further be classified by UL as a Leakage Rated Damper for use in smoke control systems under UL 555S, and bear a UL label.

2. Damper and actuator shall be tested and rated together to meet UL 555 and UL 555S requirements. If actuator is supplied by other than the damper manufacturer, UL requires actuator to be delivered to damper manufacturer for verification and marking. Appropriate mounting hardware and installation instructions must be provided by the damper manufacturer.

3. Manufacturer: Ruskin, Air Balancel, or approved.

F. Access Panels and Doors.

1. Low Pressure System Access Panels.

a. Sheet metal doors reinforced, cross-bracketed, or otherwise stiffened to prevent rattle or vibration.
b. Seal doors airtight with felt or foam edged gaskets.
c. Secure with hinges and sash locks.
d. Insulated type for installations where the immediate ductwork is insulated or sound lined.

2.8 GRILLES, REGISTERS AND DIFFUSERS

A. Furnish grilles, registers, and diffusers of the types and sizes shown on drawings.

B. Furnish with factory applied finish for extruded aluminum items and with factory baked enamel for steel items. Factory baked enamel finish shall match ceiling grid.

C. Furnish round, square, or rectangular diffusers complete with equalizing grid.

D. Equip diffusers with panels of the proper size to match the suspended ceiling layout or with the proper frame for surface mounting. Fully correlate diffuser and grille style, dimension, and fit, with ceiling type.

E. Manufacturers: Anemostat, Titus, or approved.

2.9 LOUVERS AND HOODS

Furnish air intake and exhaust devices through building walls and roof, as shown.

A. Standard Rooftop Hoods.

1. Size as shown; air pressure drop not to exceed 0.10" W.G.

2. Curb mount unit; heavy molded fiberglass top or galvanized metal with one inch interior duct liner, one inch-birdscreen, 18" high sound isolating curb. Barometric or motor operated damper as shown on the drawings.

3. Manufacturer: Penn Airette, or approved.

2.10 FILTERS

A. Filter Housings and Frames.

1. Furnish reusable ME filter housings and holding frames for filters.

2. Housings: Steel reinforced with bracing and gussets, welded, designed for no air leakage.

3. Access: Furnish serviceable filter access to filters.

4. Frames: Steel; polyester gaskets to prevent bypass; designed to accommodate any standard nominal size 24 x 24 or 24 x 12 filter without alteration of frame or housing.

5. Manufacturer: By filter manufacturer unless filter section furnished by air handling unit manufacturer.

B. Disposable Filters.

1. Capacities and sizes as shown. Disposable filters are required at air handling units and cabinet unit heaters.

2. Filters: Non-woven cotton fabric, pleated media type, with welded wire support grid and enclosing frame; reinforced with woven scrim backing.

3. Average Efficiency: 30-35% on ASHRAE Test Standard 52-76; 92% arrrestance.

4. UL listed as Class 2.

5. Filter support frame and grid designed to prevent media oscillation, separation, or collapse at maximum static pressure and velocity of system. Support frame of chipboard or other rigid material to prevent deformation during installation or removal.

6. Initial resistance at 500 fpm shall not exceed 0.30" W.G. clean.

7. Filter nominal thickness: Two inches except where unit allows only one inch thickness.

8. Furnish two complete sets of filters for use during construction, testing, and balancing. Install a new complete set of filters after testing and balancing has been completed. Total of three complete sets are required.

9. Manufacturer: Farr 30/30, or approved equal.

2.11 SOUND CONTROL

A. Lined Duct.

1. Furnish acoustically lined duct where shown to attenuate and control the transfer of airborne sound.

2. Lining: Flexible fiberglass blanket type insulation, bonded with thermosetting resin, fire ratings not to exceed flame spread 25, fuel contributed 50, and smoke developed 50.

3. Air friction correction factor 1.1 at 800 fpm.

4. Sound absorption coefficients tested in accordance with Test Method ASTM C-423 81 and ASTM E-795 F-25 mounting with 24 gauge sheet metal backing and based on 1-1/2 lb. per cubic foot density as follows:

THICKNESS	FREQUENCY					
	125	250	500	1000	2000	4000
1"	.16	.54	.67	.85	.97	1.01
2"	.33	.90	.96	1.07	1.07	1.09

5. All duct dimensions shown on drawings are net clear inside dimensions with duct liner. Install liner in compliance with requirements of NFPA 90A.

6. Manufacturers: Manville Linacoustic, or approved.

PART 3 - EXECUTION

3.1 LOW PRESSURE DUCTWORK

A. Fabricate and install ductwork in accordance with SMACNA HVAC Duct Construction Standards.

B. Install backdraft dampers for exhaust fans if motor operated dampers are not shown on the drawings or specified in Section 15900, Controls and Instrumentation. Install one inch mesh birdscreen, same material as for the louver or hood, at exhaust discharges, unless provided in the louver.

C. Install cooling coils in ductwork with insulated watertight drain pans with drain to floor drain or to point of disposal.

D. Install fire dampers, smoke dampers, and combination fire/smoke dampers in accordance with manufacturer's approved and listed UL instructions.

3.3 DUCTWORK SUPPORTS

A. Support ductwork to prevent sag, undue play, and swing.

B. Ducts 24" and Less: Provide with one inch x 18 gauge straps fastened to ductwork and to building construction. Space not more than eight feet on center.

C. Ducts 25" through 42": Provide mild steel rods fastened to angle iron stiffeners with nuts and to building construction with appropriate inserts, flanges, or clamps. Space not more than eight feet on center.

D. Ducts Over 42": Fasten hanger rods to angle stiffeners not more than four feet on center.

E. Recommend methods of fastening bracing to ductwork, include riveting, bolting, and tack welding.

F. Provide seismic restraints per Section International Building Code and SMACNA.

3.4 ACCESS

A. Furnish fans with consideration of location of motor and drive.

B. Install hinged access doors at fire dampers.

C. Arrange for the installation of access doors in general construction by the appropriate trade including paying for installation costs.

3.5 Install equipment and purchased ductwork systems in accordance with the manufacturer's recommendations.

3.6 Fully coordinate and work directly with the Balancing and Testing Agency so that all systems are in complete operating order. Make corrections and adjustments as required by the Balancing and Testing Agency in a timely manner.

END OF SECTION 233000

PART 1 -GENERAL

1.1 DESCRIPTION

A. Related Work Specified Elsewhere.

1. Mechanical General Requirements: Section 230000.
2. Vibration & Seismic Control: Section 250548.
3. Mechanical Insulation: Section 230700.

B. Description: This section describes specific requirements, products, and methods of execution for interrelated systems necessary for the generation of heat which will be distributed to the locations shown. The method of distribution of this heat is specified elsewhere.

1.2 Provide products per the manufacturer's instructions for the proper installation and operation of the systems specified.

1.3 Applicable Codes:

A. 2009 International Mechanical Code.
B. ASME Boiler and Pressure Vessel Code Section IV.
C. 2009 International Fire Code.

1.4 Provide automatic boiler controls listed in The International Mechanical Code, in addition to those specified.

PART 2 - PRODUCTS

2.1 GLYCOL BOILERS

A. Furnish factory assembled forced draft natural gas sectional cast iron boilers, rated for direct firing of glycol solution specified with the net IBR water capacity noted on the drawings.

B. Furnish the following features: Insulated flush metal jacket, burner mounting plate with refractory, pressure relief door, gas tight seal between sections, fire wall plates, flue collar with built-in breeching damper, ASME safety relief valve, combination pressure/ temperature/ altitude gauge, flange mounted gas burner, and any other items required to make boiler complete.

C. Furnish fully automatic factory wired controls, including the following: Operating aquastat, two (2) high limit aquastats, flame safety control, burner safety shutdown. Boiler control panel shall interface with controller installed in glycol supply header under Section 15900.

D. Furnish for each burner a gas train complete with dual automatic gas valves, proven intermittent gas pilot and air flow switch. Furnish each boiler with two low water safety

switches and Honeywell 7800 series burner control.

E. Furnish for each boiler a flame retention power gas burner for full modulation operation with pre-purge, proven low fire start, high fire run, and post-purge with modulating fire control. Furnish the gas burner with a pre-wired control panel with an electronic combustion safeguard burner primary control with pre-purge and post-purge programming, modulating sub-panel with manual potentiometer, an ultraviolet sensitive electronic flame detector, UL labeled, sized by the boiler manufacturer for the capacity noted on the drawings.

F. Furnish for each boiler an instrument panel attached to the boiler jacket to permit visual checking of the stack temperature and pressure, fire box pressure, supply and return glycol temperature and burner running time.

G. Manufacturer:

2.4 LOW WATER CUTOFF

A. Furnish each boiler with a manual reset low water cutoff wired in series with burner controls, McDonnell & Miller Model 63M or approved.

2.5 EXPANSION TANK

A. ASME constructed pre-pressurized diaphragm tank, 125 psi working pressure.

B. Tank construction steel shell with heavy duty butyl diaphragm.

C. Tank precharged to design system pressure.

D. Size and capacity as shown on drawings.

E. Amtrol Series "AX" Extrol expansion tank or approved equal.

2.6 MAKE-UP WATER ASSEMBLY

Reducing valve set at pressure shown on the drawings with reduced principle backflow preventer, strainer, three valve bypass for quick fill, and overflows to floor drain. Bell & Gossett, Watts or approved.

PART 3 - EXECUTION

3.1 Set equipment on a proper base or pad as recommended by the equipment manufacturer or as detailed on the drawings, compatible with the building structural system. Level equipment to within recommended tolerances. Submit shop drawings of proposed equipment layout and base.

3.2 Anchor equipment to building structure using appropriately sized bolts. Provide seismic restraint per Section 15160.

3.3 Install and wire boiler trim such as burner, low water cutouts, limit controls, relief valve, pressure and temperature gauge, and jacket for a complete and operating system.

3.4 Start-up Service: After completion of the installation, start the heating plant in the presence of a qualified representative of the boiler manufacturer and approved by the manufacturer's Alaska sales office, and provide a start-up report by this representative. The start-up report for each boiler shall include high and low fire readings for CO2, smoke Bacharach scale, net stack temperature, gas burning rate, firebox and outlet boiler pressure, and nozzle pressure. Include micro-amp or voltage reading for flame pressure. Submit a letter of certification with start-up report from this representative stating that the boilers are in correct operating order.

3.5 If equipment to be installed exceeds the weight of the specified equipment by more than 20%, or if the location is different than that shown on the drawings, submit shop drawings of revised structural loading, noting location of pertinent loads, and obtain approval prior to ordering equipment. Any additional costs for the structural building modifications to accommodate proposed substitute equipment shall be borne by the Contractor.

3.6 In systems containing glycol, install only products specifically designed and approved for continuous operation with the glycol solution specified.

3.7 Coordinate wiring so that burners and controls for each fired device are powered from a single electrical circuit serving that circuit.

END OF SECTION 235200

PART 1: GENERAL

1.01 SECTION INCLUDES

A. Packaged Rooftop air conditionors

1.02 REFERENCES

A. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
B. AMCA 99—Standards Handbook
C. AMCA 210—Laboratory Methods of Testing Fans for Rating Purposes
D. AMCA 500—Test Methods for Louver, Dampers, and Shutters.
E. AHRI 340/360 - Unitary Large Equipment
F. NEMA MG1—Motors and Generators
G. National Electrical Code.
H. NFPA 70—National Fire Protection Agency.
I. SMACNA—HVAC Duct Construction Standards—Metal and Flexible.
J. UL 900—Test Performance of Air Filter Units.

1.03 SUBMITTALS

A. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, electrical characteristics and connection requirements.
B. Product Data:
   1. Provide literature that indicates dimensions, weights, capacities, ratings, fan performance, and electrical characteristics and connection requirements.
   2. Provide computer generated fan curves with specified operating point clearly plotted.
   3. Manufacturer’s Installation Instructions.

1.04 OPERATION AND MAINTANENCE DATA

A. Maintenance Data: Provide instructions for installation, maintenance and service

1.05 QUALIFICAITONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience, who issues complete catalog data on total product.
B. Startup must be done by trained personnel experienced with rooftop equipment.
C. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters and remote controls are in place, bearings lubricated, and manufacturers’ installation instructions have been followed.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site.
B. Accept products on site and inspect for damage.
C. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

PART 2: PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Daikin Applied

2.02 GENERAL DESCRIPTION

A. Furnish as shown on plans, Daikin Applied Applied Rebel Single zone Heating and Cooling Unit model DPS. Unit performance and electrical characteristics shall be per the job schedule.
B. Configuration: Fabricate as detailed on prints and drawings:
   1. Return plenum / economizer section
   2. Filter section
   3. Cooling coil section
   4. Supply fan section
   5. Condensing unit section
C. The complete unit shall be cETLus listed.
D. Each unit shall be specifically designed for outdoor rooftop application and include a weatherproof cabinet. Each unit shall be completely factory assembled and shipped in one piece. Packaged units shall be shipped fully charged with R-410 Refrigerant and oil.
E. The unit shall undergo a complete factory run test prior to shipment. The factory test shall include a refrigeration circuit run test, a unit control system operations checkout, a unit refrigerant leak test and a final unit inspection.
F. All units shall have decals and tags to indicate caution areas and aid unit service. Unit nameplates shall be fixed to the main control panel door. Electrical wiring diagrams shall be attached to the control panels. Installation, operating and maintenance bulletins and start-up forms shall be supplied with each unit.
G. Performance: All scheduled EER, IEER, capacities and face areas are minimum accepted values. All scheduled amps, kW, and HP are maximum accepted values that allow scheduled capacity to be met.
H. Warranty: The manufacturer shall provide 12-month parts only warranty. Defective parts shall be repaired or replaced during the warranty period at no charge. The warranty period shall commence at startup or six months after shipment, whichever occurs first.

2.03 CABINET, CASING, AND FRAME

A. Panel construction shall be double-wall construction for all panels. All floor panels shall have a solid galvanized steel inner liner on the air stream side of the unit to protect insulation during service and maintenance. Insulation shall be a minimum of 1" thick with an R-value of 7.0, and shall be 2 part injected foam. Panel design shall include no exposed insulation edges. Unit cabinet shall be designed to operate at total static pressures up to 5.0 inches w.g.
B. Exterior surfaces shall be constructed of pre-painted galvanized steel for aesthetics and long term durability. Paint finish to include a base primer with a high quality, polyester resin topcoat of a neutral beige color. Finished panel surfaces to withstand a minimum 750-hour salt spray test in accordance with ASTM B117 standard for salt spray resistance.
C. Service doors shall be provided on the fan section, filter section, control panel section, and heating vestibule in order to provide user access to unit components. All service access doors shall be mounted on multiple, stainless steel hinges and shall be secured by a latch system. Removable service panels secured by multiple mechanical fasteners are not acceptable.

D. The unit base shall overhang the roof curb for positive water runoff and shall seat on the roof curb gasket to provide a positive, weather tight seal. Lifting brackets shall be provided on the unit base to accept cable or chain hooks for rigging the equipment.

2.04 ECONOMIZER SECTION

A. Unit shall be provided with an outdoor air economizer section. The economizer section shall include outdoor, return, and exhaust air dampers. The economizer operation shall be fully integral to the mechanical cooling and allow up to 100% of mechanical cooling if needed to maintain the cooling discharge air temperature. The outdoor air hood shall be factory installed and constructed from galvanized steel finished with the same durable paint finish as the main unit. The hood shall include moisture eliminator filters to drain water away from the entering air stream. The outside and return air dampers shall be sized to handle 100% of the supply air volume. The dampers shall be parallel blade design. Damper blades shall be gasketed with side seals to provide an air leakage rate of 4 cfm / square foot of damper area at 1" differential pressure per ASHRAE 90.1 Energy Standard . A barometric exhaust damper shall be provided to exhaust air out of the back of the unit. A bird screen shall be provided to prevent infiltration of rain and foreign materials. Exhaust damper blades shall be lined with vinyl gasketing on contact edges. Control of the dampers shall be by a factory installed direct coupled actuator. Damper actuator shall be of the modulating, spring return type. A comparative enthalpy control shall be provided to sense and compare enthalpy in both the outdoor and return air streams to determine if outdoor air is suitable for "free" cooling. If outdoor air is suitable for "free" cooling, the outdoor air dampers shall modulate in response to the unit's temperature control system.

2.05 FILTERS

A. Unit shall be provided with a draw-through filter section. The filter rack shall be designed to accept a 2" prefilter and a 4" final filter. The unit design shall have a hinged access door for the filter section. The manufacturer shall ship the rooftop unit with 2" construction filters. The contractor shall furnish and install, at building occupancy, the final set of filters per the contract documents.

2.06 COOLING COIL

A. The indoor coil section shall be installed in a draw through configuration, upstream of the supply air fan. The coil section shall be complete with a factory piped cooling coil and an ASHRAE 62.1 compliant double sloped drain pan.

B. The direct expansion (DX) cooling coils shall be fabricated of seamless high efficiency copper tubing that is mechanically expanded into high efficiency aluminum plate fins. Coils shall be a multi-row, staggered tube design with a minimum of 3 rows. All cooling coils shall have an interlaced coil circuiting that keeps the full coil face active at all load conditions. All coils shall be factory leak tested with high pressure air under water.

C. The cooling coil shall have an electronic controlled expansion valve. The unit controller shall control the expansion valve to maintain liquid subcooling and the superheat of the refrigerant system.

D. The refrigerant suction lines shall be fully insulated from the expansion valve to the compressors.

E. The drain pan shall be stainless steel and positively sloped. The slope of the drain pan shall be in two directions and comply with ASHRAE Standard 62.1. The drain pan shall have a minimum slope of

1/8" per foot to provide positive draining. The drain pan shall extend beyond the leaving side of the coil. The drain pan shall have a threaded drain connection extending through the unit base.

2.07 SUPPLY FAN

A. Supply fan shall be a single width, single inlet (SWSI) airfoil centrifugal fan. The fan wheel shall be Class II construction with aluminum fan blades that are continuously welded to the hub plate and end rim. The supply fan shall be a direct drive fan mounted to the motor shaft.
B. Fan assembly shall be a slide out assembly for servicing and maintenance
C. All fan assemblies shall be statically and dynamically balanced at the factory, including a final trim balance, prior to shipment.
D. The fan motor shall be a totally enclosed EC motor that is speed controlled by the rooftop unit controller. The motor shall include thermal overload protection and protect the motor in the case of excessive motor temperatures. The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase. Motors shall be premium efficiency.
E. The supply fan shall be capable of airflow modulation from 30% to 100% of the scheduled designed airflow. The fan shall not operate in a state of surge at any point within the modulation range.

2.08 HEATING SECTION

A. A hot water heating coil shall be factory installed in the heat section. The hot water heat section shall be installed downstream of the supply air fan. A factory-tested diffuser shall be used in order to provide air distribution across the coil. The rooftop unit shall include a piping vestibule. The coil connection shall terminate in the vestibule. All coil connections shall be copper, steel connections shall not be allowed in order to prevent dielectrics and corrosion.
B. Coils shall be fabricated of seamless 3/8" diameter copper tubing that is mechanically expanded into high efficiency rippled and corrugated aluminum plate fins. All coil vents and drains shall be factory installed. Hot water coil shall be fully cased to allow for easy replacement.
C. The coil shall have freeze protection and shall be controlled by the unit DDC controller. With the detection of a freeze condition the heating coil valve shall be driven fully open. The unit controller shall indicate an alarm.
D. Coil shall be factory leak tested with high pressure air under water.

2.09 CONDENSING SECTION

A. Outdoor coils shall be cast aluminum, micro-channel coils. Plate fins shall be protected and brazed between adjoining flat tubes such that they shall not extend outside the tubes. A sub-cooling coil shall be an integral part of the main outdoor air coil. Each outdoor air coil shall be factory leak tested with high-pressure air under water.
B. Fan motors shall be an ECM type motor for proportional control. The unit controller shall proportionally control the speed of the condenser fan motors to maintain the head pressure of the refrigerant circuit from ambient condition of 0~125°F. Mechanical cooling shall be provided to 25º F. The motor shall include thermal overload protection and protect the motor in the case of excessive motor temperatures. The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase.

C. The condenser fan shall be low noise blade design. Fan blade design shall be a dynamic profile for low tip speed. Fan blade shall be of a composite material.
D. The unit shall have scroll compressors. One of the compressors shall be an inverter compressor providing proportional control. The unit controller shall control the speed of the compressor to maintain the discharge air temperature.
E. Pressure transducers shall be provided for the suction pressure and head pressure. Temperature sensor shall be provided for the suction temperature and the refrigerant discharge temperature of the compressors. All of the above devices shall be an input to the unit controller and the values be displayed at the unit controller.
F. Refrigerant circuit shall have a bypass valve between the suction and discharge refrigerant lines for low head pressure compressor starting and increased compressor reliability. When there is a call for mechanical cooling the bypass valve shall open to equalizing the suction and discharge pressures. When pressures are equalized the bypass valve shall close and the compressor shall be allowed to start.
G. Each circuit shall be dehydrated and factory charged with R-410A Refrigerant and oil.

2.10 ELECTRICAL

A. Unit wiring shall comply with NEC requirements and with all applicable UL standards. All electrical components shall be UL recognized where applicable. All wiring and electrical components provided with the unit shall be number and color-coded and labeled according to the electrical diagram provided for easy identification. The unit shall be provided with a factory wired weatherproof control panel. Unit shall have a single point power terminal block for main power connection. A terminal board shall be provided for low voltage control wiring. Branch short circuit protection, 115-volt control circuit transformer and fuse, system switches, and a high temperature sensor shall also be provided with the unit. Each compressor and condenser fan motor shall be furnished with contactors and inherent thermal overload protection. Supply fan motors shall have contactors and external overload protection. Knockouts shall be provided in the bottom of the main control panels for field wiring entrance.
B. A single non-fused disconnect switch shall be provided for disconnecting electrical power at the unit. Disconnect switches shall be mounted internally to the control panel and operated by an externally mounted handle.

2.11 CONTROLS

A. Provide a complete integrated microprocessor based Direct Digital Control (DDC) system to control all unit functions including temperature control, scheduling, monitoring, unit safety protection, including compressor minimum run and minimum off times, and diagnostics. This system shall consist of all required temperature sensors, pressure sensors, controller and keypad/display operator interface. All MCBs and sensors shall be factory mounted, wired and tested.
B. The stand-alone DDC controllers shall not be dependent on communications with any on-site or remote PC or master control panel for proper unit operation. The microprocessor shall maintain existing set points and operate stand alone if the unit loses either direct connect or network communications. The microprocessor memory shall be protected from voltage fluctuations as well as

any extended power failures. All factory and user set schedules and control points shall be maintained in nonvolatile memory. No settings shall be lost, even during extended power shutdowns.

C. The DDC control system shall permit starting and stopping of the unit locally or remotely. The control system shall be capable of providing a remote alarm indication. The unit control system shall provide for outside air damper actuation, emergency shutdown, remote heat enable/disable, remote cool enable/disable, heat indication, cool indication, and fan operation.

D. All digital inputs and outputs shall be protected against damage from transients or incorrect voltages. All field wiring shall be terminated at a separate, clearly marked terminal strip

E. The DDC controller shall have a built-in time schedule. The schedule shall be programmable from the unit keypad interface. The schedule shall be maintained in nonvolatile memory to insure that it is not lost during a power failure. There shall be one start/stop per day and a separate holiday schedule. The controller shall accept up to sixteen holidays each with up to a 5-day duration. Each unit shall also have the ability to accept a time schedule via BAS network communications.

F. The keypad interface shall allow convenient navigation and access to all control functions. The unit keypad/display character format shall be 4 lines x 20 characters. All control settings shall be password protected against unauthorized changes. For ease of service, the display format shall be English language readout. Coded formats with look-up tables will not be accepted. The user interaction with the display shall provide the following information as a minimum:
    1. Return air temperature.
    2. Discharge air temperature.
    3. Outdoor air temperature.
    4. Space air temperature.
    5. Outdoor enthalpy, high/low.
    6. Compressor suction temperature and pressure
    7. Compressor head pressure and temperature
    8. Expansion valve position
    9. Condenser fan speed
    10. Inverter compressor speed
    11. Dirty filter indication.
    12. Airflow verification.
    13. Cooling status.
    14. Control temperature (Changeover).
    15. VAV box output status.
    16. Cooling status/capacity.
    17. Unit status.
    18. All time schedules.
    19. Active alarms with time and date.
    20. Previous alarms with time and date.
    21. Optimal start
    22. Supply fan and exhaust fan speed.
    23. System operating hours.
        a. Fan
        b. Exhaust fan

c. Cooling
d. Individual compressor
e. Heating
f. Economizer
g. Tenant override

G. The user interaction with the keypad shall provide the following:
1. Controls mode
a. Off manual
b. Auto
c. Heat/Cool
d. Cool only
e. Heat only
f. Fan only
2. Occupancy mode
a. Auto
b. Occupied
c. Unoccupied
d. Tenant override
3. Unit operation changeover control
a. Return air temperature
b. Space temperature
c. Network signal
4. Cooling and heating change-over temperature with deadband
5. Cooling discharge air temperature (DAT)
6. Supply reset options
a. Return air temperature
b. Outdoor air temperature
c. Space temperature
d. Airflow (VAV)
e. Network signal
f. External (0-10 vdc)
g. External (0-20 mA)
7. Temperature alarm limits
a. High supply air temperature
b. Low supply air temperature
c. High return air temperature
8. Lockout control for compressors.
9. Compressor inter-stage timers
10. Night setback and setup space temperature.
11. Building static pressure.
12. Economizer changeover
a. Enthalpy
b. Dry bulb temperature

13. Currently time and date
14. Tenant override time
15. Occupied/unoccupied time schedule
16. One event schedule
17. Holiday dates and duration
18. Adjustable set points
19. Service mode
    a. Timers normal (all time delays normal)
    b. Timers fast (all time delays 20 sec)

H. If the unit is to be programmed with a night setback or setup function, an optional space sensor shall be provided. Space sensors shall be available to support field selectable features. Sensor options shall include:
   1. Zone sensor with tenant override switch
   2. Zone sensor with tenant override switch plus heating and cooling set point adjustment. (Space Comfort Control systems only)

I. To increase the efficiency of the cooling system the DDC controller shall include a discharge air temperature reset program for part load operating conditions. The discharge air temperature shall be controlled between a minimum and a maximum discharge air temperature (DAT) based on one of the following inputs:
   1. Airflow
   2. Outside air temperature
   3. Space temperature
   4. Return air temperature
   5. External signal of 1-5 vdc
   6. External signal of 0-20 mA
   7. Network signal

2.12 ROOF CURB

A. A prefabricated heavy gauge galvanized steel, mounting curb shall be provided for field assembly on the roof decking prior to unit shipment. The roof curb shall be a full perimeter type with complete perimeter support of the air handling section and condensing section. The curb shall be a minimum of 14" high and include a nominal 2" x 4" wood nailing strip. Gasket shall be provided for field mounting between the unit base and roof curb.

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
1. Feeder Megohm Testing.
2. Receptacle Branch Circuit Testing.
3. Ground Fault Circuit Interrupter Testing.
4. Telecommunication Unshielded Twisted Pair Testing.
5. Optical Fiber Testing.
6. Telecommunication Backbone Bonding Testing.
7. Electrical Service and Separately Derived System Ground Testing.
8. Transformer Testing.
9. Phase Load Balance Test.
10. Fire Alarm Test.

1.2 REFERENCES

A. NETA ATS (International Electrical Testing Association) - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

B. ANSI/IEEE Std 81-1983 Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.

C. ANSI/TIA/EIA – 568-A-5 Commercial Building Telecommunication Cabling Standard.

D. ANSI/TIA/EIA – TSB67 Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cable Systems.

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.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit Test Reports per Section 26 00 20.

1.4 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/RECEPTACLE TESTER

1. Product Description: Branch circuit analyzer capable of receptacle testing of voltage drop under load, hot-neutral-ground conductor resistances, common mode (N-G) Voltage, and G.F.C.I. trip point.
2. Manufacturer: Ideal SureTest. Model: ST-1D Branch Circuit Analyzer.

C. TELECOMMUNICATION UNSHIELDED TWISTED PAIR TEST METER
1. Product Description: Hand-Held Cat 6/5E Level III Telecommunication Cable Analyzer to 350 MHZ. Prior to test upgrade the unit with latest software revision.
2. Manufacturer:
   a. HP WireScope Model: 350.
   b. Fluke Model: DSP 4100.
3. Equipment Accuracy: Per TIA/EIA TSB95.

D. OPTICAL FIBER TEST METER
1. Product Description: Light source and power meter and loss meter Fiber Probe attachment and remote unit for the Level III tester. Test probe range operating within the range of 850 + 30 nm and 1300 + 20 nm in accordance with ANSI/TIA/EIA-526-14
2. Manufacturer:
   a. HP WireScope Model: 350.
   b. Fluke Model: DSP 4100.

E. GROUND RESISTANCE CLAMP-ON METER
1. Product Description: Digital, direct reading clamp-on resistance ground tester.
2. Manufacturer: AEMC. Model: 3710 or 3730.
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).

F. 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.

1.5 TEST INSTRUMENT CALIBRATION

A. All test equipment shall be in good mechanical and electrical condition.

B. Provide calibration for the telecommunication UTP Level III test instrument directly traceable to the National Institute of Standards and Technology (NIST) of higher accuracy than that of the instrument tested.

1.6 MINIMUM REPORT INFORMATION

A. Report Criteria: After each test, promptly submit one copy of report to 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. Name of Tester and witnesses.
   3. Date and time of sampling or inspection.
   4. Identification of product and specifications section.
   5. Type of inspection or test.
   6. Date of test.
   7. Results of tests.
   8. Indicate compliance or non-compliance with Contract Documents.
   9. Final adjustment setting values where applicable.

B. Submit copy of all tests performed in the O&M manual.

C. Submit copy of all tests performed in the O&M Manual, include CDROM electronic copy of all telecommunication test full spectrum plots.

1.7 GENERAL REQUIREMENTS

A. Request for Tests: Notify Project Manager a minimum of 72 hours in advance of all tests.

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. Perform additional tests when test is performed incorrectly, deemed inaccurate, or incorrectly documented.

E. Perform all testing prior to substantial completion or system acceptance.

F. Retest all material, cables etc that are disturbed after testing.

G. 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

3.1 FEEDER CONDUCTOR TEST

A. Tests Criteria:
1. Use Megohm meter to test all feeder cables.
2. Perform insulation-resistance test on each panel feeder 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.

3.2 BRANCH CIRCUIT AND RECEPTACLE TEST

A. Test Criteria:
1. Use Branch Circuit Analyzer to perform the tests.
2. Test minimum each installed receptacle.

B. Test Criteria:
1. Open Hot.
2. Open Neutral.
3. Open Ground.
4. Hot and Neutral reversed.
5. Neutral and Ground reversed.
6. Hot and Ground reversed.
7. Ground resistance. (verify ground integrity).

3.3 RECEPTACLE GROUND FAULT CIRCUIT INTERUPPTER TEST

A. Test Criteria:
1. Use Branch Circuit Tester to perform test of each GFCI protected receptacle.

B. Test Values:
1. Trip Range: Between 6-9 ma within 6.5 seconds.

3.4 TELECOMMUNICATION UNSHIELDED TWISTED PAIR TEST

A. Incoming Inspection Test Criteria:
   1. Inspect all materials for damage.

B. Final Inspection Test Criteria:
   1. Perform test on every horizontal cable from patch panel to station outlet or other cables installed.
   2. Testing shall conform to ANSI/TIA/EIA Cat 5e recommendations.
   3. 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.
   4. 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.
      o. Propagation Delay and Delay Skew Specification for 100 ohm 4-pair cable.
   5. Provide summary of test results to flag any failed components.

C. Test Values:
   1. Meet or exceed the criteria per ANSI/TIA/EIA – 568-A-5 and TSB95.

3.5 OPTICAL FIBER CABLE TEST

A. Test Criteria:
   1. Initially test each optical cable with a light source and power meter utilizing procedures as stated in ANSI/TIA/EIA-526-14 Method B on every optical fiber strand installed.
   2. Provide detailed test results in native electronic instrument format and hard copy in the O&M Manual.
   3. Test each optical fiber strand at 850 nm and 1300 nm.
   4. Test each optical fiber strand from each end.

B. Test Values:
   1. Maximum Cable Attenuation:
      a. 850 nm - 3.5 dB/km.
      b. 1300 nm - 1.5 dB/km.
   2. Maximum Attenuation per connector Pairs: 0.75 dB.

3. Maximum Total Link Attenuation:
Link Attenuation=cable attenuation+connector attenuation.
4. =[(cable length)*(cable attenuation)]+[(1.5 dB)]

3.6 TELECOMMUNICATION BACKBONE BONDING TEST

A. Rack to TMGB or TGB:
1. Use multimeter to measure the resistance from each rack frame to the adjacent insulated grounding busbar.
2. Record resistance value in Ohms.

B. Telecommunication Backbone Bonding:
1. Use ground resistance clamp-on meter to measure the resistance with meter clamped at on each telecommunication backbone bonding at each isolated busbar.
2. Record resistance value in Ohms and detected current in Amperes.

C. Test Values:
1. Maximum resistance from Rack to adjacent busbar: 0.01 Ohms.
2. Back Bone Bonding resistance: 5 Ohms.

3.7 ELECTRICAL SERVICE AND SEPARATELY DERIVED SYSTEM GROUND TEST

A. Test Criteria:
1. Use ground resistance clamp-on meter to measure the resistance of service ground with meter clamped between system neutral bond and each grounding electrode. Perform this test on new or existing services and all separately derived systems.
2. Record resistance value in Ohms.

B. Test Values:
1. Ground maximum resistance: 25 Ohms.

3.8 TRANSFORMER TEST

A. Electrical Test:
1. Use Multimeter to perform test.
2. Measure output voltage on secondary side.

B. Test Values:
1. Voltage Output: 120 Volts.
2. Adjust transformer taps to provide closet possible output to 120 Volts within plus or minus 5%.

3.9 PHASE LOAD BALANCE TEST

A. After energizing building loads conduct a phase load balance test for each panelboard with a clamp on ammeter.

B. Shift loads to provide current balance within 10% of the other phases.

3.10 FIRE ALARM TEST

A. At minimum provide 100% test of the new fire alarm devices and submit test report. Test in accordance with NFPA 72 and local fire department requirements.

B. Provide 72 hour notice to project manager and Anchorage International Airport prior to Substantial Completion Testing.

C. Testing shall include the following verifications at minimum:
1. The functional operation or re-settable devices (manual stations, detectors, etc.) and circuit.
2. The functional operation of alarm devices and circuits.
3. The functional operation of monitored device circuits.
4. The functional operation of control and output circuits.
5. The supervision function of initiating, indicating, monitoring, Control and Supply Circuits.
6. Central Station Automatic signaling.
7. Proper sequences of mechanical control.
8. Verify wire size, power supply, number of devices on the circuit etc. are suitable to support 100% of the devices being in alarm or operated simultaneously.
9. Test a representative number of devices for trouble by removing the detector from its base. The address and trouble condition for each shall be displayed. Insert a different type of detector into base and verify address and trouble condition is displayed. The detector shall return to normal operation only when the proper detector type is inserted into the base.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Project close out requirements.
   2. Project close out documentation.

1.2 CLOSEOUT SUBMITTALS

A. Provide project closeout requirements and documentation of the following items:
   1. Project Clean Up.
   2. Demonstration of Electrical System.
   3. Operation and Maintenance Data.
   4. Record Drawings.
   5. Site Building Documentation.
   6. Test Records.
   7. Certificate of Completion

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 PROJECT CLEAN UP

A. Clean-Up - Leave project completely free of debris resulting from electrical work, and leave all electrical items clean.

B. Repair – Paint to match existing any surfaces damaged during construction. Repair or replace any items damaged during construction.

3.2 DEMONSTRATION OF ELECTRICAL SYSTEM

A. Electrical Inspection - Provide Owner with Certificate of Occupancy signed by the Inspector having jurisdiction.

B. 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.

C. 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.

3.3 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. General - 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 shut 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 troubleshooting information for lighting equipment, motor starters, drives 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 hard copy of each panelboard circuit directory and in excel format.
9. Provide Fire Alarm As-built shop drawings.

D. Telecommunication – In addition to the general requirements listed above provide the following additional requirements for the telecommunication system:
1. Provide all information included in the approved submittal.
2. Test reports required in accordance with Section 26 00 10. The test reports are to be provided in hard copy and electronically in native format of the tester on CDRom disk. Provide summary page both electronically and in hard copy of test results highlighting pass fail and *pass results.
3. 11 inch by 17 inch reduced size “As-built” drawings. Fold drawings accordion style to fit in standard size notebooks.
4. Provide a complete schedule of all telecommunications jacks with their jack numbers and associated cable number denoting TR, Rack, Patch Panel and Port

number in spread sheet format. Provide electronically and provide a copy mounted adjacent to each rack in a protective plastic jacket.

3.4 RECORD DRAWINGS

A. Contractor shall maintain one set of the contract electrical drawings and specifications and telecommunication system shop drawings 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 project manager prior to substantial completion.
   1. Mark record drawings with red pencil actual installation that 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.
   4. Provide red lined as-built drawings to the owner prior to final inspection.

3.5 SITE BUILDING DOCUMENTATION

A. Panelboard Circuit Directory.
   1. Provide panel circuit directory installed in each panelboard in accordance with Section 26 05 53.

B. One-Line Diagrams and Panel Map.
   1. Provide panelboard map and one line diagram installed adjacent to the MDP in accordance with Section 26 05 53.

C. Telecommunication Schedules.
   1. Provide schedule of telecommunication outlets adjacent to telecommunication rack in each telecommunication room for outlets served from that location in accordance with Section 26 05 53.

D. Telecommunication As-built Shop Drawings.
   1. Provide copy of telecommunication single line diagram of building system and floor plan of area served in each telecommunication room in accordance with Section 26 05 53.

3.6 TEST RECORDS

A. Test and document all equipment as required in Section 26 00 10 and submit with the Operating and Maintenance Manual.

3.7 CERTIFICATE OF COMPLETION

A. Submit at the time of the Substantial Completion Inspection, a complete letter in the following format:

I, _____(Name), of _____(Firm), certify that the work is complete in accordance with approved Contract Plans and Specifications, and authorized

change orders (copies of which are attached hereto) and will be ready for final inspection as of _____(Date). I further certify that the following requirements have been fulfilled:

1. Megger readings performed, _____copies attached.
2. Operating manuals completed and instruction of operating personnel is performed _____(Date) _____(Signed Owner's Representative).
3. Record document drawings are up to date, accurate, and ready to deliver to ANC.
4. Emergency systems are tested and fully operational.
5. Fire Alarm system is tested and fully operational.
6. Security System is tested and fully operational.
7. Telecommunications system test reports have been submitted to and approved by ANC. The test reports shall certify that the telecommunications system is complete, passes all test criteria, is fully operational, and that all work has been witnessed as specified.
8. Airport Paging Announcement Control System is tested and fully operational.
9. Ground-Fault systems performance tests are complete, copies of logs attached.
10. All other tests required by approved Contract Documents have been performed.
11. All specified Owner Training is complete.
12. All systems are fully operational. Project is ready for final inspection.

SIGNED:_____DATE:_____
TITLE:_____

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes general requirements for electrical installation and is applicable to all Division 26, 27, and 28 Sections.

1.2 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. Schedule work and provide all installation requirements to meet project schedule for local seasonal weather conditions.

E. Coordinate and provide all specific equipment and installation requirements of serving utility for electrical power, telecommunication, cable television.

F. Provide shop drawings for each low voltage system. Submit fire alarm shop drawings with all details required by plan review department. Make all necessary plan revisions for system approval by the AHJ.

1.3 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 NEC, EIA/TIA, NFPA 72, NFPA 101, and all MOA/State of Alaska 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 shown.

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 the symbol legend, called out on the drawings or specifications.

1.4 DEFINITIONS

A. "DATA" – Telecommunication CAT 6 or 5e equipment.

B. "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.

C. "EXPOSED" - Exposed to view after construction is completed.

D. "FURNISH" - Purchase materials as shown and specified. Deliver to project site at location shown to be installed by supporting crafts.

E. "INSTALL" - Set in place and connect equipment furnished by others for a complete and ready to use installation.

F. "PROVIDE" - Furnish all products, equipment, subcontracts, labor, testing, etc., required and install for a complete ready to use installation.

G. "SHOP DRAWING" - Detailed, dimensioned working construction drawing drawn to a particular scale adequately showing installation intent, details and coordination of interrelated trades.

H. "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".

I. "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.

J. "WEATHERPROOF" - Electrical equipment noted as weatherproof or "WP" shall be provided with raintight enclosures or device plates as applicable.

K. (E) – Denotes "existing".

1.5 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. At each switchboard, panelboard 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.

D. 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 any equipment changes or substitutions affecting the electrical system. Coordinate overload elements to match actual equipment nameplates.

E. Obtain written permission from Architect/Engineer prior to cutting, drilling or weakening structural components.

1.6 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.
3. ANSI/IEEE C2 - National Electrical Safety Code (NESC).
4. International Building Code (IBC).
5. International Fire Code (IFC).
6. Americans with Disabilities Act Accessibility Guidelines (ADAAG).

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.
3. American Society of Testing and Materials - ASTM.
4. Institute of Electrical and Electronics Engineers - IEEE.
5. National Electrical Manufacturers' Association - NEMA.
6. National Fire Protection Association - NFPA.
7. EIA/TIA Telecommunications Standards.
8. BiCSi Telecommunications Distribution Methods Manual.

1.7 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 Division 26, 27, and 28 Specifications. Submittals shall comply with all requirements of Division 1. In addition, submittal shall comply with the following:
1. Each submittal copy shall be bound in an individual three-hole, 8-1/2"x11 hard back loose-leaf binder.
    a. Mark outer cover front and spine with job name.
    b. List the submittal contents in an index by specification section numbers and titles under first tab of binder.
    c. Provide subsequent tabs in binders for each specification section numbers on 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 binder 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, address, nearest supplier address, 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. 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.
   j. Delete all extraneous material data from submittal that does not apply to equipment specified and/or highlight the specific items that 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. Luminaires, lamps, ballasts and accessories.
   2. Gear, controls, raceways, pathways, conductors, devices etc.
   3. Low Voltage Systems.
   4. Submittals not conforming to these requirements will be returned for correction, without review.

1.8 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. Provide all materials to conform to applicable industry standards and Underwriters Laboratories standards. The same manufacturer throughout the project shall supply similar items.

1.9 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.

1.10 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 form 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 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.

PART 2 - PRODUCTS

2.1 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

3.1 WORKMANSHIP

A. All electrical work must be installed in strict accordance with the National Electrical Code and any applicable state or local codes.

B. Conductors and equipment of different voltage levels, frequency, current characteristics (AC & DC) or functions (normal vs. emergency, etc.) shall not share the same raceways or enclosures unless specifically shown on the drawings or approved by the Contracting Agency, or inherently necessary for correct system function (i.e., at transfer switches, transformers, etc.)

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes building wire and cable and wiring connectors and connections.

1.2 REFERENCES

A. NECA (National Electrical Contractors Association) - Standard of Installation.

B. NETA ATS (International Electrical Testing Association) - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.3 SYSTEM DESCRIPTION

A. Product Requirements - Provide products as follows:
   1. Stranded conductor for feeders and branch circuits 8 AWG and larger and stranded or solid 10 AWG and smaller.
   2. Stranded conductors for control circuits.
   3. Conductor not smaller than 12 AWG for power and lighting circuits.
   4. Conductors not smaller than 10 AWG for raceways with more than three circuits.
   5. Conductor not smaller than 14 AWG for control circuits.
   6. Conductor not smaller than 20 AWG for low voltage assemblies or 18 AWG otherwise.
   7. Minimum size for 20 amp branch circuit measured from the panelboard to the furthest device on the circuit unless noted on the drawings otherwise:
      a. 10 AWG conductors for 120 Volt branch circuits 80 feet to 120 ft.
      b. 8 AWG conductors for 120 Volt branch circuits greater than 120 feet.
      c. 10 AWG conductors for 277 Volt branch circuits 120 feet to 200 feet.
      d. 8 AWG conductors for 277 Volt branch circuits greater than 200 feet.
      e. 8 AWG for all exterior lighting circuits.
   8. Size branch circuit conductors for fixed loads such as lighting, motors etc per the actual connected amperage to provide less than 5% overall voltage drop for the system.

B. Wiring Methods - Provide the following wiring methods for all branch circuits and feeders:
   1. Heated indoor locations: THHN/THWN or XHHW-2 insulation in raceway.
   2. Exterior, wet or other cold locations: XHHW-2 insulation in raceway.

C. Conductors and cables for special systems not covered by this section are denoted in the associated specification section, drawing reference or as recommended by the system manufacturer whichever is greater.

1.4 DESIGN REQUIREMENTS

A. Conductor sizes are based on copper.

B. Provide all conductors sized per NEC requirements including adjustment factors for ambient temperature and more than three current carrying conductors per raceway.

C. Provide all branch circuits sized to provide less than 5% voltage drop from the panelboard to the last device on the circuit. Use the load provided in the panel schedule for calculations.

1.5 SUBMITTALS

A. Division 1 - Submittal Procedures and Section 26 05 00.

B. Product Data: Submit for building wire and each cable assembly type.

1.6 COORDINATION

A. Where wire and cable destination is indicated and routing is not shown, determine routing and lengths required.

PART 2 - PRODUCTS

2.1 THHN/THWN BUILDING WIRE

A. Product Description: General purpose single conductor stranded or solid.

B. Conductor: Class B or C stranded, annealed copper per UL 83 or 1063 or Aluminum for 2 AWG and larger.

C. Insulation: Polyvinyl chloride (PVC) sheathed with nylon jacket meeting requirements of UL 83. Sizes 1/0 AWG and larger marked “For CT Use” and be sunlight resistant.

D. Temperature: THHN 90 degrees C Dry and THWN 75 degrees C Wet.

E. Voltage: 600 Volts.

2.2 XHHW-2 BUILDING WIRE

A. Product Description: General purpose single conductor stranded or solid.

B. Conductor: Class B stranded, annealed copper per UL 44 or Aluminum for 2 AWG and larger.

C. Insulation: Crosslinked polyethylene (XLP) per UL 44.

D. Temperature: 90 degrees C.

E. Voltage: 600 Volts.

2.3 MC CABLE

A. Description: General pupose armored steel jacketed multi-conductor cable.

B. Jacket: Galvanized interlocking steel metal jacket. Cables located in concrete pours to be PVC jacketed listed for use in concrete. Cables for fire alarm to be color coded red.

C. Conductor/Insulation: Copper conductor with THHN 90 deg C, Color Coded. Rated for voltage of the application.

D. Ground: Integral ground conductor.

2.4 WIRING CONNECTORS

A. 8 AWG and smaller
1. Dry interior areas: Spring wire connectors, pre-insulated “twist-on” rated 105 degrees C per UL 468C. Crimp insulated fork or ring terminals for conductors terminating under screw type terminals, Thomas & Betts Sta-Kon or equal.
2. Motor connections: Spring wire connectors, pre-insulated “twist-on” rated 105 degrees C per UL 468C. Provide a minimum of 8 wraps of Scotch 33+ electrical tape around conductors and connector to eliminate connector back off.
3. Wet or exterior: Spring wire connectors, pre-insulated “twist-on”, resin filled rated for direct burial per UL 486D.
4. Lugs or terminals, where provided as standard manufacturer’s items on equipment or devices furnished, may be used.

B. 6 AWG and larger
1. Motor connection: 600 V, 90 degrees C., copper tin plated compression motor pigtail connector, quick connect/disconnect, slip on insulator. Thomas & Betts or approved equal.
2. Two way connector: 600 V, 90 degrees C., compression long barrel, copper tin plated. Thomas & Betts or approved equal. Insulate with Scotch 23 rubber insulating base covering and Scotch 33+ outer wrap.
3. Cable joints: 600 V, 90 degrees C., compression, copper tin plated. Thomas & Betts or approved equal. Insulate with Scotch 23 rubber insulating base covering and Scotch 33+ outer wrap.
4. Lugs or terminals, where provided as standard manufacturer’s items on equipment or devices furnished, may be used.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide color code schedule at each panelboard.

B. Provide continuous raceway system for all conductors and cables unless specifically noted otherwise on the drawings or specifications.

C. Route wire and cable to meet Project conditions.

D. Route conductors from each system in independent raceway system and not intermix in the same raceway, enclosure, junction box, wireway, or gutter as another system unless otherwise shown on the plans. Examples of circuits to not be intermixed are 480Y/277 with 208Y/120 Volt circuits, emergency power, line voltage circuits with low voltage wiring, power limited, telecommunication, direct current, etc.

E. Do not install XHHW-2 conductors when ambient temperatures are below –5 degrees C and THHN/THWN conductors when ambient temperatures are below 0 degrees C.

F. Provide stranded wire for all connections to motors, transformers and equipment that vibrates or requires flexibility.

G. Do not terminate more than one conductor per individual branch circuit breakers.

H. Install wire and cable in accordance with NECA "Standard of Installation."

I. Neatly train and lace wiring inside boxes, equipment, and panelboards supported with cable ties.

J. Provide cable supports as recommended by the NEC or cable manufacturer in vertical conduits.

K. Special Techniques - Building Wire in Raceway:
1. Pull conductors into raceway at same time.
2. Install building wire 4 AWG and larger with pulling equipment.

L. Special Techniques - Cable:
1. Protect exposed cable from damage.
2. Support cables above accessible ceiling using J-hooks or on cable tray. Do not rest cable on ceiling panels or ceiling systems.
3. Use suitable cable fittings and connectors for all box entries.

M. Special Techniques - Wiring Connections:
1. Perform wiring connections and splices only in accessible outlet or junction boxes.
2. Do not splice feeder conductors unless otherwise noted on the drawings.
3. Keep splices in underground junction boxes and handholes, and manholes to an absolute minimum. Where splices cannot be avoided, use a totally encapsulating splice kit as manufactured by 3M Company.
4. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
5. Clean conductor surfaces before installing lugs and connectors.
6. Strip conductor insulation to the exposed length as recommended by the manufacturer for the connector used.
7. Tape uninsulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor.
8. Install compression connectors for copper conductor splices and taps, 6 AWG and larger.
9. Install insulated spring wire connectors with plastic caps or compression when not available for copper conductor splices and taps, 8 AWG and smaller.

10. Where stranded conductors are terminated on screw type terminals install crimp on fork terminals. Do not place bare stranded conductors directly under screws.

3.2 WIRE COLOR

A. General
1. For wire sizes 10 AWG and smaller, install wire colors in accordance with the following:
a. Black and red for single phase circuits at 120/240 volts.
b. Black, red, and blue for circuits at 120/208 volts single or three phase.
c. Brown, orange and yellow for circuits at 277/480 volts single or three phase.
2. For wire sizes 8 AWG and larger, identify wire with colored tape at terminals, splices and boxes. Colors are as follows:
a. Black and red for single phase circuits at 120/240 volts.
b. Black, red, and blue for circuits at 120/208 volts single or three phase.
c. Brown, orange and yellow for circuits at 277/480 volts single or three phase.

B. Ground (Neutral) Conductors: White. When two or more neutrals are located in one conduit, individually identify each with proper circuit number. Provide gray color for all 277Volt neutrals.

C. Branch Circuit Conductors: Install three or four wire home runs with each phase uniquely color coded.

D. Feeder Circuit Conductors: Uniquely color code each phase.

E. Ground Conductors:
1. For 8 AWG and smaller: Green.
2. For 6 AWG and larger: Identify with green tape at both ends and visible points including junction boxes.

3.3 FIELD QUALITY CONTROL

A. Inspect and test per Section 26 00 10 – Electrical Testing.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
1. Rod electrodes.
2. Wire.
3. Mechanical connectors.
4. Exothermic connections
5. Lab Ground Bus.
6. Telecommunication Grounding and Bonding.

1.2 REFERENCES

A. ANSI/TIA/EIA - 607 Commercial Building Grounding and Bonding Requirements for Telecommunications.

B. NETA ATS (International Electrical Testing Association) - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

C. NFPA 70 (National Fire Protection Association) - National Electrical Code.

1.3 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. Metal gas piping system.
5. Rod electrode.

1.4 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 25 ohms maximum.

1.5 SUBMITTALS

A. Division 1 - Submittal Procedures and Section 26 05 00.

B. Product Data: Submit data on grounding electrodes and connections.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit Test Reports per Section 26 00 10.

1.7 COORDINATION

A. Division 1 - Administrative Requirements: Requirements for coordination.

B. Complete grounding and bonding of building reinforcing steel prior concrete placement.

PART 2 - PRODUCTS

2.1 ROD ELECTRODES

A. Product Description:
1. Material: Copper-clad steel.
2. Diameter: 3/4 inch.
3. Length: 10 feet.

B. Connector: Connector for exothermic welded connection.

2.2 GROUND AND BONDING CONDUCTOR

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.

2.3 MECHANICAL CONNECTORS

A. General Use: Non-reversible crimp type lugs only.

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.

2.4 EXOTHERMIC CONNECTIONS

A. Product Description: Exothermic materials, accessories, and tools for preparing and making permanent field connections between grounding system components.

2.5 LAB GROUND BUS

A. Wall mounted around room perimeter, solid copper, 1” wide minimum, ¼” thick, pre-drilled lug attachment holes mounted on standoff brackets.

2.6 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 standoff brackets.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove paint and surface contaminants at connection points.

3.2 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.
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.

3.3 METHODS OF CONNECTION

A. Make all ground cable splices, bonds, connections to ground rods, building steel, metal and piping systems by exothermic (thermal) welded or irreversible compression type connectors. Welded, irreversible or crimp lugs allowed above grade.

B. Provide exothermic (thermal) welded connections for all ground cable splices, bonds, connections to ground rods, building steel, and metal piping systems. Welded, irreversible or crimp lugs allowed above grade.

C. Grounding lugs or terminals, where provided as standard manufacturer's items on equipment or devices furnished, may be used.

D. Feeder raceway grounding bonds to be grounding type bushing with ground lug using mechanical compression screw.

E. Branch circuit junction and outlet boxes to be #10 green threaded screw into box with pigtail bonded to device for outlet boxes. Twist wire nut for splices. Size per NEC requirements.

F. Telecommunication ground bond connections to be barrel crimp on cable side and bolt with lock washer at termination side.

3.4 DISTRIBUTION AND BRANCH CICUIT PANELBOARDS

A. Provide feeder raceway ground bushing bonded to feeder ground conductors and ground bus of equal or greater size to the feeder grounding conductor for each feeder.

B. Provide ground bus for branch circuit and feeder ground terminations.

3.5 TRANSFORMERS (SEPARATELY DERIVED SYSTEMS)

A. Bond neutral (X0 Terminal) to ground at each transformer per NEC 250-30(a)(1).

B. Provide grounding electrode conductor bonded to nearest building steel sized with respect to the derived (secondary conductors) per NEC 250-30 and NEC 250-66.

C. Provide bond to metallic water piping system within 5 feet of entrance to the building NEC 250-104(a)(4).

D. Bond transformer internal shield and enclosure to ground system.

E. Provide raceway ground bushing bonded to ground for transformer primary sized per NEC table 250-122 and secondary raceways sized per NEC table 250-66 to the overcurrent protection device.

3.6 GENERAL INSTALLATION

A. Install rod electrodes at locations as indicated on the drawings spaced a minimum 10 feet apart.

B. Install grounding and bonding conductors concealed from view except in mechanical and electrical rooms.

C. Provide raceway for each grounding or bonding conductor. Bond the raceway and conductor together at each ferrous conduit termination with grounding bushings.

D. Clean each mechanical connection and coat with antioxidant prior to connection.

E. Provide exothermically welded connections to all connections that will be concealed or located below grade.

F. Install concrete encased electrode as shown on the drawings or a minimum of 25 feet 4 AWG bare copper wire in foundation footing bonded to the ground system. Provide minimum 2 inch concrete cover.

G. 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.

H. Provide bonding for each metallic raceway and wireway system to provide continuous electrical continuity. Provide bond to every box and enclosure.

I. 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.

J. 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.

K. Grounding electrical system using continuous metal raceway system enclosing circuit conductors in accordance with NEC.

L. 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.

M. Permanently attach equipment and grounding conductors prior to energizing equipment.

3.7 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 Main Grounding Bus bar (TMGB) in the main telecommunication room.
2. Provide a Telecommunication Grounding Bus bar (TGB) in each telecommunication room.
3. Provide an insulated 6 AWG copper minimum or as denoted on the plans Telecommunication Bonding Backbone (TBB) conductor.
4. Provide all bonds and bonding jumpers the same size as the TBB except where noted otherwise.
5. Provide a non-ferrous aluminum raceway or PVC in non-plenum rated spaces for the entire TBB system.
6. Bond the TMGB to the electrical service entrance ground.
7. Provide TBB that interconnects all TGBs to the TMGB bonding them together. Each TBB will originate at the TMGB and extend as a continuous conductor throughout the building with terminations, splices and taps only on TMGBs and TGBs located inside designated telecommunication spaces.
8. Bonds for the sole purpose of bonding the pulling junction boxes in the TBB may be installed within that box.
9. Provide a dedicated bond from each TMGB and TGB to the local building steel where available.
10. Provide a dedicated Alternating Current Equipment Ground (ACEG) bond from each TMGB and TGB to the electrical panel ground bus that feeds the power receptacles in the telecommunication space where the ground bus is located.
11. Bond each telecommunication horizontal raceway, cable tray, floor duct, metallic pathway or chase which enters a telecommunication space to the associated telecommunication ground bus bar with a 6 AWG minimum to a metallic ground bushing.
12. Provide a green color code or stripe with phase tape at each termination or accessible section.
13. Bond each telecommunication cable runway system in each telecommunication space to the associated telecommunication ground bus bar with a 6 AWG minimum or as denoted on plans.
14. Provide nonmetallic label for each TBB denoting cable ID and termination point at the remote end.

3.8 FIELD QUALITY CONTROL

A. Test electrical ground and bonding system in conformance with Section 26 00 10.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Conduit supports.
2. Formed steel channel.
3. Spring steel clips.
4. Equipment bases and supports.
5. Seismic Restraints.

1.2 REFERENCES

A. NFPA 70 (National Fire Protection Association) - National Electrical Code.

B. IBC (International Building Code).

1.3 SUBMITTALS

A. Division 1 - Submittal Procedures and Section 26 05 00.

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.

1.4 DESIGN REQUIREMENTS

A. Seismic Calculations:
1. Provide shop drawing and calculations for anchorage of electrical equipment and raceway systems. Shop drawings to include anchor bolt description, layout, sizes of materials, specifications and building structure to be used for attachment. Provide shop drawings and calculations sealed by registered structural engineer in the State of Alaska.
2. Seismic support design to resist earthquake forces in accordance with National Uniform Seismic Installation Guidelines for Architects, Engineers, Inspectors and Contractors.
3. Total lateral force to be taken as 1.0 times the equipment weight acting in any direction through the equipment center of gravity.
4. Shop Drawings and Calculations are not required for:
a. Floor mounted equipment weighing less than 400 pounds.
b. Raceways employing pre-approved seismic restraint systems.

PART 2 - PRODUCTS

2.1 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.

2.2 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.

2.3 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).

2.4 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.

2.5 SEISMIC SUPPORT WIRE AND CABLE

A. Product Description: #12 gage ceiling support wire where concealed. Aircraft stainless steel cable where exposed.

2.6 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

3.1 INSTALLATION - HANGERS AND SUPPORTS

A. Anchors and Fasteners:

1. Concrete Structural Elements: Provide expansion anchors. Powder actuated anchors can only be used when explicit owner approval is provide in writing to the contractor.
2. Steel Structural Elements: Provide beam clamps. Provide spring steel clips where concealed.
3. Concrete Surfaces: Provide expansion anchors.
4. Plaster and Gypsum Board Partitions: Provide sheet metal backing installed behind wallboard.
5. Hollow Masonry: Provide toggle bolts.
6. Solid Masonry Walls: Provide expansion anchors.
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.

C. Seismic Bracing:
1. Support and brace all electrical equipment and associated raceways per IBC requirements.
2. Provide 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 dedicated seismic support wires for each ceiling mounted light fixture weighing less than 50 pounds. Attach support wires to building structure independent from ceiling system and on opposing corners of the light fixtures to not allow fixture to drop more than 6 inches upon ceiling failure. Secure each end with three tight wraps within 1 inch at each end of the wire.

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.

3.2 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads of concrete, minimum 3-1/2 inches thick and extending 6 inches beyond supported transformer and floor mounted equipment. Anchor the housekeeping pad to the floor slab by dowels or rebar.

B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring of all equipment per manufactures recommendations and at the four corner points at minimum.

C. Construct supports of formed steel channel for seismic bracing. Brace and fasten with flanges bolted to structure.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

1.2 REFERENCES

1.3 SYSTEM DESCRIPTION

1.4 DESIGN REQUIREMENTS

1.5 SUBMITTALS

1.6 DELIVERY, STORAGE, AND HANDLING

1.7 COORDINATION

PART 2 - PRODUCTS

2.1 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.

2.2 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.

2.3 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 liquidtight.

2.4 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. Die cast or pressure cast fittings and locknuts are not permitted. No set screw fittings are permitted.

2.5 POLYVINYL CHLORIDE CONDUIT (PVC)

A. Product Description: Schedule 40 or 80 where exposed in the car wash areas.

2.6 INNERDUCT

A. Product Description: UL910 Plenum Rated; Indoor Corrugated.

B. Fittings: By same manufacturer as duct.

2.7 SURFACE METAL RACEWAY

A. Dual Channel
1. Manufacturers:
a. Wiremold, Model 6000 or approved equal.
b. Substitutions: Section 01 30 00 - Submittals.
2. Product Description: Multi-channel surface steel raceway with fitted snap on cover and steel accessories, suitable for use as multi-outlet assembly. Keep data and power conductors separate at all times. Provide Category 5e rated raceway, fittings and components, inserts or limiting cable fill to meet Category 5e requirements is not acceptable. Raceway covers with knock outs for accessories or cable entries are not acceptable.
3. Two equal compartments.
4. Receptacles: Provide accessories to accept receptacles as specified in Section 26 27 26.
5. Telecommunication Outlets: As specified in Section 27 10 00.
6. Device Spacing: As indicated on drawings.
7. Channel Finish: Coordinate with architect.
8. Fittings: Furnish manufacturer's standard couplings, entrance fittings, elbows, device brackets, end caps, seam covers, wire clips, device faceplates and connectors.
9. Cuts: Perform all cuts with Wiremold 6000 raceway base and cover shear.

2.8 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. Floor Boxes: Fire rated poke through or concrete rated where located in concrete floor system. Brass Trim finish ring.

C. Cast Boxes: NEMA FB 1, Type FD, galvanized malleable iron. Furnish gasketed cover by box manufacturer. Furnish threaded hubs.

D. Wall Plates: As specified in Section 26 27 26.

2.9 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

B. Surface Mounted Cast Metal Box: NEMA 250, Type [4] [4X] [6]; flat-flanged, surface mounted junction box:
1. Material: Galvanized cast iron.
2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

2.10 EXPANSION FITTINGS:

A. Galvanized malleable iron, galvanized with grounding bond jumper.

2.11 RACEWAY SEALING FITTINGS:

A. Galvanized malleable iron, galvanized filled with sealing compound.
1. Class 1 Division 1 boundary lines and isolation of arcing devices use Class 1 Division 1 sealing compound.

2.12 BUSHINGS:

A. Non-grounding: Threaded impact resistant plastic.

B. Grounding: Insulated galvanized malleable iron/steel with hardened screw bond to raceway and conductor lug.

2.13 LOCKNUTS:

A. Threaded Electro Zinc Plated Steel designed to cut through protective coatings for ground continuity.

2.14 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.

PART 3 - EXECUTION (Not Used)

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes pathway support requirements for low voltage cabling ladder rack systems in telecommunication rooms.

1.2 REFERENCES

A. ANC Terminal Construction Standards.

B. National Electric Code (NFPA 70) Article 250 - Grounding.

C. National Electric Code (NFPA 70) Article 770 - Optical Fiber Cables and Raceways.

D. National Electric Code (NFPA 70) Article 800 - Communications Circuits.

E. ANSI/TIA/EIA-568-A -- Commercial Building Telecommunications Cabling Standards.

F. ANSI/TIA/EIA-569-A -- Commercial Building Standards for Telecommunications Pathways and Spaces.

G. ANSI/TIA/EIA-607 -- Commercial Building Grounding and Bonding Requirements for Telecommunications.

H. UL Standards - UL 94HB, UL 723, and UL 2043.

1.3 SUBMITTALS

A. Division 1 - Submittal Procedures and Section 26 05 00.

B. Shop Drawings: Indicate routing, elevations, support types, dimensions, support points, and cable capacity. Information to be included on the telecommunication system shop drawing required in Section 27 15 00.

C. Product Data: Submit fittings, cable capacity, mounting requirements, accessories and finishes.

D. 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.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual routing of cable tray with capacity information on “As-built” drawing required in Section 27 15 00.

PART 2 - PRODUCTS

2.1 CABLE TRAY

A. Manufacturer: GS Metals Corporation “FLEXTRAY” or equal.

B. Size: As indicated on drawings.

C. Description: 12” by 4” steel wire mesh.

PART 3 - EXECUTION

3.1 EXISTING WORK

A. Maintain access to existing cable tray, cable runways and other installations remaining active and requiring access. Modify installation or provide access panel.

3.2 SUPPORT AND ROUTING OF CABLES

A. Provide continuous pathway system for all low voltage cable systems. Provide telecommunication system continuous cable support in accordance with Section 27 15 00.

B. Maintain a minimum EMI separation clearance in conformance with Section 27 15 00.

C. Install the telecommunication pathways in accordance with ANSI/EIA/TIA-569 – Commercial Building Standard for Telecommunication Pathways and Spaces.

D. Support pathway systems from building to support structure. Do not support pathway from ductwork, piping, suspended ceilings or other equipment hangers.

E. Support of telecommunication cabling by supports not rated Category 5 compliant is prohibited.

F. Support of cables by ceiling tiles, ceiling grid, hanger wires is prohibited.

G. Coordinate all pathway runs with other trades prior to installation.

H. Provide a minimum of 3 inches clear vertical space above ceiling system at cable lowest point.

I. Support trays and fasten to structure and finishes in accordance with Section 26 05 29. Install supports at each connection point, at end of each run, and at other points to maintain spacing between supports as per manufacturers recommendations..

J. Route station cables and backbone cables at right angles to electrical power circuits.

K. Coordinate the layout of pathways with all other trades. Report conflicts to Contracting Agency for resolution by the Contracting Agency.

L. Install firestopping to sustain ratings when passing cables through fire-rated elements.

M. Maintain STC rating of wall when cables pass through sound rated walls.

3.3 CABLE TRAY INSTALLATION

A. Install cable tray using threaded rods attached to support structure.

B. Support brackets are to be placed per manufacturers recommended spacing and locations.

C. Provide all necessary transitions kits and support kits, clamps, threaded rod suspension, as required to make a complete job, follow all manufacturer requirements.

D. Provide bonding of cable tray to ground bus in accordance with Section 26 05 26.

E. Install firestopping to sustain ratings when passing cable tray through fire-rated elements.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
1. Nameplates.
2. Labels.
3. Wire markers.
4. Conduit markers.
5. Underground warning tape.
6. Working clearance striping.
7. One-line Diagram and Panel Map.
8. Telecommunication One-Line Diagram and Floor Plan As-built.

1.2 SUBMITTALS

A. Division 1 - Submittal Procedures and Section 26 05 00.

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.

1.3 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

2.1 NAMEPLATES

A. Product Description: Laminated three-layer plastic with engraved white letters on black background. Attach to equipment using epoxy glue.

B. Letter Size:
1. 1/4 inch high letters for identifying individual panel or equipment.
2. 1/8 inch high letters for remaining lines with 1/8 inch spacing between lines.

C. Minimum nameplate size: 1/8 inch thick with a consistent length and height for each type of nameplate wherever installed on the project.

D. Emergency nameplates to be red, normal nameplates to be black, and standby nameplates to be yellow.

2.2 LABELS

A. Product Description: Embossed adhesive tape labels, with 3/16 inch black letters on clear background made using Dynamo 5500 label printer.

2.3 WIRE MARKERS

A. Power and Lighting Description: Cloth tape type wire markers for all neutrals and Phase conductors.

B. Low Voltage System Description: Machine printed label with unique wire number that is shown on shop drawing for system.

C. Telecommunication Description: Machine printed label with unique wire number.

2.4 UNDERGROUND WARNING TAPE

A. Product Description: Red 6 inch wide detectable.

B. Wording to read “Caution – Buried Electric Line Below”.

2.5 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. Panel schedules shall indicate odd circuit numbers on the left and even circuit numbers on the right. Sequential panel directories are not acceptable.

PART 3 - EXECUTION

3.1 NAMEPLATE INSTALLATION

A. Distribution Panels and Switchboards.
   1. Provide overall equipment identification for each new and existing equipment as follows:
      a. Line 1: Distribution Panel Name.
      b. Line 2: Voltage, phase and wire configuration.
      c. Line 3: Denote panel is “NORMAL”, “STANDBY”, or “EMERGENCY”

   2. Provide Main disconnect circuit breaker(s) identify service disconnect circuit breaker(s) as follows: “SERVICE DISCONNECT”

   3. Provide circuit breaker identification for each feeder.

a. Line 1: Name of panelboard or equipment served.
b. Line 2: Location of served panelboard.

B. Panelboards.
1. Provide name plate for each new and existing panelboard with the following information:
a. Line 1: Panelboard Name.
b. Line 2: Voltage, phase and wire configuration
c. Line 3: Denote panel is “NORMAL”, “STANDBY”, or “EMERGENCY”.

C. Disconnects, Starters, or Contactors:
1. Provide nameplate for each device with the following information:
a. Line 1: Load served.
b. Line 2: Panelboard and circuit number from which the device is fed.
c. Line 3: Fuse or Circuit amperage and poles. Where fused disconnect denote the maximum fuse size to be installed.

D. Transformers:
1. Provide nameplate for each new and existing transformer with the following information:
a. Line 1: Transformer Name.

E. Control or Low Voltage System Panels:
1. Provide nameplate for each new and existing control panel with the following information:
a. Line 1: Panel name as shown on the shop drawings.
b. Line 2: System description such as Fire Alarm, BAS etc.
c. Line 3: Panelboard and circuit number from which the panel is fed if applicable.

F. Junction Box Labeling:
1. Label junction boxes in concealed areas with indelible marker noting panel and circuit number for power circuits and zone or loop number for low voltage circuits.

3.2 LABEL INSTALLATION

A. Spare Raceways:
1. Provide raceway label on each individual raceway denoting the source and termination point at each end.

3.3 WIRE MARKER INSTALLATION

A. Provide wire marker for each conductor at panelboards, pull boxes, outlet and junction boxes, and each load connection. Wire ID number to match at each end.

B. Concealed junction boxes: Mark with indelible black marker concealed from view. Mark the panelboard and circuit numbers of wiring on all junction boxes with sheet steel covers.

C. Color code phases, neutral, and ground per NEC requirements and Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables.

D. Where 480V/277V and 208V/120V systems enter a common enclosure, the grounded conductor shall be identified in accordance with NEC.

E. Power and Lighting Circuits: Panelboard name and branch circuit or feeder number.

F. Control Circuits: Control wire number as indicated on schematic and shop drawings. Each conductor to be assigned a unique number.

G. Telecommunication Cables: Cable wire number to denote the station outlet with appended cable number at each end.

3.4 WARNING PLACARDS

A. Provide warning placards and warning message labels for all of the following cases for new and existing panel:
   1. Series Rated Equipment per NEC 110-22 and 240-86.
   2. Multiple voltage system ungrounded conductor identification per NEC 210-4(d) at each panelboard.
   3. Multiple power service warning to single unit.
   4. External power sources that receive power from a second source and are not de-energized by the disconnecting means of the equipment.
   5. NEC required warnings.

3.5 UNDERGROUND WARNING TAPE INSTALLATION

A. Install underground warning tape along length of each underground conduit, raceway, or cable 6 to 8 inches below finished grade, directly above buried conduit, raceway, or cable.

3.6 TELECOMMUNICATION LABELING

A. Labeling shall conform to ANSI/TIA/EIA-606 standards and per direction provided by the project manager. Coordinate the exact labeling scheme prior to commencement of work. The labeling scheme will be similar to the following:
   1. Provide nameplate at the top of each telecommunication rack denoting the unique rack identification name.
   2. Label each patch panel with each unique patch panel name.
   3. Label patch panel ports 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., 103-J2-1.
   4. Provide list of telecommunication outlets cross referenced to the rack, patch panel and port in a protective cover at each telecommunication room location that is specific to the facilities terminated therein.
   5. Label outlets with telecommunication room identification number cable is run from (TRx), followed by room number in which the outlet is located (xxxx),

followed by a single number to indicate particular outlet within room (Jx),i.e.,TCA-103-J2.

B. Fiber Optic Labeling:
   1. Label the face of each fiber optic fiber connector housing with unique name.
   2. Label each fiber connector housing connector port to denote cable unique name denoted on the drawings or with telecommunication room name and individual fiber number (TRx-2) where no labeling is provided. Each end of the termination to have the same name.

3.7 PANELBOARD CIRCUIT DIRECTORY

A. Provide circuit directory in every new panelboard and every existing panelboard that was modified. Install directory in panelboard in protective cover and submit a copy in the O&M Manual.

3.8 TELECOMMUNICATION ONE-LINE DIAGRAM AND FLOOR PLAN AS-BUILT

A. Provide telecommunication one-line diagram of the building telecommunication system in each telecommunication room.

B. Provide floor plan of area served by each telecommunication room showing all telecommunication outlet locations, equipment racks, and termination fields with labeling identification matching field devices. Install floor plan as-built drawing in each telecommunication room for areas served.

3.9 COORDINATION WITH ROOM NUMBERING

A. Contractor shall use the final room numbering scheme which may differ from the room numbering scheme in the contract documents for all references in labeling and programming for the Fire Alarm System, Telecommunication System, and Panelboard Circuit Directories. Obtain final room numbering prior to programming or labeling these systems.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes enclosed contactors for lighting and general purposes.

1.2 REFERENCES

A. NEMA ICS 2 (National Electrical Manufacturers Association) - Starters, Contactors, and Overload Relays Rated Not More Than 2000 Volts AC or 750 Volts DC.

B. NEMA ICS 5 (National Electrical Manufacturers Association) - Industrial Control and Systems: Control Circuit and Pilot Devices.

C. NEMA ICS 6 (National Electrical Manufacturers Association) - Industrial Control and Systems: Enclosures.

1.3 SUBMITTALS

A. Division 1 - Submittal Procedures and Section 26 05 00.

B. Product Data: Submit dimensions, size, voltage ratings and current ratings.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations and ratings of enclosed contactors.

B. Operation and Maintenance Data: Submit instructions for replacing and maintaining coil and contacts.

PART 2 - PRODUCTS

2.1 CONTACTOR FEATURES – GENERAL

A. Manufacturers:
1. Square D Company.
2. Cutler-Hammer, Inc.
3. General Electric Company.
4. Siemens Energy and Automation, Inc.

B. Enclosures
1. For other than Panelboard Lighting Contactors, enclosures shall be ANSI/NEMA ICS 6, Type 1 or as required to meet conditions of the installation. Panelboard Lighting Contactors shall be mounted within the Panelboard.

C. Accessories
1. Provide the following accessories as indicated for each contactor:

a. Selector Switches: ON/OFF of HAND/OFF/AUTOMATIC. NEMA ICS 2, heavy duty type.
b. Indicating Lights: NEMA ICS 2, push-to-test type.
c. Auxiliary Contacts: field convertible, quantity indicated.
d. Other: as indicated.

D. Coil Voltages: 120 volts, 60 Hz, or as indicated for each contactor.

E. Poles: As indicated or required for the specific application.

F. Contact Rating: As indicated or as required to meet conditions of the installation.

G. Size: As indicated or required by the load.

H. Configuration: Provide types as indicated:
1. Electrically held shall have continuously rated, encapsulated coils.
2. Mechanically held shall be electrically operated with encapsulated coils. Standard coil clearing contacts are to be provided so that the contactor coils shall be energized only during the instance of operation.

2.2 GENERAL PURPOSE CONTACTORS

A. Manufacturers:
1. Square D Company.
2. Cutler-Hammer, Inc.
3. General Electric Company.
4. Siemens Energy and Automation, Inc.

B. Description: NEMA ICS 2, AC general purpose magnetic contactor.

C. Coil: encapsulated type.

D. Contacts: Totally enclosed, double-break silver-cadmium-oxide power contacts. Contact inspection and replacement shall be possible without disturbing line or load wiring.

E. Wiring: Straight-through wiring with all terminals clearly marked.

2.3 MULTIPOLE LIGHTING CONTACTORS

A. Manufacturers:
1. Square D Company.
2. Cutler-Hammer, Inc.
3. General Electric Company.
4. Siemens Energy and Automation, Inc.

B. Description: Magnetic lighting contactor.

C. Contact Rating: 30 amperes for all types of ballast and tungsten lighting, resistive heating, and motor loads.

D. Contacts: Totally enclosed, double-break silver-cadmium-oxide power contacts. Contact inspection and replacement shall be possible without disturbing line or load wiring. All contacts shall have clearly visible N.O. and N.C. contact status indicators.

E. Wiring: Straight-through wiring with all terminals clearly marked.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install enclosed contactors as indicated on Drawings.

B. Install enclosed contactors plumb. Provide supports in accordance with Section 26 05 29.

C. Height: 5 feet to operating handle.

D. Install engraved plastic nameplates. Refer to Section 26 05 53 for product requirements and location.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes linear rated and non-linear rated panelboards.

1.2 REFERENCES

A. NECA (National Electrical Contractors Association) -Standard of Installation

B. NEMA AB 1 (National Electrical Manufacturers Association) - Molded Case Circuit Breakers.

C. NEMA KS 1 (National Electrical Manufacturers Association) - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

D. NEMA PB 1 (National Electrical Manufacturers Association) - Panelboards.

E. NEMA PB 1.1 (National Electrical Manufacturers Association) - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

F. NETA ATS (International Electrical Testing Association) - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems

1.3 SUBMITTALS

A. Division 1 - Submittal Procedures and Section 26 05 00.

B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

C. Product Data: Submit catalog data showing specified features of standard products.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of panelboards and record actual circuiting arrangements.

B. Operation and Maintenance Data: Submit spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

PART 2 - PRODUCTS

2.1 PANELBOARDS

A. Manufacturers:

1. Square D Company.
2. Culter Hammer.
3. Siemens.

B. Product Description: NEMA PB1, circuit breaker type.

C. Panelboard Bus: Copper current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.

D. Neutral Bus: Insulated plated copper solid neutral.

E. Minimum Integrated Short Circuit Rating: Minimum as indicated on the drawings. When series ratings are applied with integral or remote upstream devices, provide a label denoting the conditions of the UL series ratings including:
1. Size and type of upstream device.
2. Branch devices that can be used.
3. UL series short-circuit rating.

F. 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, Class A ground fault interrupter circuit breakers as indicated on Drawings. Do not use tandem circuit breakers.

G. Enclosure: NEMA PB 1, type as indicated on the drawings.

H. Cabinet Box: 6 inches deep, 20 inches wide.

I. Cabinet Front: Hinged “door in door” cover with semi-flush cylinder lock and catch assembly. Key all panelboard locks alike. Provide keys to owner with close out documents. Doors over 48 inches in height shall have auxiliary fasteners. Provide surface trims the same size as the box and flush trims to have 0.75 inch overlap to the box on all sides. Provide a removable dead front safety barrier assembly behind the door in door to cover bus when door is open.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards in accordance with NEMA PB 1.1 and NECA "Standard of Installation."

B. Install panelboards plumb.

C. Install recessed panelboards flush with wall finishes.

D. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with bottom no more than 3 inches above floor.

E. Install filler plates for unused spaces in panelboards.

F. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes to match as-built conditions.

G. Install engraved plastic nameplates and clearance striping in accordance with Section 26 05 53.

H. Install spare conduits out of each recessed panelboard to accessible location above ceiling. Minimum spare conduits: Two empty ¾ inch and one 1 inch. Identify each as "SPARE TO PANEL XXX" where XXX is to denote the associated panelboard name.

I. Ground and bond panelboard enclosure according to Section 26 05 26.

3.2 FIELD QUALITY CONTROL

A. Perform testing as required in Section 26 00 10 - Electrical Testing and Section 26 00 20 - Electrical Closeout.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes arrangement with Utility Company for electric service; service provisions; and utility metering equipment

1.2 SYSTEM DESCRIPTION

A. System configuration denoted for each site on the plans.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals and Section 26 05 00– Common Work Results for Electrical.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with Utility Company written requirements.

B. Maintain one copy of each document on site.

1.5 COORDINATION

A. Coordinate with utility company for scheduling shut-downs locations of equipment and configuration of the new service and requirements.

B. Utility charges for service installation will be paid by Owner and are not part of this contract.

PART 2 - PRODUCTS

2.1 UTILITY METER BASE

A. All equipment provided must be coordinated with the serving utility and provided in accordance with the serving utility requirements and regulations.

B. Product Description: Meter base rated for use with CT enclosure, receive watthour meter that meet ANSI C12.10, NEMA type 3R enclosure, provision for test switch, ring style, Painted gray, UL 414 listed and complies with ANSI C12.7.

C. Provide ground bond from CT enclosure to meter base.

2.2 METERING TRANSFORMER CABINET

A. Product description: steel, NEMA 3R, UL 414 Listed, removable hinged door, mounting brackets for utility current transformers. Provide side gutter pull section where required by utility sized in accordance to the service standards.

B. Provide internal mounting brackets and buss bars per utility requirements.

C. Include provisions for padlocking and sealing.

PART 3 - EXECUTION

3.1 SHUT DOWNS

A. All shut downs are to be coordinated with contracting officer 72 hours in advance.

3.2 INSTALLATION

A. Coordinate with serving utility and provide all equipment and requirements for service upgrade and reconnection.

B. Coordinate with utility and provide the exact quantity and size of service entrance raceways required.

C. Install service entrance conduits to building service entrance equipment. Utility Company will connect service lateral conductors to the primary side of the current transformers.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes receptacles, switches, dimmers, device plates and box covers.

1.2 REFERENCES

A. NECA (National Electrical Contractors Association) - Standard of Installation.

B. NEMA WD 1 (National Electrical Manufacturers Association) - General Requirements for Wiring Devices.

C. NEMA WD 6 (National Electrical Manufacturers Association) - Wiring Device -- Dimensional Requirements.

1.3 SUBMITTALS

A. Division 1 - Submittal Procedures and Section 26 05 00.

B. Product Data: Submit manufacturer's catalog information showing device characteristics, specification grade, UL listing, dimensions, colors, and configurations.

PART 2 - PRODUCTS

2.1 RECEPTACLES

A. Manufacturers:
1. Hubbell.
2. Bryant.
3. Arrow Hart.
4. Pass and Seymour.

B. Duplex Receptacles: Specification Grade, Duplex NEMA 5-20R, 120 Volt, 20 Amp, UL 498 and FSUL WC596-G, back and side wired, nylon face.

C. GFCI Protected Receptacles: Specification Grade Ground Fault Receptacle, 5 mA plus or minus 1 mA, Feed-through, Duplex NEMA 5-20R, 120 Volt, 20 Amp, UL 943, Class A and FSUL WC596-G, back and side wired.

D. Twist Lock: NEMA L20R Specification Grade.

E. 208V and 480V Special Receptacles: Coordinate with owner the exact configuration required for connection denoted on the plans.

2.2 SWITCHES

A. Manufacturers:
1. Hubbell.
2. Bryant.
3. Arrow Hart.
4. Pass and Seymour.

B. Single Pole Switches: Specification Grade, Federal Specification WS-896, back and side wired, rated 277V, 20 Amp.

C. 3-Way Switch: Specification Grade, back and side wired, rated 277V, 20 Amp.

D. 4-Way Switch: Specification Grade, back and side wired, rated 277V, 20 Amp.

E. Double Pole Switch: Specification Grade, back and side wired, rated 277V, 20 Amp.

F. Keyed Switch: Specification Grade, back and side wired, rated 277V, 20 Amp.

G. Pilot Light Switch: Specification Grade, illuminated handle when “ON” or separate neon pilot light, back and side wired, rated 277V, 20 Amp.

H. Timer Switch: Specification Grade, twist or electronic 3 hour timer auto shut off.

2.3 DEVICE PLATES

A. Decorative Cover Plate: Smooth, stain finished type 302 stainless steel with screws matching device color.

B. Exterior or Wet Area Cover Plates: Weatherproof, cast metal with hinged gasketed device covers, GFCI configuration where device is GFCI. Flap to open in upward direction to allow device to remain weatherproof while in use. Provide cover plates that fit snugly against the finished surface and provide a weatherproof seal.

C. Interior Dry, Unfinished Area Raised Cover Plates: Galvanized steel.

2.4 DEVICE COLOR

A. General Switches, Receptacles: Grey.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Rigidly fasten outlet boxes and devices to prevent any play of device.

B. Install in accordance with NECA "Standard of Installation."

C. Verify door swings prior to each switch box rough-in. Install all switches on strike side of door for each space.

D. Clean debris from outlet boxes.

E. Install devices plumb and level.

F. Install switches with OFF position down.

G. Install receptacles with grounding pole on bottom.

H. Connect wiring device grounding terminal to outlet box with bonding jumper and branch circuit equipment grounding conductor.

I. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

J. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

3.2 FIELD QUALITY CONTROL

A. Test each receptacle, switch and sensor device per Section 26 00 10 – Electrical Testing.

3.3 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.4 CLEANING

A. Clean exposed surfaces to remove splatters and restore finish.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes thermal magnetic molded case circuit breaker, electronic trip molded case circuit breakers and fuses.

1.2 REFERENCES

A. NEMA AB 1 – National Electrical Manufacturers Association) Molded Case Circuit Breakers and Molded Case Switches.

B. UL 489 – (Underwriters Laboratories Inc.) Molded Case Circuit Breakers and Circuit Breaker Enclosures.

C. UL943 – Standard for Ground Fault Circuit Interrupters.

D. National Electrical Manufacturers Association: NEMA FU 1 - Low Voltage Cartridge Fuses.

1.3 SUBMITTALS

A. Division 1 - Submittal Procedures and Section 26 05 00.

B. Product Data: Submit switch ratings and enclosure dimensions.

PART 2 - PRODUCTS

2.1 MOLDED CASE CIRCUIT BREAKERS

A. Product Description: Thermal Magnetic 80% rated standard function.

B. GFP: Provide GFP protection for all service circuit breakers rated 1000 Amps or more at 480 Volts.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with NECA "Standard of Installation."

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes fusible and nonfusible disconnect switches, and enclosed circuit breakers.

1.2 REFERENCES

A. NECA (National Electrical Contractors Association) -Standard of Installation.

B. NEMA FU 1 (National Electrical Contractors Association).- Low Voltage Cartridge Fuses.

C. NEMA KS 1 (National Electrical Contractors Association).- Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

D. NETA ATS (International Electrical Testing Association) - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (International Electrical Testing Association).

1.3 SUBMITTALS

A. Division 1 - Submittal Procedures and Section 26 05 00.

B. Product Data: Submit switch ratings and enclosure dimensions.

PART 2 - PRODUCTS

2.1 NON-FUSIBLE SWITCH ASSEMBLIES

A. Manufacturers:
1. Square D Company
2. Cutler Hammer.
3. Siemens.

B. Product Description: NEMA KS 1, Type Heavy Duty (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, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
1. Interior Dry Locations: Type 1.
2. Exterior Locations: Type 3R.

D. Furnish switches with entirely copper current carrying parts.

E. Switch Rating: Coordinate all details pertaining to amperage, horsepower rating, voltage, poles, neutral terminals, ground lugs and enclosure type and provide most suitable for load served.

2.2 FUSIBLE SWITCH ASSEMBLIES

A. Manufacturers:
1. Square D Company
2. Cutler Hammer.
3. Siemens.

B. Product Description: NEMA KS 1, Type Heavy Duty (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, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
1. Interior Dry Locations: Type 1.
2. Exterior Locations: Type 3R.

E. Switch Rating: Coordinate all details pertaining to amperage, horsepower rating, voltage, poles, neutral terminals, ground lugs and enclosure type and provide most suitable for load served.

F. Short Circuit Current Rating: UL listed for Available Fault Current as denoted on the drawings or 200,000 rms symmetrical amperes when used with or protected by Class R or Class J fuses (30-600 ampere switches employing appropriate fuse rejection schemes).

2.3 ENCLOSED CIRCUIT BREAKER

A. Manufacturers:
1. Square D Company
2. Cutler Hammer.
3. Siemens.

B. Product Description: Type Heavy Duty (HD) with externally operable handle interlocked to prevent opening front cover with switch in ON position, enclosed circuit breaker switch. Handle lockable in OFF position.

C. Steel enclosure finished with manufacturer's standard gray enamel.
1. Interior Dry Locations: Type 1.
2. Exterior Locations: Type 3R.

D. Switch Rating: Coordinate all details pertaining to amperage, horsepower rating, voltage, poles, neutral terminals, ground lugs and enclosure type and provide most suitable for load served.

E. Short Circuit Current Rating: As shown on the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with NECA "Standard of Installation."

B. Install enclosed switches plumb. Provide supports in accordance with Section 26 05 29.

C. Height: 5 feet to operating handle.

D. Install fuses for fusible disconnect switches.

E. Install engraved plastic nameplates in accordance with Section 26 05 53.

F. Apply adhesive tag on inside door of each fused switch indicating the maximum NEMA fuse class and size installed.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes manual and magnetic motor controllers in individual enclosures.

1.2 REFERENCES

A. NEMA AB 1 (National Electrical Manufacturers Association) - Molded Case Circuit Breakers.

B. NEMA ICS 2 (National Electrical Manufacturers Association) - Industrial Control and Systems: Controllers, Contactors, and Overload Relays Rated Not More Than 2000 Volts AC or 750 Volts DC.

C. NEMA ICS 5 (National Electrical Manufacturers Association) - Industrial Control and Systems: Control Circuit and Pilot Devices.

D. NEMA ICS 6 (National Electrical Manufacturers Association) - Industrial Control and Systems: Enclosures.

1.3 SUBMITTALS

A. Division 1 - Submittal Procedures and Section 26 05 00.

B. Product Data: Submit catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations and ratings of enclosed controllers.

B. Operation and Maintenance Data: Submit Replacement parts list for controllers.

PART 2 - PRODUCTS

2.1 AC FRACTIONAL HORSEPOWER STARTER SWITCHES

A. Manufacturers:
   1. Square D Company
   2. Cutler Hammer.
   3. Siemens.

B. The manual starter shall consist of a manually operated toggle switch equipped with red pilot light and melting alloy type thermal overload relay.

C. Thermal unit shall be one-piece construction and interchangeable. Starter shall be inoperative if thermal unit is removed.

2.2 AC MANUAL STARTERS

A. Manufacturers:
   1. Square D Company.
   2. Cutler Hammer.
   3. Siemens.

B. Manual starters shall be constructed and tested in accordance with the latest published NEMA standards.

C. The manual starters shall consist of a manually operated switch equipped with red pilot light and melting alloy type thermal overload relays in every phase conductor. Thermal units shall be one-piece construction and the starter shall be inoperative if any thermal unit is removed.

D. Starters shall be furnished in a NEMA 1 general purpose enclosure unless otherwise indicated on the plans or required by the conditions of the area in which they are installed.

2.3 AC MAGNETIC STARTERS – LINE VOLTAGE TYPE

A. Manufacturers:
   1. Square D Company.
   2. Cutler Hammer.
   3. Siemens.

B. Motor starters shall be across-the-line magnetic type rated in accordance with NEMA standards, sizes, and horsepower ratings.

C. Starters shall be mounted in NEMA 1 general purpose enclosures unless otherwise indicated on plans or required by the conditions of the area in which they are installed.

D. Starters shall be furnished with overload relays in every phase conductor and starters shall be inoperative if any overload unit is removed.
   1. Overload relays shall be bimetallic type. Thermal units shall be of one-piece construction and interchangeable.

E. Starters through NEMA size five (5) shall be equipped with double break silver alloy contacts. All contacts shall be replaceable without removing power wiring or removing starter from panel.

F. Coils shall be of molded construction and shall be 120 VAC or as required for the application. Starters shall have a fused 120V control power transformer in enclosure, or alternatively, on 120/208 volt systems, the power system neutral conductor may be utilized. In all cases, control power shall be disconnected by the starter disconnecting means, unless otherwise specifically approved.

G. Starters shall be suitable for field-addition of at least four (4) auxiliary electrical interlocks of any arrangement, normally-open or normally-closed.

H. All starters shall have enclosure-mounted red running pilot light and Hand-Off-Auto switch.

2.4 AC COMBINATION STARTERS WITH FUSIBLE DISCONNECT SWITCH

A. Manufacturers:
1. Square D Company.
2. Cutler Hammer.
3. Siemens.

B. Combination starters shall be manufactured in accordance with the latest published NEMA standards, sizes, and horsepower ratings.

C. Disconnect switch combination starters shall consist of a visible blade disconnect switch and a motor starter.

D. Combination starters shall be mounted in NEMA 1 general purpose enclosures unless otherwise indicated on the plans or required by the conditions of the area in which they are installed.

E. The disconnect handle used on combination starters shall always be in control of the disconnect device with the door opened or closed. The disconnect handle shall be clearly marked as to whether the disconnect device is "on" or "off."

F. Magnetic starters provided under all Divisions of the Specifications shall be in accordance with this Section.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install enclosed controllers as indicated on Drawings.

B. Install enclosed controllers plumb. Provide supports in accordance with Section 26 05 29.

C. Height: 5 feet to operating handle.

D. Select and install overload heater elements in motor controllers to match installed motor characteristics.

E. Install engraved plastic nameplates. Refer to Section 26 05 53 for product requirements and location.

3.2 FAN SHUT DOWN WIRING

A. Provide all interlock wiring, relays and detection for each fan over 2000 CFM to provide unit shutdown upon detection of smoke in the supply air duct. Where building is equipped with a fire alarm system such fans to shut down upon any alarm.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes interior luminaires, lamps, ballasts, and accessories.

1.2 REFERENCES

A. ANSI C82.1 - Ballasts for Fluorescent Lamps - Specifications.

B. ANSI C82.4 - Ballasts for High-Intensity Discharge and Low Pressure Sodium Lamps (Multiple Supply Type).

1.3 SUBMITTALS

A. Division 1 - Submittal Procedures and Section 26 05 00.

B. Shop Drawings: Indicate dimensions and components for each luminaire not standard product of manufacturer.

C. Product Data: Submit dimensions, ratings, and performance data.

1.4 QUALIFICATIONS

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

1.5 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 - PRODUCTS

2.1 INTERIOR LUMINAIRES

A. Manufacturers:
1. As denoted on plans in the Luminaire Schedule.

B. Product Description: Complete interior luminaire assemblies, with features, options, and accessories as scheduled.

2.2 FLUORESCENT BALLASTS

A. Manufacturers:
1. Advance.
2. Magnetek.
3. Motorola.

B. Configuration: Electronic, Rapid Start with thermal protection, non-PCB. T5 ballast to be Programmed Rapid Start.

C. Harmonic Distortion: <10% THD.

D. Power Factor: >95% High Power Factor (0.95).

E. Sound Rating: Class "A".

F. Minimum Starting Temperature: 50 deg. F.

G. Ballast Factor: >0.88.

2.3 COMPACT FLUORESCENT

A. Manufacturers:
1. Advance.
2. Magnetek.
3. Osram Sylvania.

B. Configuration: Electronic, Program or Rapid Start with thermal protection, non-PCB, "End of Life Sensing Technology".

C. Harmonic Distortion: <10% THD.

D. Power Factor: >95% High Power Factor (0.95).

E. Sound Rating: Class "A".

F. Minimum Starting Temperature: 50 deg. F.

2.4 LAMPS

A. Manufacturers:
1. General Electric.
2. Philips.
3. Osram Sylvania.

B. Fluorescent:
1. Medium Bi-pin, T8, T5, Compact Fluorescent – RE835 with CRI of 82 or greater.
2. Minimum Initial Light Output:
   a. 4 foot Lamp 32W T8 – 2900 Lumens.
   b. 4 foot Lamp 28W T5 – 2750 Lumens.
   c. 4 foot Lamp 54W T5HO – 4450 Lumens.
   d. Triple Tube Compact Fluorescent Lamp 32W TRT – 2400 Lumens.
3. All lamps to be classified as Non-Hazardous waste when subjected to TCLP prescribed by EPA where required by owner.

2.5 LENSES

A. Lenses for recessed fluorescent luminaires shall be 100 percent virgin acrylic with a minimum overall thickness of 0.125 inch, except where specifically noted.

2.6 RECESSED FIXTURES

A. Luminaires shall have thermal protection conforming to NEC and shall so be identified as thermally protected unless fixture is:
   1. Identified for use and installed in poured concrete, or
   2. Identified as suitable for installation in cavities where the thermal insulation will be in direct contact with the fixture.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install suspended luminaires using pendants supported from swivel hangers. Install pendant length required to suspend luminaire at indicated height.

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 luminaires according to the requirements of the IBC as well as any local amendments, and Section 26 05 29.

D. Support luminaires larger than 2 x 4 foot size independent of ceiling framing.

E. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prevent movement.

F. Provide "Linear" luminaires with all corners, transitions, adjustable sections, custom angles, etc., to provide continuous linear systems. These features shall be provided to center the lamp cavity(s) of the luminaire within the designated mounting space(s) (typically wall-to-wall).

G. Exposed Grid Ceilings: Support surface-mounted luminaires on grid ceiling directly from building structure.

H. Install recessed luminaires to permit removal from below.

I. Install clips to secure recessed grid-supported luminaires in place.

J. Install wall-mounted luminaires at height as indicated on Drawings or as scheduled.

K. Install accessories furnished with each luminaire.

L. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

M. Install specified lamps in each luminaire.

N. Ground and bond interior luminaires in accordance with Section 26 05 26.

O. Provide fixtures in conformance with the Luminaire Schedule, with all required flanges and supports. Luminaires 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.

P. Canopies for pendant-hung luminaires shall be of the ball-joint type. Where more than one pendant is used per luminaire, as in the case of linear fluorescents, a ball-joint fitting shall also be provided in the luminaire-end of each pendant.

3.2 PERFORMANCE SPECIFICATION

A. The Luminaire 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

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes exterior luminaires, lamps, ballasts, and accessories.

1.2 REFERENCES

A. ANSI C82.1 – Ballasts for Fluorescent Lamps Specifications.

B. ANSI C82.4 – Ballasts for High-Intensity Discharge and Low Pressuire Sodium Lamps (Multiple Supply Type).

C. Illuminating Engineering Society of North America (IESNA):
   1. LM-79 Approved Method for the Electrical and Photometric Measurements of Solid-State Luminaires.
   2. LM-80 Approved Method for Measuring Lumen Maintenance of LED Light Sources.

D. Underwriters Laboratories, Inc. (UL):
   1. UL-8750 Light Emitting Diode (LED) Light Sources for Use in Lighting Products.

1.3 SUBMITTALS

A. Division 1 - Submittal Procedures and Section 26 05 00.

B. Shop Drawings: Indicate dimensions and components for each luminaire not standard product of manufacturer.

C. Product Data: Submit dimensions, ratings, and performance data.

1.4 QUALIFICATIONS

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

1.5 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 - PRODUCTS

2.1 EXTERIOR LUMINAIRES

A. Manufacturers:
   1. As denoted on plans in the Luminaire Schedule.

B. Product Description: Complete exterior luminaire assemblies, with features, options, and accessories as scheduled.

C. Listed by a Nationally Recognized Testing Laboratory (NRTL) as suitable for exterior environments noted.

2.2 FLUORESCENT BALLASTS

A. Manufacturers:
1. Advance.
2. Magnetek.
3. Philips Electronics.
4. General Electric.
5. Osram Sylvania.
6. Motorola.

B. Configuration: Electronic, Rapid Start with thermal protection, non-PCB. T5 ballast to be Programmed Rapid Start.

C. Harmonic Distortion: <10% THD.

D. Power Factor: 90% minimum.

E. Sound Rating: Class “A”.

F. Minimum Starting Temperature: -20 deg. F.

G. Ballast Factor: 0.88 minimum.

2.3 HID BALLASTS

A. Manufacturers:
1. Advance.
2. General Electric.
3. Philips Electronics
4. Magnetek.
5. Osram Sylvania.

B. Configuration: Constant Wattage High Autotransformer High Power Factor Type.

C. Harmonic Distortion: 15% THD maximum.

D. Power Factor: 90% minimum High Power Factor (0.90).

E. Minimum Starting Temperature: -40 deg. F.

2.4 LED DRIVERS

A. Minimum Efficiency: 85%

B. Harmonic Distortion: <20% THD

C. Power Factor: >90% High Power Factor (0.90).

D. Rated Starting Temperature: -40 deg. F.

2.5 LAMPS

A. Manufacturers:
1. General Electric.
2. Philips.
3. Osram Sylvania.

B. Fluorescent:
1. Medium Bi-pin, T8, and T5 Fluorescent – RE835 with CRI of 82 or greater.
2. Minimum Initial Light Output:
a. 4 foot Lamp 32W T8 – 2900 Lumens.
b. 4 foot Lamp 54W T5HO – 4450 Lumens.
3. Suitable for luminaire and ballast configuration noted.
4. All lamps to be classified as Non-Hazardous waste when subjected to TCLP prescribed by EPA as required by owner.

C. HID:
1. Medium or Mogul screw-in base lamp - CRI of 65 or greater.
2. Suitable for luminaire and ballast configuration noted.

2.6 POLES

A. Manufacturers:
1. Pole manufacturer to match area luminaire as denoted in the Luminaire Schedule.

B. Product Description: Complete exterior luminaire pole assembly, with features, options, and accessories as scheduled. Poles shall be provided with grounding lugs.

C. Pole shall be sized for 100MPH winds with a 1.3 gust factor at luminiare configuration Effective Projected Area (EPA).

D. Pole bases shall be pile driven type with concrete protection ring. See drawings for pole base detail.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prevent movement.

B. Install wall-mounted luminaires at height as indicated on Drawings or as scheduled.

C. Install accessories furnished with each luminaire.

D. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

E. Install specified lamps in each luminaire.

F. Ground and bond exterior luminaires in accordance with Section 26 05 26.

G. Install a grounding electrode for each luminiare pole. Install a grounding conductor pigtail in the base of each luminaire pole for connecting luminaire to grounding system.

H. Provide luminaires in conformance with the Luminaire Schedule, with all required flanges and supports. Luminaires shall be provided complete with all 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.

I. Provide luminaire poles with anchor bolts and decorative bolt covers.

3.2 PERFORMANCE SPECIFICATION

A. The Luminaire Schedule is a general guide to type, quality and other characteristics. Luminaires of equal or better performance and quality may be substituted, subject to approval.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Contractor designed and installed intrusion detection system.

B. Intrusion detection system wire and cable.

C. Intrusion detection system identification and labeling.

D. Intrusion Detection System Testing.

1.2 RELATED WORK

A. Section 260519 – Low-Voltage Electrical Power Conductors and Cables.

B. Section 260533 – Raceway and Boxes for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems.

1.3 SUMMARY OF WORK

A. Provide all equipment, materials, labor, documentation, and services necessary to furnish, install, calibrate, adjust, and test a complete and operational Intrusion Detection System (IDS), as required herein and as indicated on the Drawings. The system shall consist of a fully automated and integrated computer-based system, including, but not limited to the following functions and capabilities:
   1. IDS Alarm Monitoring and Reporting of alarm and trouble conditions detected by individual devices.
   2. Network system access for administration, programming, monitoring, and maintenance.

B. The system equipment and installation shall comply with all provisions and requirements of this specification, as well as any and all applicable national, state and local codes and standards.

1.4 SYSTEM DESCRIPTION

A. System Components: The basic components of the IDS shall include:
   1. UL listed control panel with 7 hour battery backup, auto dialer, and network interface capability.
   2. Keypad interface for programming and arm/disarm functions.
   3. Magnetic door contacts for exterior doors.
   4. Glassbreak sensors for rooms with exterior windows.
   5. Motion sensors for common rooms and corridors.
   6. Panic buttons for manual system alarm.
   7. Alarm sirens located inside building and building exterior.

1.5 SEQUENCE OF OPERATION

A. Arm/Disarm System:

1. System Operation: The system shall either be armed or disarmed locally by using the security keypad, typically located in the front office, or remotely by using a client workstation or mobile device.
2. System Disarm: The staff will use keys to enter the building through the front doors and enter the front office area. All door contacts and motion sensors in the entry area shall be part of a Delayed Area Masking (DARM) group, which shall delay alarm activation for 90 seconds to allow the staff to get to the keypad to disarm the system. During this delay, an audible tone will sound at the keypad. After the PIN code is correctly entered, the audible tone shall stop, the green LED on the adjacent faceplate shall illuminate and all alarm points shall be masked. The system shall send a "System Disarmed" signal to the server via the WAN and to the Central Monitoring Station. If the delay timer expires before the system is disarmed, an alarm in the zone where the entry area is located will be transmitted to the server/workstation via the LAN/WAN and to the Central Monitoring Station.
3. System Arm: After the PIN code is correctly entered, the red LED on the adjacent faceplate shall illuminate and all alarm points shall be unmasked. There shall be a 90 second delay to allow the staff to exit the building. During this delay, the alarm points in the DARM group shall remain masked and the audible tone at the keypad shall sound. If the delay timer expires before the staff member exits the front door, an alarm in the zone where the entry area is located will be transmitted to the server/workstation via the LAN/WAN and to the Central Monitoring Station.

B. Maskable Field Devices:

1. Alarm: All field devices such as door contacts, motions sensors, and glassbreak sensors shall interface with the main control panel. If the system is disarmed, these alarm points shall be masked and shall not report any alarms. If the system is armed, activation of any alarm point shall generate an alarm in the zone (i.e. Front Door Contact) where the device is located. This signal shall be transmitted to the server/workstation via the LAN/WAN and to the Central Monitoring Station.

C. System Trouble:

1. Tamper: Activation of any of the tamper switches on the control panel or sensor devices shall generate a "Security Trouble" alarm that is transmitted to the server via the LAN/WAN.
2. Power/Battery: Trouble signals shall also be generated for AC power failure, low battery at the main control panel. These signals shall be transmitted to the server/workstation via the LAN/WAN.
3. Field Devices: All individual field device circuits are supervised, using an end-of-line (EOL) resistor. An "Open" or "Short" trouble condition on any field device shall generate a "Security Trouble" alarm that is transmitted to the server/workstation via the LAN/WAN.

D. System Alarm:
   1. Upon receipt of alarm signals at the main control panel, the system shall transmit an alarm condition to the Central Monitoring Station via telephone line, and to the server/workstation via the LAN/WAN.
   2. Keypad: The display readout on the keypad shall match the text message that is being sent to the Central Monitoring Station, with additional explanatory text added to each numerical code to clearly show the alarm being generated. All text messages shall be approved by the Owner prior to programming the control panel.

1.6 REGULATORY REQUIREMENTS

A. All systems shall comply with applicable federal, state, and local building codes. Conduit and wire installation shall comply with all of the provisions of Division 26.

B. All equipment and assemblies shall be Underwriters Laboratories approved if applicable.

1.7 QUALIFICATIONS

A. The Security Systems Integrator shall submit qualifications in accordance with Division 1. Qualifications shall include the following:
   1. The entire Intrusion Detection System shall be installed and programmed by a single Security Systems Integrator. The Security Systems Integrator shall be certified to install the system installed and shall have a minimum of five years documented experience installing and programming security systems in the State of Alaska. Documentation of previous experience shall include at least three (3) similar projects where a security system of this type has been installed.
   2. Where the Security Integrator is a branch office or other division of a larger organization, the qualifications of the branch office or other division shall meet the requirements of the Contract Documents.
   3. The Security Integrator shall provide documentation that at least one field installer on the project is certified to install the security system and shall have completed certification training prior to start of work. The Contractor shall submit qualifications of the On-Site Installer prior to start of work.

1.8 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Submit under provisions of Division 1 and Division 26.

C. Provide manufacturer's data sheets on all equipment proposed for use on this project.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

E. Electronic AutoCad® drawings of the building floor plans are available upon request for preparation of the shop drawings. All device locations shall be field verified by the Contractor prior to completion of the shop drawings.

F. Provide contract-size shop drawings that include the following information:
1. Locations of all equipment and field devices, as well as routing of all cables with the number and size of conductors in each run. Scale of floor plan shall match Contract Drawings.
2. Minimum 1/4-inch enlarged plan of each equipment room. Plan must be large enough to show actual equipment layouts and to show that all equipment will fit in the intended space with no conflicts.
3. Locations and sizes of all raceways, sleeves, and penetrations. Fire rated penetrations shall be specifically noted.
4. Provide a building zone map denoting the coverage areas as indicated on the Drawings.
5. Provide a one-line diagram that shows the signal relationships of all devices within the system.
6. Provide voltage drop calculations for all devices. Provide battery calculations for the main control panel, including all connected devices. Calculations shall include estimated time system will run without utility AC power in non-alarm state. All calculations shall be shown on the Drawings.
7. For each major component, such as the main control panel, show a typical detail of all wiring connections to the equipment. This detail shall include all wire/cable color-coding and all identification tags where applicable.
8. Indicate electrical characteristics and connection requirements, including line voltage and low voltage wiring, and logic diagrams or block diagrams where required. All text on the drawings shall be legible without magnification when the shop drawings are reduced to 11” x 17”.
9. Shop drawings denoting all details of the security system must be submitted and approved by the Owner prior to commencement of installation.

G. System Software Submittal
1. All room names, icon labels, and event descriptions on all graphic maps shall be selected by the Owner. As part of the Software Submittal, the Contractor shall submit the following:
   a. An electronic copy of an I/O points table in Microsoft® Excel® spreadsheet format. This table shall include all points controlled or monitored by the system and the Owner’s Representatives shall assign meaningful names to the points.
   b. Provide 8.5” x 11” color printouts of all facility graphic maps and other customized screens. Graphic maps shall clearly show samples of all colors and positions of items such as alarm points that change color on the screen when activated.
2. After the Owner has completed the review, the Owner will provide the Contractor with a list of modifications to the I/O Points Table, Event List, and the graphic maps that are deemed appropriate for the proper operation of the system. The Contractor shall make all modifications at no additional cost to the Owner.

1.9 PROJECT RECORD DRAWINGS

A. Submit documents under provisions of Division 1.

B. Accurately indicate actual location of all security devices and controlling equipment, including the main control panel, power supplies, magnetic contacts, glassbreak sensors, relays, electric door strikes, magnetic locks, etc. All field devices shall be shown with their actual device addresses.

C. Show the location and routing of all conduit and cables, including locations of major pull and junction boxes.

D. Include a reduced set (11" x 17") set of the project record drawings in the Operation and Maintenance Manual.

E. After review and approval of the Project Record Drawings by the Owner, the Contractor shall provide the following documents;
   1. One 8.5” x 11” zone map that shows each zone within the building. Map shall be used by Owner staff and central station monitoring company.
   2. One final 11” x 17” laminated zone map that shows each zone within the building. Map shall be mounted above the keypad at the building front entry.
   3. One complete set of laminated 11” x 17” Project Record Drawings. Drawings shall be bound in a 3-ring binder and hung from a wall hook adjacent to the main control panel.

1.10 OPERATION AND MAINTENANCE MANUAL

A. Submit documents under provisions of Division 1.

B. Operation and Maintenance Data: Include bound copies of operating and maintenance data with programming instructions.

C. Provide operation and maintenance instructions including detailed electronic schematic drawings, detailed parts list and exploded view of all equipment, detailed troubleshooting instructions and a reduced set of the project record drawings.

D. Provide completed copies of the System Test Reports.

E. Provide detailed instructions on system start-up, including instructions on re-starting the file server after a system failure/lock-up.

F. Provide detailed instructions on downloading/uploading system software updates and on replacement of defective components in the file server or workstation computer.

G. Program Documentation: Provide one electronic copy of the System Software Program to aid in future maintenance, troubleshooting and modification of the security system.

1.11 INSTRUCTION OF OPERATING PERSONNEL

A. In accordance with the requirements of Division 1 and this section, provide hands-on operational training for on-site building staff. Class shall be held at a location to be determined by the Owner and shall consist of four (4) hours of classroom instruction and hands-on training. Training shall include basic operation of the system. At the end of the class, the participants shall be capable of arming/disarming the system and scrolling through the menus to determine where active alarm points (i.e. open doors) are located in the building. The training shall include the following elements:
   1. Describe and demonstrate general system operation and layout.
   2. Explain identification system, diagrams, signals and alarms.
   3. Describe and demonstrate all keypad functions.
   4. Describe and demonstrate all dialer and network communication functions.
   5. Provide training in accordance with Division 1.

B. Training sessions for the security system shall be conducted on-site by the Manufacturer's Representative.
   1. Training session schedules shall conform to the requirements of the Owner.
   2. Submit schedules to Owner for approval not less than two weeks prior to training session.

1.12 COORDINATION

A. The 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.

B. Coordinate all work with lighting, power, ventilation, sprinklers and other systems in the areas of work to avoid interferences.

1.13 QUALITY ASSURANCE

A. Provide complete testing of the security system in accordance with this section.

B. After installation, and before termination, all wiring shall be checked and tested to ensure there are no grounds, opens, or shorts on any conductors or shields. The Contractor shall maintain a complete log of all such quality assurance tests and make them available for inspection by the Owner at any time during the construction phase. At the completion of the installation all test results shall become part of the maintenance documentation.

C. Inspection:
   1. The Contractor shall carry out the inspection requirements of the Contract and shall provide the Owner with documentation to the effect that off-site work is being properly fabricated, and in accordance with the contract documents.
   2. The Contractor shall notify the Owner sufficiently in advance of the time when quality control tests are to be performed so that the Owner or their designee may witness such tests, if desired. The presence or absence of the Owner from these tests shall not relieve the Contractor from completing the tests in accordance with the contract documents. Contractors QA documentation and practices shall be

subject to Owner inspection at any time. The field-certified installer must be present during final testing and calibration.

1.14 WARRANTY AND MAINTENANCE CONTRACT

A. Warrant all materials and equipment to be new and free from defects in material and workmanship for a period of one year under provisions of Division 1.

B. Provide a maintenance contract to maintain the security system for one year from the date of substantial completion for the project. The maintenance contractor shall be certified to maintain and repair the intrusion detection system. At the end of one year, the Owner shall have the option of extending or canceling the contract.

C. Thirty days prior to the expiration of the maintenance contract, the Security Systems Integrator shall contact the Owner's Representative to determine if any adjustments or reprogramming are necessary to maintain proper operation of the security system. If any adjustments or reprogramming are necessary, they shall be done at no cost to the Owner.

1.15 EXTRA MATERIALS

A. No spare parts are required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide products of manufacturer selected in compliance with requirements. 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.

B. The Contractor shall provide the latest product model and software version available from each manufacturer at the time of installation. No "beta version" or "test software" products will be accepted. All proposed and provided equipment and/or products shall be from the specified and approved manufacturers only, unless previously approved by the Owner.

C. All products and materials are to be new and free of defects, damage and corrosion. All materials shall be in compliance to all applicable codes and designed specifically for the function intended.

D. Quantity and location of all devices and equipment shall be as specified in Contract Documents or as required for a complete and operable system.

2.2 SYSTEM SOFTWARE

A. Provide system software necessary for system control, operation, alarm logs, and maintenance on Owner's server or designated workstation.

2.3 MAIN CONTROL PANEL

A. Panel shall be UL listed with 7 hour minimum battery backup, have auto dialer for Central Monitoring Station, have direct LAN/WAN connection for Owner server or workstation connection, be capable of reporting alarms to Owner mobile devices, and shall be capable of supervising up to 48 zones.

B. Enclosure shall have tamper switch and keyed flush lock.

2.6 INPUT DEVICES

A. Magnetic Door Contacts:
1. Unless otherwise noted on the Drawings, all door contacts shall be recessed type. Where existing field conditions make it impossible to recess contacts in frame, surface-mounted contacts may be used. Where wiring cannot be concealed, use high-security door contacts with armored cable whip. Standard surface-mounted door contacts may be used where wiring can be concealed and in other specific locations approved by the Owner prior to rough-in.
2. Standard Surface-Mounted Contacts: UL listed N.O. contacts with flame-retardant white/natural ABS housing, concealed #6 screw terminals that accept 14 to 22 AWG wire, external test points, and maximum gap distance (make) of 1.25 inches. Surface-mounted contacts shall be used only where wiring can be concealed and other specific locations approved by Owner prior to rough-in.
3. High-Security Surface-Mounted Contacts: UL listed N.O. contacts with aluminum housing and armored cable whip. Maximum gap distance (make) of 3 inches.
4. Recessed Contacts: UL listed N.O. contacts with flame-retardant white/natural ABS housing, hermetically sealed, potted magnetic reed switch, 12-inch #22 AWG leads, and maximum gap distance (make) of 1 inch in steel doors.

B. Panic Pushbuttons: Provide panic pushbuttons for building staff at Owner requested locations. Pushbuttons shall manually generate a system alarm.

C. Acoustic Glassbreak Sensors: UL listed acoustic glassbreak sensor with 360° coverage pattern, adjustable 25-foot maximum coverage radius, Form A contacts, 12VDC input, and 2.75” x 4” rectangular white ABS housing designed to install on a single-gang box.

D. Motion Sensors:
1. Wall-Mounted Interior Motion Sensors: A combination long-range/wide-angle adaptive Mirror Optic PIR motion sensor with microprocessor-controlled “4D” processing, 12VDC input, and white ABS housing. Unit shall have 12 on-site selectable coverage patterns between 200’ long and 80’/40’ wide. Select coverage pattern based on installed location. Provide ceiling/wall swivel bracket where required for mounting at specified locations.
2. Ceiling-Mounted Interior Motion Sensors: Dual Optic adaptive PIR motion sensor with microprocessor-controlled “4D” processing, two 180° mirror segments, 12VDC input, and white ABS housing. Coverage shall be selectable for either

180° or 360° with 18 full curtains of coverage. Provide base plate where required for surface-mount installations. Provide recessed mounting kit where required for recessed installations.

2.7 KEYPAD

A. Supervised remote 4 X 4 (16-button) alpha-numeric keypad annunciator with back-lit liquid crystal display capable of providing system information on active alarm points in the system. Keypad shall be mounted at +50" AFF.

B. Mount a minimum 1/16" scale building map in a frame with a clear acrylic cover, next to the main keypad. Map shall be labeled to correspond to the information displayed at the keypad annunciator. Submit a copy of the map for approval prior to installation.

2.9 SYSTEM WIRE AND CABLE

A. Multi-Drop Power/RS-485 Communications Cable: Belden #6342PC or approved equal plenum-rated, 3-pair, 18 AWG, stranded tinned copper conductors, individually twisted shielded pairs with 100% overall shield, drain wire, 300-Volt insulation, rated 90º C, with an overall plenum jacket.

B. Door Contact Input Cable: West Penn #25222 or approved equal 1-pair, 20 AWG, twisted, unshielded, stranded tinned copper conductors, 300-Volt FEP insulation, rated 90º C, with an overall plenum jacket.

C. Motion/Glassbreak Sensor Input Cable: West Penn #25244 or approved equal 4-conductor, 18 AWG, stranded tinned copper conductors, 300-Volt FEP insulation, rated 90º C, with an overall plenum jacket.

D. Relay Output Cable: West Penn #25225 or approved equal 1-pair, 16 AWG, twisted, unshielded, stranded tinned copper conductors, 300-Volt FEP insulation, rated 90º C, with overall plenum jacket.

E. Interconnect Cable: Plenum-rated, 18 AWG, twisted, shielded or unshielded (as required or recommended by manufacturer), stranded tinned copper conductors, 300-Volt FEP insulation, rated 90º C, and plenum jacket. Pair count as required to provide connections for all specified points between DDC and security system.

2.10 SYSTEM LABELING

A. Nameplates: Laminated 1/8-inch thick, three-layer plastic with engraved white letters on black background. Letter size shall be 1/4-inch high letters for identifying individual panel or equipment, 1/8-inch high letters for remaining lines with 1/8 inch spacing between lines. Attach to equipment using threaded screws or pop-rivets.

B. Labels: Adhesive tape labels, with 3/16 inch Bold Black letters on clear background made using Dynamo 5500 label printer or approved equal.

C. Wire Markers: Self-adhesive machine-printed label with unique wire number that is shown on security system shop drawings.

2.11 SYSTEM TEST EQUIPMENT

D. LAPTOP COMPUTER
1. Specifications equal to or greater than required by software. Note that this computer is for Contractor use in programming and shall not be turned over to the Owner. The intent is that the Contractor uses a laptop computer on-site for programming, instead of trying to program the system remotely via the WAN connection.

E. GLASSBREAK SENSOR TESTER
1. Product Description: Hand-held tester that generates glassbreak sounds to test glassbreak sensors.

2.12 SYSTEM TEST REPORTS

A. Report Criteria: After each test, promptly submit one copy of report to Owner. Provide form with the minimum following information:
1. Date issued.
2. Project title and/or number.
3. Name and Model of Tester and witnesses.
4. Date and time of sampling or inspection.
5. Identification of product and specifications section.
6. Type of inspection or test.
7. Date of test.
8. Results of tests.
9. Indicate compliance or non-compliance with Contract Documents.
10. Final adjustment setting values where applicable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to beginning equipment installation, examine areas to receive system equipment and devices. Verify that all conditions are acceptable.

3.2 INSTALLATION

A. General:
1. Install all equipment and devices in accordance with the manufacturer's instructions and drawings. Coordinate locations of all sensors and magnetic contacts to provide optimum performance in the associated area.
2. Keep up to date "As-built" record drawings at the job site detailing the layout and field modifications to the Shop Drawings. Update the Shop Drawing electronic copy with the field red-lined changes.
3. Pathway Separation Clearances:

a. Provide 3” minimum clearance from bottom of security system pathway to ceiling tile and T-bar ceiling and 12 inches clear space above cable trays for access.
b. Do not route security system cables adjacent and parallel to unshielded and ungrounded power cabling.

4. Do not route raceways over or adjacent to boilers.

B. All work shall conform to the National Electrical Contractor's Association "Standard of Installation".

3.3 SYSTEM WIRING

A. No wiring other than that directly associated with the Intrusion Detection System shall be permitted in Intrusion Detection System conduits and pathways.

B. Cables to be installed in raceway, cable tray, continuous cable support system or J-hooks the entire length of each cable. In all locations where devices are installed in inaccessible ceilings or concealed in walls (i.e. door contacts, motion sensors), utilize signal cable in raceway from the device to the area above the accessible grid ceiling.

C. Unless otherwise noted in the Contract Documents, install a dedicated cable to each individual field device.

D. Install 1-foot cable service loop for all security system cable at the last J-hook nearest the raceway down to the device, or as near as possible to the device when J-hooks are not installed.

E. Wiring splices are to be avoided to the extent possible, and if needed they must be made only in junction boxes and shall be crimp connected. Wire nut-type connections are not acceptable.

3.4 SYSTEM LABELING

A. Install nameplates and labels parallel to equipment lines.

B. Secure nameplate with pop rivets or brass machine screws tapped and threaded to cabinet. Machine screws shall not protrude more than 1/16 inch on back side.

C. Provide label on each field device, denoting device address. Affix label to device faceplate for ceiling-mounted devices or wall-mounted devices above 8’-0” AFF. Affix label inside backbox for exterior devices.

D. Install wire marker for each cable at cabinets, pull boxes, junction boxes, and each load connection. Wire ID number to match at each end.

3.5 EQUIPMENT CONNECTION AND CONFIGURATION

A. Main Control Panel:

1. Connect the main control panel to dedicated 120V power circuit. Coordinate connection location and requirements with electrician.

2. Connect the main control panel to the Owner LAN/WAN via a port on the Owner's Ethernet switch. Coordinate with Owner for exact switch connection point.

3. Connect the main control panel to telephone line(s) for Central Station Monitoring.

4. Coordinate all programing, LAN/WAN, and Central Monitoring Station connections and requirements with Owner. The Contractor is responsible for all materials, labor, and programming required to accomplish a complete and functioning system at no additional cost to the Owner.

C. Glassbreak Sensors: Calibrate the glassbreak sensors for each space where they are installed in accordance with manufacturer's instructions. This shall include using the glassbreak tester to first put the sensor into "calibrate" mode and then generating a "plate" glassbreak sound from the four corners of the room. All glassbreak sensors shall be left in the "unmasked" mode, regardless of the masked/unmasked condition of the overall security system.

D. Motion Sensors: Install motion sensors as specified and initially activate the "walk test" feature on each sensor. This feature shall remain active until after the Final Completion Inspection. Adjust detector aim and masking pattern as required to provide maximum coverage but eliminate false alarms.

3.6 FIELD QUALITY CONTROL AND TESTING

A. Perform a 100% Device Test on each device point and circuit for proper operation. Confirm operation by observation in LAN/WAN via a Contractor's laptop computer.
   1. Test each set of magnetic contacts for proper operation and contact closure.
   2. Test field-of-view for each motion sensor and re-aim as necessary for intended coverage area. Mask sensors or change lenses as necessary to prevent false tripping from points outside the coverage area. Remove motion sensor from walk test mode after proper operation is confirmed.
   3. Test each glassbreak sensor with handheld tester to verify proper operation. Test shall be performed with tester near actual windows. Relocate or add sensors within room as necessary to obtain proper coverage area.
   4. Test keypads and status panels for proper operation.

B. Verify that activation of all field devices noted above will properly send an alarm signal to the main control panel and then transmit to the Central Monitoring Station and Owner LAN/WAN.

C. Prior to testing the transmitting functions, the Contractor shall notify both the Owner and the Central Monitoring Station in writing for testing periods more than 4 hours. For testing periods less than 4 hours, notification shall be done by phone. The intent is that the Central Monitoring Station can ignore the incoming events during the testing phase.

D. Provide a report from the system that shows all devices tested. Provide a report from the Central Monitoring Station that shows all alarms received. Compare the two reports to determine whether any field devices are inoperative or not properly linked. Provide copies of both reports to the Owner after the test.

E. If the building is occupied during the testing phase, provide initial basic training to building staff on arming and disarming the system. This training does not count toward the formal Owner training specified in this section.

3.8 SYSTEM DEMONSTRATION

A. Demonstrate to the Owner the system can Arm and Disarm.

B. Demonstrate all perimeter doors and motion sensors are operable and not jumpered out.

C. Demonstrate system alarm reporting to the Central Monitoring and Owner LAN/WAN. Test each zone on and verify that the signal is correctly received at the monitoring station and that the identification of the zone matches the identification at the keypad.

D. Demonstrate proper operation of the reports. Generate sample Historical Reports using Owner-provided printers.

E. Confirm system operation under simulated utility power outage. Confirm Central Monitoring Station and Owner LAN/WAN receives alarms.

F. Demonstrate archiving of the System Event Transaction Log File.

G. Demonstrate properly restricted operator privileges by logging in as an Operator and demonstrating operation.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

A. This section includes a Contractor designed and installed fire alarm system. The Fire Alarm / Life Safety System supplied under this specification shall be a microprocessor-based network system. All Control Panel Assemblies and connected Field Appliances shall be both designed and manufactured by the same company, and shall be tested and cross-listed as compatible to ensure that a fully functioning Life Safety System is designed and installed.

B. Section includes fire alarm control panels, manual fire alarm stations, automatic smoke and heat detectors, fire alarm signaling appliances, and auxiliary fire alarm equipment and power and signal wire and cable.

1.2 REFERENCES

A. The equipment and installation shall comply with the current provisions of the following standards:
1. National Electric Code, Article 760.
2. National Fire Protection Association Standards:
    a. NFPA72 - National Fire Alarm Code.
    b. NFPA101 - Life Safety Code.
3. Local and State Building Codes.
4. Local Authorities Having Jurisdiction.
5. Underwriters Laboratories Inc.
6. Factory Mutual

B. The system and all components shall be listed by Underwriters Laboratories Inc. for use in fire protective signaling system under the following standards as applicable:
1. UL 864/UOJZ, APOU Control Units for Fire Protective Signaling Systems.
2. UL 268 - Smoke Detectors for Fire Protective Signaling Systems.
3. UL 268A - Smoke Detectors for Duct Applications.
4. UL 217 - Smoke Detectors Single Station.
5. UL 521 - Heat Detectors for Fire Protective Signaling Systems.
6. UL 228 - Door Holders for Fire Protective Signaling Systems.
7. UL 464 - Audible Signaling Appliances.
8. UL 1638 - Visual Signaling Appliances.
9. UL 38 - Manually Activated Signaling Boxes.
10. UL 346 - Waterflow Indicators for Fire Protective Signaling Systems.
11. UL 1971 - Standard for Signaling Devices for the Hearing Impaired.
12. UL 1481 - Power Supplies for Fire Protective Signaling Systems.

C. Americans with Disabilities Act (ADA).

D. International Standards Organization (ISO)
1. ISO-9000
2. ISO-9001

1.3 SYSTEM DESCRIPTION

A. Fire Alarm System:
   1. New fire alarm system with a Class B (Style 4) Addressable Intelligent Fire Alarm System for manual and automatic local fire alarm system with dual line auto-dialer for remote monitoring.

B. Edwards System Technology (EST) is the design basis of the fire alarm system for standard of installation requirements and quality level of equipment. Equipment manufactured by Simplex, or Siemens (Edwards OEM type) are acceptable alternatives.

1.4 SUBMITTALS

A. Provide submittals in accordance with Division 1, Section 26 05 00 and the following requirements:
   1. Provide quantity of shop drawings and submittal information required in Division 1 if denoted; otherwise provide a minimum of three complete sets.
   2. Shop Drawings:
      a. The Shop Drawings shall be reproduced electronically from a Master Copy supplied in digital format. Electronic copy of the contract drawings will be available at no charge to use as base plan for generation of electronic submittal.
      b. Indicate system-wiring diagram showing each device and wiring connection; indicate annunciator layout, and design calculations.
      c. Provide 1/8” scale floor plans with all new fire alarm control and auxiliary panels, initiating and indicating devices, raceway and conductor routing, quantities and connection requirements for every component.
      d. Provide complete one-line riser diagrams denoting system connection configuration of all device types.
      e. Color full size depiction of the Electronic graphic annunciator.
      f. Provide standby battery capacity calculation per NFPA 72 with devices counts and consumption data.
      g. Provide calculations for notification appliance circuits voltage drops do not exceed voltage drop limits.
   3. Submit to AHJ: Submit drawings to Fire Marshal the AHJ for review and written approval. Coordinate all modifications required.
   4. Submit to Factory Mutual Insurance Company: Submit specifications, shop drawings and equipment nomenclature to Factory Mutual Insurance Company for review and written approval. Allow a minimum of 2 weeks for review by Factory Mutual Insurance Company.
   5. Product Data: Submit catalog data showing electrical characteristics and connection requirements.
   6. Test Reports: Indicate procedures and results for specified field testing and inspection.

1.5 CLOSEOUT SUBMITTALS

A. Operating manuals covering the installed Life Safety System.

B. Point to Point diagrams of the entire Life Safety System as installed. This shall include all connected Smoke Detectors and addressable field modules. All drawings shall be provided in CAD and supplied in standard .DXF format. Mylar media plots of each sheet shall also be provided. A system generated point-to-point diagram is required to ensure accuracy. One copy of point-to-point diagram shall be laminated and remain at school site.

C. The application program listing for the system as installed at the time of acceptance by the building owner and/or Local AHJ (Disk and Hard copy printout).

D. Name, address and telephone of the authorized factory representative.

E. All drawings must reflect device address and programmed characteristics as verified in the presence of the engineer and/or the end user unless device addressing is electronically generated, and graphically printed.

F. Certificate of compliance shall be provided. The certificate shall clearly indicate the installed system complies with all NFPA, ADA and Factory Mutual Global requirements.

1.6 QUALIFICATIONS

A. The installation of the system shall conform the State of Alaska requirements and supervised by a representative with a current State Fire Alarm License.

B. Manufacturer: The Manufacturer shall be a nationally recognized company specializing in fire alarm systems. This organization shall employ factory trained and NICET certified technicians, and shall maintain a service organization within the state of Alaska. The Manufacturer and service organization shall have a minimum of 5 years experience in the fire protective signaling systems industry.

C. Installer: The installation organization shall be a company specializing in the installation of fire alarm systems. This organization shall have a minimum of 5 years experience with installation of fire protective signaling systems. The fire protective signaling system shall supervised by NICET certified installers.

D. The Installer supplying final check-out, contractual service and testing, shall be Listed and Authorized by UL to provide services for alarm system Certification as a means of identifying compliance with applicable NFPA Standards.

1.7 WARRANTY

A. Warranty all materials, installation and workmanship for one (1) year from date of acceptance.

B. A copy of the manufacturers' warranty shall be provided with close-out documentation and included with the operation and installation manuals.

1.8 SYSTEM STARTUP, OWNER'S INSTRUCTIONS, COMMISSIONING

A. System startup shall be performed by a Factory Trained and Authorized Engineered Systems Distributor. Certain functions of the Systems Startup Procedure may be

performed by a contractor under the direction of the Factory Trained and Authorized Engineered Systems Distributor.

B. Provide 100% system test and document per NFPA 72.

C. Owners' Instructions and Operation Manuals, specific for this project, shall be supplied to the Building Operations Staff by the Factory Trained and Authorized Engineered Systems Distributor prior to acceptance. A "Generic" or "Typical" Owners' Instruction and Operation Manual shall not be acceptable to fulfill this requirement.

D. Commissioning of the installed system shall be performed by the Factory Trained and Authorized Engineered Systems Distributor in the presence of the Local AHJ, the Building Owners, Representative, and a Representative of FM Global.

1.9 EQUIPMENT AND MATERIAL GENERAL REQUIREMENTS

A. All equipment furnished for this project shall be new and unused. All components and systems shall be designed for uninterrupted duty. All equipment, materials, accessories, devices, and other facilities covered by this specification or noted on contract drawings and installation specifications shall be the best suited for the intended use and shall be provided by a single manufacturer. If any of the equipment provided under this Specification is provided by different manufacturers, then that equipment shall be recognized as compatible by both manufacturers, and "Listed" as such by Underwriters' Laboratories.

B. The system shall be capable of detecting the electrical location of each Signature intelligent device, including smoke, heat, pull stations and duct detector devices. It shall be possible to display the intelligent device map on a PC.

C. In addition, "As-Built" riser and wiring diagrams reflecting all T-Taps, each programmed device characteristic including detector type, base type, serial number, sensitivity setting and wire configurations will be provided to the Architect/Engineer, based on the information gathered during the verification process described above.

D. System installation and operations shall be verified by the manufacturer's representative and a verification certificate presented upon completion. The manufacturer's representative shall be responsible for an on-site demonstration of the operation of the system and initial staff training as required by the Architect and/or Consulting Engineer.

E. It shall be possible for authorized service personnel using a Program/Service Tool or laptop PC to change the personality/function of a Signature Series Device to meet changes in building layout or environment. System changes shall be verified by the manufacturer's representative and a verification certificate presented upon completion.

F. Coordinate with owner to gain approved room numbering scheme prior to programming system, annunciator, and system map procurement. Update the annunciator drawing and system map to include the owner provided rooms numbers and correlate programming to the number provided.

PART 2 PRODUCTS

2.1 LIFE SAFETY SYSTEM

A. The Life Safety System shall be a Multi-Processor Based Network System designed specifically for Fire applications. The Life Safety System shall be UL listed under Standards 864 (Control Units for Fire-Protective Signaling Systems) under categories UOJZ and APOU, and ULC listed under standard CAN/ULC-S527.

B. Added special components:
1. Provide bypass and supervision relays at minimum:
   a. Disable Audible bypass
   b. Door release bypass
   c. Fan shut down bypass
   d. Sprinkler tamper bypass
2. Provide Control User interface switches to control the bypass supervision features described above.
3. Magnetic Door Release Pushbutton:
   a. Full guard red push button, momentary contacts. Provide with 1 spare set of N.O. Contacts.
   b. Install in factory steel enclosure.
   c. Square D ZB4BA46 AND XAPG19100 or equal.

C. The Life Safety System shall include all required hardware and system programming to provide a complete and operational system, capable of providing the protected premises with the following functions and operations:
1. Modular systems design, with a layered application design concept, including an "Operational Layer" and a "Human Interface Layer", to allow maximum flexibility of the system with a minimum physical size requirement.
2. All System operational software is to be stored in FLASH memory. Control Panel disassembly, and replacement of electronic components of any kind shall not be required in order to upgrade the operations of the installed system to conform to future application code and operating system changes.
3. Advanced Windows™-based System Definition Utility with Program Version Reporting to document any and all changes made during system start-up or system commissioning. Time and Date Stamps of all modifications made to the program must be included to allow full retention of all previous program version data.
4. System response to any alarm condition must occur within 3 seconds, regardless of the size and the complexity of the installed system.
5. HVAC Status LED Illumination shall be controlled by the activation of the output device. A "Flash", followed by a "Steady" illumination will verify operation without the need for a "sail" switch in each air handling unit.
6. System Common Control Functions shall be automatically routed to any node of the system as a function of the time of day and date.

D. Life Safety System Mechanical and Overall Feature Summary
1. The Life Safety System shall include the following features and shall support the following operations in each installed cabinet or node of the system:

a. Ground fault detection by panel, by Signature Data Circuit, and by device module.
b. Ability to download all system applications programs and “firmware” from a computer through a single point in the system.
c. True Distributed Intelligence, including microprocessor-based Detectors and Modules.
d. AC Power Trouble Delay adjustable from 4 Hours to 10 Hours.
e. Removable, Interlocked terminal blocks for the connection of the field wiring to the Fire Alarm Control Panel.
f. Electronic Addressing of Field Devices.
g. Dead Front Construction.
h. Outer door flush keyed lock.
i. Battery backup per NFPA.
j. Auto Dialer for connection to remote monitoring Station with line grabbers.

E. Life Safety System Human Interface

1. The Fire Alarm / Life Safety System shall include an Emergency Operators’ Interface Panel that shall include the following system annunciation and control functions:
   a. Hands Free Emergency Operation. The first and last highest priority event on the system shall be displayed automatically and simultaneously.
   b. Control Panel Internal Audible Signal shall have four programmable signal patterns, to allow for the easy differentiation between Alarm, Supervisory, Trouble and Monitor conditions within the installed system.
2. Discreet “System Status” LEDs:
   a. Power Status LED - Green LED shall illuminate when AC power is present.
   b. Test Status LED - Yellow LED shall illuminate when any portion of the system is in the test mode. A programmable timer shall cause the system to automatically exit the test mode after a period of system inactivity. This Test LED shall function in a local or in a group mode.
   c. CPU Fail Status LED - Yellow LED shall illuminate when the panel controller has an internal failure.
   d. Ground Fault Status LED - Yellow LED shall illuminate when ungrounded wiring connected to the cabinets’ power supply has continuity to ground. This feature shall function in either a local or group mode.
   e. Disable Status LED - Yellow LED shall illuminate whenever any point or zone in the installed system is manually disabled.
3. Discreet Common Control Switches with Associated Status LEDs:
   a. Reset: Depression of the Reset Switch starts the system reset operation. The associated Yellow LED shall have three flash rates during this operation to inform the user of the progress status of the reset cycle. The LED shall flash fast during the smoke detector power down sequence, then it shall flash slowly during the restart phase, and shall illuminate steadily for the restoral phase. The LED shall go out completely when the system is back to normal mode. Each phase, as well the overall reset cycle shall be programmable to perform other functions.

b. Alarm Silence: Depression of the Alarm Silence Switch shall turn off all (audible and/or visible) Notification Appliance Circuits. The associated yellow LED illuminates when the Alarm Silence function is active, whether by the Alarm Silence Switch, or by an integral software timer. Subsequent activation of the Alarm Silence Switch shall resound the signals. Activation of the Alarm Silence switch shall be programmable to perform other functions.

c. Panel Silence: Depression of the Panel Silence Switch shall turn off the systems' internal audible signal when configured as a 'local' system. The associated yellow LED illuminates when the panel silence feature is activated.

d. Drill Switch / LED: Depressing the DRILL switch activates the fire drill function. Yellow LED indicates that the fire drill function is active. The Drill Switch shall also be programmable to perform system functions other than the Drill Function.

4. Other Operator Control Switches:

a. Previous Message Switch: Pressing the Previous Message Switch shall scroll the display to show the preceding message in the selected queue. Holding the Previous Message Switch and pressing any queue select switch moves to the top of the respective queue event list. Scrolling through event messages may be done by the operator at any time.

b. Next Message Switch: Pressing the Next Message Switch shall scroll the display to show the following message in the selected queue. Holding the Previous Message Switch and pressing any queue select switch moves to the bottom of the respective queue event list. Scrolling through event messages may be done by the operator at any time.

c. More Details Switch: Pressing the More Details Switch shall show the address and 42 character location message of the active device on display. If a zone is active, pressing the switch displays the address and message of active devices within the zone. When multiple devices are active, the "Previous/Next" message switch may be used to scroll through the messages.

F. Printer

1. Provide desktop printer located in the telecommunication room.

G. The System Main Liquid Crystal Display:

1. The Liquid Crystal display shall provide the means to inform the System Operator with detailed information about the off-normal status of the installed Fire Alarm / Life Safety System. The Main Display shall automatically respond to the status of the system, and shall display that status on a 4 line by 20 character backlit alpha-numeric Graphical Liquid Crystal Display.

2. The following status functions shall be annunciated by the Main Liquid Crystal Display:

a. The current Date and Time.

b. A Custom System Title (2 lines X 21 characters).

c. A summary total of the Alarm History of the system.

3. With the Fire Alarm Life Safety System in the Alarm Mode, the LCD shall automatically reconfigure into four logical windows.

a. Systems Status Window - The LCD shall show the system time, and the number of active points and disabled points in the system in this section of the LCD Display.
b. Current Event Window - The LCD shall show the first active event of the highest priority in reverse text to highlight the condition to the Emergency Operator. The top line of the reversed text shall show the sequence number in which the displayed event was received, as well as its event type. The second and third lines of reversed text shall display an identification message related to the displayed event.
c. Last Event Window - The LCD shall show the most recent, highest priority event received by the system.
d. Type Status Window - The LCD shall show the total number of active events in the system, by event type. There shall be four different System Event Types that shall be displayed, “Alarm Events”, “Supervisory Events”, “Active Trouble Events”, and “Active Monitor Events”.

4. System Message Processing:
   a. In order to simplify, and to clarify the System Status information that is given to the Emergency Operator, the Main LCD shall include queues for each of the System Event Types. The Main LCD shall allow the Emergency operator access to the System Status information contained within those queues by pressing an associated queue select switch. Whenever there is an unacknowledged event in any of the System Event queues, the associated Status LED shall flash. Viewing each event listed in a queue shall acknowledge all events in that queue, and shall cause the associated LED to illuminate steady.
   b. All messages contained in any of the System Event queues shall be accessible for review by the Emergency Operator using the “Previous/Next” message switch. It shall be possible to route additional event information to a printer.
5. Maintenance Menu - The Main LCD shall also allow the System Operator to access system maintenance functions through a four level password system. The authorized System Operator shall be able to access the following functions:
   a. System Status - The system shall allow the operator to determine the status of individual system components, including active points, disabled points, and active points by panel. **list additional**
   b. Enable - The system shall allow the operator to restore a disabled point (device) in the system, allowing that point (device) to operate as originally intended by the application program of the system. Additionally, the system shall allow the operator to restore any group function, guard patrol function, Panel, system module, “software - defined zone”, operator control, or time control function.
   c. Disable - The system shall allow the operator to disable any point (device) in the system, inhibiting that point (device) from operating as originally intended by the application program of the system. Additionally, the system shall allow the operator to disable any group function, guard patrol function, Panel, system module, “software - defined zone”, operator control, or time control function within the system.
   d. Activate - The system shall allow the operator to manually turn on any system output point, or system function. Alternate Smoke Detector

sensitivity, message routing within the system, guard patrol timing, and check-in group timings shall be modifiable with this simple command from the control panel.

e. Restore - The system shall allow the operator to restore the primary (application program defined) operation to the Smoke Detector sensitivity and the message routing functions with this simple command from the control panel.

f. Control Output - The system shall allow the operator to manually command and control relays and LEDs. Relays shall be able to be commanded to "Latch", to energize as a "High Priority", or as a "Low Priority", to "Energize", or to "De-Energize". LEDs shall be able to be commanded to "Latch", to energize as a "High Priority", or as a "Low Priority", to turn "On", to turn "Off", to "Slow Blink", or to "Fast Blink".

6. Reports via the Main LCD and connected system printers
   a. Provide room number (Use owner furnished update) and Zone as denoted on the electronic graphic annunciator.
   b. Provide detailed status of individual system components.
   c. The system shall provide a report that gives a sensitivity listing of all detectors that have less than 75% environmental compensation remaining.
   d. The system shall provide a report that provides a sensitivity listing of any particular detector.
   e. The system shall provide a report that gives a listing of the sensitivity of all of the detectors on any given panel in the system, or any given SDC loop within any given panel.
   f. The system shall provide a report that gives a chronological listing of system events.
   g. The system shall provide a listing of all of the firmware revision listings for all of the installed network components in the system.
7. The system shall allow the authorized operator to perform all of the following system functions through programming:
   a. Set the System Time.
   b. Set the System Date.
   c. Set (Change) the System Passwords.
   d. Restart the System.
   e. Set the Dates for the System Holiday Schedule.
   f. Clear the Chronological System History File.
8. The system shall allow the authorized operator to perform test functions within the installed system. Test functions shall be defined by the authorized operator to be performed on a per cabinet, circuit, or service group basis.
   a. Local Control and Display Annunciator - Each panel in the installed system shall include local Control and Display Annunciators. These annunciators shall have integral membrane style, tactile push-button control switches, for the control of system functions, and LEDs with programmable (software-controlled) flash rates and slide-in labels for annunciation of system events.
   b. The Local Control Display Annunciators shall provide the system with individual zone and / or device annunciation.

c. The Local Control Display Annunciators shall provide the system with individual zone and / or device annunciation with zone and / or device disable.
d. The Remote Control Display Annunciators shall provide the system with individual alarm and trouble annunciation per zone and / or device with zone and / or device disable.
e. The Local Control and Display Annunciators shall provide the system with groups of three switches that have a software controlled interlock to allow only one of the switches to be active at any time. The switch triads shall be used for all of the fan and damper controls in the protected premises.

H. Life Safety System Operations Interface:
1. SDC Card - The Signature Device Card (SDC) shall be the interface between the Fire Alarm Control Panel and the Signature Series Detectors and Modules. The communications format between the SDC and the Signature Series Devices shall be 100% digital. Communications to devices must incorporate BROADCAST POLLING and DIRECT ADDRESS SEARCH to ensure the fastest reporting of off-normal conditions to the system human interface layer.
2. It shall be possible to wire the SDC as Class A (Style 6 or Style 7) or Class B (Style 4) without twisted or shielded wire. It must be possible to wire branch circuits (T-Taps) from Class B Circuits.
3. The associated controller (3-SSDC), through the SDC, shall provide the ability to set the sensitivity and alarm verification of each of the individual intelligent detectors on the circuit. It shall be possible to automatically set the sensitivity of individual intelligent detectors during day and night periods.
4. It shall be possible for the SDC to address all intelligent devices connected to it without having to set switches at the individual devices.
5. It shall be possible to obtain a mapping report of all devices connected to the circuit for confirmation of “as-built” wiring. The map shall show physical wiring of T-Taps, device types, and the panel addresses of devices connected to the circuit. The SDC shall be capable of reporting unexpected additional device addresses and changes to the wiring in the data circuit. A specific trouble shall be reported for any off-normal non-alarm condition.
6. The SDC shall be able to report the following information on a per intelligent device basis:
   a. Device Serial Number
   b. Device Address
   c. Device Type
   d. Current Detector Sensitivity Values and the Extent of Environmental Compensation.
   e. Any of 32 possible trouble codes to specifically diagnose faults.
7. Should a Signature Driver Controller CPU fail to communicate, the Signature circuit shall go into the stand-alone mode. The circuit shall be capable of producing a loop alarm if an alarm type device becomes active during stand-alone mode.

I. Hard Wired NAC Circuits

1. Provide where indicated on the plans supervised hard wired Notification Appliance Circuits (NAC) for the control of 24Vdc EST Genesis Series

Signaling Appliances. The NAC shall be Class B (Style 4), and shall control up to 3.5 amps of power to the circuit. All Notification Appliance Devices shall be synchronized and comply with all ADA requirements.

2.2 TEXT ANNUNCIATORS

A. Provide text annunciator with 4 feature LEDs for “Normal”, “Alarm”, “Supervisory”, and “Trouble”. Provide two push-button switches for “Back” and “Next/Acknowledge”. EST model 2-LSRA.

B. Provide keyed, clear, outer protective cover. MEGA STOPPERS Model 7500H.

2.3 INTELLIGENT DETECTORS

A. The System Intelligent Detectors shall be capable of full digital communications using both broadcast and polling protocol. Each detector shall be capable of performing independent fire detection algorithms. The fire detection algorithm shall measure sensor signal dimensions, time patterns and combine different fire parameters to increase reliability and distinguish real fire conditions from unwanted deceptive nuisance alarms. Signal patterns that are not typical of fires shall be eliminated by digital filters. Devices not capable of combining different fire parameters or employing digital filters shall not be acceptable.

B. Each detector shall have an integral microprocessor capable of making alarm decisions based on fire parameter information stored in the detector head. Distributed intelligence shall improve response time by decreasing the data flow between detector and Analog loop controller. Detectors not capable of making independent alarm decisions shall not be acceptable. Maximum total Analog loop response time for detectors changing state shall be 0.5 seconds.

C. Each detector shall have a separate means of displaying communication and alarm status. A green LED shall flash to confirm communication with the Analog loop controller. A red LED shall flash to display alarm status. Both LEDs on steady shall indicate alarm-standalone mode status. Both LEDs shall be visible through a full 360 degree viewing angle.

D. The detector shall be capable of identifying up to 32 diagnostic codes. This information shall be available for system maintenance. The diagnostic code shall be stored at the detector.

E. Each smoke detector shall be capable of transmitting pre-alarm and alarm signals in addition to the normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level. Each smoke detector may be individually programmed to operate at any one of five (5) sensitivity settings.

F. Each detector microprocessor shall contain an environmental compensation algorithm that identifies and sets ambient “Environmental Thresholds” approximately six times an hour. The microprocessor shall continually monitor the environmental impact of temperature, humidity, other contaminates as well as detector aging. The process shall employ digital compensation to adapt the detector to both 24 hour long term and 4 hour

short term environmental changes. The microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches 80% and 100% of the allowable environmental compensation value. Differential sensing algorithms shall maintain a constant differential between selected detector sensitivity and the "learned" base line sensitivity. The base line sensitivity information shall be updated and permanently stored at the detector approximately once every hour.

G. The intelligent Analog device and the Analog loop controller shall provide increased reliability and inherent survivability through intelligent Analog standalone operation. The device shall automatically change to standalone conventional device operation in the event of a loop controller polling communications failure. In the Analog standalone detector mode, the Analog detector shall continue to operate using sensitivity and environmental compensation information stored in its microprocessor at the time of communications failure. The Analog loop controller shall monitor the loop and activate a loop alarm if any detector reaches its alarm sensitivity threshold.

H. Each Signature Series device shall be capable of automatic electronic addressing and/or custom addressing without the use of DIP or rotary switches. Devices using DIP or rotary switches for addressing, either in the base or on the detector shall not be acceptable.

I. The intelligent Analog detectors shall be suitable for mounting on any Signature Series detector mounting base.

1. Heat Detector – Fixed Temperature

    a. Provide intelligent fixed temperature heat detectors. 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^{o}F (57^{o}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.

2. Heat Detector - Fixed Temperature/Rate of Rise

    a. Provide intelligent combination fixed temperature/rate-of-rise heat detectors. 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^{o}F (57^{o}C) and a rate-of-rise alarm point of 15^{o}F (9^{o}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.

3. Smoke Detector – Ionization
   a. Provide intelligent ionization smoke detectors. The analog ionization detector shall utilize a unipolar ionization smoke sensor to sense changes in air samples from its surroundings. The integral microprocessor shall dynamically examine values from the sensor and initiate an alarm based on the analysis of data. Systems using central intelligence for alarm decisions shall not be acceptable. The detector shall continually monitor any changes in sensitivity due to the environmental affects of dirt, smoke, temperature, aging and humidity. The information shall be stored in the integral processor and transferred to the analog loop controller for retrieval using a laptop PC or the SIGA-PRO Signature Program/Service Tool. The ion detector shall be rated for ceiling installation at a minimum of 30 ft (9.1m) centers and be suitable for wall mount applications. The ion smoke detector shall be rated for operation in constant air velocities from 0 to 75 ft/min. (0-0.38 m/sec) and with intermittent air gusts up to 300 ft/min. (1.52m/sec) for up to 1 hour.
   b. The percent smoke obscuration per foot alarm set point shall be field selectable to any of five sensitivity settings ranging from 0.7% to 1.6%. The ion detector shall be suitable for operation in the following environment:
      1) Temperature: 32^{o}F to 120^{o}F (0^{o}C to 49^{o}C).
      2) Humidity: 0-93% RH, non-condensing.
      3) Elevation: Up to 6,000 ft. (1828 m).
4. Smoke Detector – Photoelectric
   a. Provide intelligent photoelectric smoke detectors. The analog photoelectric detector shall utilize a light scattering type photoelectric smoke sensor to sense changes in air samples from its surroundings. The integral microprocessor shall dynamically examine values from the sensor and initiate an alarm based on the analysis of data. Systems using central intelligence for alarm decisions shall not be acceptable. The detector shall continually monitor any changes in sensitivity due to the environmental affects of dirt, smoke, temperature, aging and humidity. The information shall be stored in the integral processor and transferred to the analog loop controller for retrieval using a laptop PC. The photo detector shall be rated for ceiling installation at a minimum of 30 ft (9.1m) centers and be suitable for wall mount applications. The photoelectric smoke detector shall be suitable for direct insertion into air ducts up to 3 ft (0.91m) high and 3 ft (0.91m) wide with air velocities up to 5,000 ft/min. (0-25.39 m/sec) without requiring specific duct detector housings or supply tubes.
   b. The percent smoke obscuration per foot alarm set point shall be field selectable to any of five sensitivity settings ranging from 1.0% to 3.5%. The photo detector shall be suitable for operation in the following environment:
      1) Temperature: 32^{o}F to 120^{o}F (0^{o}C to 49^{o}C).
      2) Humidity: 0-93% RH, non-condensing.
      3) Elevation: no limit.
5. Smoke Detector – Multisensor Technology

a. Sensor to integrate Ionization, Photelectric and heat sensors in one detector.
b. Selectable alarm points.

6. Provide intelligent addressable detectors. The analog photoelectric detector shall utilize a light scattering type photoelectric smoke sensor to sense changes in air samples from its surroundings.
7. Standard Mounting Bases
   a. Provide standard detector mounting bases SIGA-SB suitable for mounting on North American 1-gang, 3½" or 4" octagon box and 4" square box. The base shall, contain no electronics, support all Signature Series detector types and have the following minimum requirements:
      1) Removal of the respective detector shall not affect communications with other detectors.
      2) Terminal connections shall be made on the room side of the base. Bases which must be removed to gain access to the terminals shall not be acceptable.
      3) The base shall be capable of supporting one (1) Signature Series Remote Alarm LED Indicator. Provide remote LED alarm indicators where shown on the plans.
8. Relay Detector Mounting Bases
   a. Provide relay detector mounting bases SIGA-RB suitable for mounting on North American 1-gang, 3 ½ " or 4" octagon box and 4" square box. The relay base shall support all Signature Series detector types and have the following minimum requirements:
      1) The relay shall be a bi-stable type and selectable for normally open or normally closed operation.
      2) The position of the contact shall be supervised.
      3) The relay operation shall be exercised by the detector processor upon power up.
      4) The relay shall automatically de-energize when a detector is removed.
      5) The operation of the relay base shall be controlled by its respective detector processor. Detectors operating standalone mode shall operate the relay upon changing to alarm state. Relay bases not controlled by the detector microprocessor shall not be acceptable.
      6) Form "C" Relay contacts shall have a minimum rating of 1 amp @ 30 Vdc and be listed for "pilot duty".
      7) Removal of the respective detector shall not affect communications with other detectors.
      8) Terminal connections shall be made on the room side of the base. Bases which must be removed to gain access to the terminals shall not be acceptable.
9. Duct Detector Housing
   a. Provide smoke detector duct housing assemblies to facilitate mounting an intelligent analog Photoelectric Detector along with a standard, relay or isolator detector mounting base. Provide for variations in duct air velocity between 300 and 4000 feet per minute. Protect the measuring chamber from damage and insects. Provide an air exhaust tube and an air sampling inlet tube which extends into the duct air stream up to ten

feet. Provide drilling templates and gaskets to facilitate locating and mounting the housing. Provide five one gang knockouts for mounting optional Signature Series modules. Finish the housing in baked red enamel. Provide Remote Alarm LED Indicators and Remote Test Stations adjacent to each unit in an accessible location. EST SIGA-DH Duct Smoke Detector Housing with SIGA-LED and EST-6261-006 Air Sampling tube. Air sampling tube to be the length of the duct or air passage to be covered.

b. Provide remote LED alarm for each duct detector in the nearest corridor. Provide label on each remote indicator to identify associated unit.

c. Provide all wiring, raceway, relays etc to intercept control wiring of air handler to provide unit shut down local to each unit.

d. Provide necessary modification to duct work to facilitate duct detector installation.

e. Provide power wiring from the FACP. At contractors option 120V power can be used where available.

2.4 INTELLIGENT MODULES

A. It shall be possible to address each Intelligent Signature Series module without the use of DIP or rotary switches. Devices using DIP 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. Modules requiring EPROM, PROM, ROM changes or DIP switch and/or jumper changes shall not be acceptable. 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. The module shall be capable of storing up to 24 diagnostic codes that can be retrieved for troubleshooting assistance. Input and output circuit wiring shall be supervised for open and ground faults. The module shall be suitable for operation in the following environment:

1. Temperature: 32^{o}F to 120^{o}F (0^{o}C to 49^{o}C).
2. Humidity: 0-93% RH, non-condensing.

2.5 INTELLIGENT MANUAL FIRE ALARM STATIONS

A. It shall be possible to address each Signature Series fire alarm pull station without the use of DIP or rotary switches. Devices using DIP switches for addressing shall not be acceptable. The manual stations shall have a minimum of 2 diagnostic LEDs mounted on their integral, factory assembled single or two stage input module. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The station shall be capable of storing up to 24 diagnostic codes that can be retrieved for troubleshooting assistance. Input circuit wiring shall be supervised for open and ground faults. The fire alarm pull station shall be suitable for operation in the following environment:

1. Temperature: 32^{o}F to 120^{o}F (0^{o}C to 49^{o}C).
2. Humidity: 0-93% RH, non-condensing.

B. Product Description: Manual double-action (single stage) station made from durable (red) lexan. Keyed lock for interior access. SIGA-278 or equal.

C. Backbox: Manufacturer's standard surface mounted (red) device backbox for all devices. 276B-RSB or approved equal.

2.6 NOTIFICATION APPLIANCES

A. All appliances shall be U.L. Listed for Fire Protective Service.

B. All strobe appliances or combination appliances with strobes shall be capable of providing the “Equivalent Facilitation” that is allowed under the Americans with Disabilities Act Accessabilities Guidelines (ADA(AG)), and shall be UL 1971, and ULC S526 Listed.

C. All appliances shall be of the same manufacturer as the Fire Alarm Control Panel specified to assure absolute compatibility between the appliances and the control panels, and to assure that the application of the appliances is done in accordance with the single manufacturer’s instructions.

D. Any appliances that do not meet the above requirements, and are submitted for use must show written proof of their compatibility for the purposes intended. Such proof shall be in the form of documentation from all manufacturers that clearly states that their equipment (as submitted) is 100% compatible with each other for the purposes intended.

E. Backbox: Manufacturer's standard red backbox for all surface mounted devices. EST model 27193 or approved equal.

1. Strobes
   a. Provide strobes manufactured by EST, Cat No. 405 Series. In - Out screw terminals shall be provided for wiring. The strobes shall have a red metal face plate. They shall provide 15 cd, 15/75 cd, 30 cd, 60 cd, 110 cd synchronized flash outputs as required by the application determined during the shop drawing process.
   b. Strobes shall mount in a North American 4” square box. The strobe shall have lens markings oriented for wall mounting.
   c. It shall be possible to replace the lens markings with LKW series or LKC series lens marking kits.
   d. Provide weatherproof wall boxes for outdoor mounting.
2. Horns
   a. Provide electronic horns manufactured by EST, Genesis Series. In - Out screw terminals shall be provided for wiring. The horn shall have a red plastic housing. Horns 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 of 100 dBA shall be provided. Horn shall mount to a North American 4” electrical box (2-1/8” deep) using the 2 screws provided with box or to a 2-gang (2-3/4” deep) electric box.
   b. Provide weatherproof wall boxes for outdoor mounting.
3. Horn/Strobes
   a. Provide electronic horn/strobes manufactured by EST, Genesis Series. In - Out screw terminals shall be provided for wiring. The horn/strobe

shall have a red 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 of 97 dBA average shall be provided.

b. The strobe shall provide 15 cd, 15/75 cd, 30 cd, 110 cd synchronized flash outputs as required by the application determined during the shop drawing process.

c. It shall be possible to replace the lens markings with LKW series or LKC series lens marking kits.

d. Provide electronic horn/strobes manufactured by EST, Cat. No. 757 Series. The horn/strobe shall have a red plastic housing. A sound output level of 98 or 94 dBA average shall be provided.

e. Horn/strobe shall mount to a North American 1-gang masonry electrical box (2-1/2" deep).

f. Provide weatherproof wall boxes for outdoor mounting, compatible with EST, Cat No. 757 Series horn / strobe combination.

4. Chime/Strobes
   a. Chime - Edwards 757 Series Chime.
   b. Chime/Strobe – Edwards 757 Series Chime Strobe.

5. Sprinkler Bell
   a. Reconnect as required.

2.7 DOOR HOLDERS

A. Provide electromagnetic door holders connected for fail safe operation with the following features:
   1. Minimum 25 Lbf holding force.
   2. Silent operation.
   3. Coordinate voltage with transformer and system configuration provided.
   4. Finish to be brushed zinc or stainless steel.
   5. Coordinate exact configuration required at each door.
   6. Units to be connected to 24 volts dc.
   7. EST 1500 Series.
   8. Units to include cast factory backbox for door holder manufacturer.
   9. Door plate to be bolted through the door with finished trim hardware.
   10. Do not provide sheet steel back boxes.

B. Provide power supply to power all new and replaced door holders. Provide power connection to 120 V primary source and overcurrent protection.

2.8 ANCILLARY DEVICES

A. Remote Relays
   1. Ancillary devices submitted for use must have written proof of their compatibility for the purposes intended. Such proof shall be in the form of documentation from all manufacturers that clearly states that their equipment (as submitted) is 100% compatible with each other for the purposes intended.

2. Provide remote control relays connected to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be DPDT and rated for 10 amperes at 115 Vac. A single relay may be energized from a voltage source of 24 Vdc, 24 Vac, 115 Vac, or 230 Vac. A red LED shall indicate the relay is energized. A metal enclosure shall be provided.
3. Provide remote control relays connected to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be SPDT and rated for 10 amperes at 115 Vac. A single relay may be energized from a voltage source of 24 Vdc, 24 Vac, 115 Vac, or 230 Vac. A red LED shall indicate the relay is energized. A metal enclosure shall be provided.

2.9 FLOW SWITCH MONITOR

A. Connect to and monitor all existing flow switches.

2.10 TAMPER SWITCH

A. Connect and monitor all existing tamper switches.

2.11 CONDUCTORS

A. Product Description: Provide conductors of the sizes and types as recommended by the system manufacturer.

B. Fire alarm circuit conductors have insulation color or code as follows:
1. Power Branch Circuit Conductors: Black, red, white.
2. Initiating Device Circuit: Black, red.
3. Detector Power Supply: Violet, brown.
4. Signal Device Circuit: Blue (positive), white (negative).
5. Door Release: Gray, gray.

2.12 SYSTEM MAP

A. On wall beside each fire alarm panel and text annunciator provide a system map under clear 1/8” plexiglass with black metal frame permanently screwed to the wall with 4 screws around the perimeter of the map.

B. Map to denote locations of all panels, annunciator, zone locations, and device address and room numbers that correlate with text display on panel to locate system event.

C. Orientate each map consistent with location the map is installed. Provide call denoting “YOU ARE HERE” at the installation point for each map.

D. The map to be color coded for clarity of zoning.

E. The final layout to be approved prior to final printing.

F. Design: The system shall be configured as shown on the drawings.

2.13 SPARE CAPACITY

A. Provide minimum 25% spare capacity in each signal line circuit and notification appliance circuit at minimum.

2.14 SPARE PARTS

A. Provide the following spare parts delivered to the owner at the time of training:
   1. 2 Pull stations.
   2. 2 Smoke detectors – minimum of (2) for each type used.
   3. 2 Horn Strobes.

PART 3 EXECUTION (Not Used)

END OF SECTION