Technical Specifications

McGrath Sub-Regional Health Clinic

100% Design Submittal VOL I.

April 20, 2009

ALASKA NATIVE TRIBAL HEALTH CONSORTIUM DEPT. OF ENVIRONMENTAL HEALTH & ENGINEERING DIVISION OF HEALTH FACILITIES 1901 S. BRAGAW STREET, STE 200 ANCHORAGE, ALASKA 99508

AND

Denali Commission 510 L Street, Suite 410 Anchorage, AK 99501





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DIVISION 1	GENERAL REQUIREMENTS

01010	Summary of Work
01040	Project Coordination
01090	Reference Standards
01200	Project Meetings
01310	Construction Schedules
01340	Submittals, Shop Drawings, Project Data, & Samples
01370	Schedule of Values
01400	Quality Control
01500	Temporary Construction Facilities
01546	Safety and Health
01600	Materials & Equipment
01630	Substitutions
01700	Contract Closeout
01710	Cleaning
01720	Project Record Documents
01730	Operating & Maintenance Data
01740	Warranties & Bonds

DIVISION 2 SITE WORK

02230	Site Clearing and Grubbing
02300	Earthwork
02310	Trenching, backfilling and Compaction for Utilities
02374	Erosion Control Devices
02530	Sanitary Sewerage
02610	Pipe Culverts
02718	Sign Assembly
02763	Pavement Markings

- DIVISION 3 CONCRETE
 - 03300 Cast in Place Concrete
- DIVISION 4 MASONRY (NOT USED)

DIVISION 5 METALS

05100 Structural Steel Framing

DIVISION 6 WOOD AND PLASTICS

06010 06100 06180 06192 06196 06200	Lumber Rough Carpentry Glue Laminated Beams Fabricated Wood Trusses Manufactured Wood Joists Finish Carpentry
06200	Finish Carpentry

DIVISION 7 THERMAL AND MOISTURE PROTECTION

07110	Sheet Membrane Waterproofing
07190	Vapor Retarder / Air Infiltration Barriers
07200	Thermal / Acoustical Insulation
07212	Board Insulation
07213	Batt and Blown-in Insulation
07300	Shingles and Roofing Tiles
07464	Siding, Soffit, Fascia and Trim
07620	Sheet Metal Flashing, Trim, and Gutters

07900	Joint Sealants
DIVISION 8	DOORS AND WINDOWS
08111	Steel Doors and Frames
08211	Wood Doors
08610	Plastic Windows
08700	Door Hardware
08800	Glazing
DIVISION 9	FINISHES
09255	Gypsum Board Assemblies
09260	Drywall Suspension System
09311	Tile Floor Finish
00312	
09512	
09511	Acoustical Cellings
09650	Resilient Poor
09651	
09680	Carpeting Delation & Finishing
09900	Painting & Finishing
DIVISION 10	SPECIALTIES
10260	Wall & Corner Guards
10400	Signs and Symbols
10520	Fire Extinguishers, Cabinets, & Accessories
10800	Toilet & Bath Accessories
10925	Misc. Specialties
	EQUIPMENT
11452	Appliances
DIVISION 12	FURNISHINGS
12302	Modular Casework
12500	Window Blinds
DIVISION 13	SPECIAL CONSTRUCTION (NOT USED)
DIVISION 14	CONVEYING SYSTEMS (NOT USED)
DIVISION 15	MECHANICAL
15010	Basic Mechanical Requirements
15060	Hangers and Supports
15000	Machanical Identification
15080	
15100	
15120	Piping Speciallies
15130	Pumps Develoption Materia Biology
10140	Domestic Water Fiping
15150	Sanitary vvaste and vent Piping
15180	Hydronic Piping
15190	Fuel Piping
15300	Fire Suppression Materials and Methods
15350	Wet Pipe Fire Suppression Systems
15410	Plumbing Fixtures
15485	Domestic Hot Water Generators
15510	Heating Boilers and Accessories
15550	Breeching, Chimneys, and Stacks

15760	Terminal Heating Units
15810	Ducts
15830	Fans
15850	Air Outlets and Inlets
15905	Instrumentation and Control Elements
15950	Testing, Adjusting and Balancing

DIVISION 16 ELECTRICAL

16010	Electrical General Provisions
16060	Grounding
16070	Electrical Hangars and Supports
16075	Electrical Identification
16120	Wire and Cable
16130	Raceway and Boxes
16140	Wiring Devices
16141	Floor Boxes
16411	Enclosed Switches
16415	Underground Electrical Service
16442	Panelboards
16510	Lighting
16612	Fire and Security
16745	Telecommunication
16950	Electrical Testing

SUMMARY OF WORK

PART 1 - GENERAL

- 1.01 WORK COVERED BY CONTRACT DOCUMENTS:
 - A. Work Consists of:
 - 1. New Construction of a Sub-Regional Health Clinic in the Village of McGrath.
 - B. Related requirements specified elsewhere:
 - 1. Instructions and Information for Bidders in Division 0
 - 2. Other Sections in Divisions 1-16.
 - 3. Related information on Contract Drawings.
 - C. Contractor's Duties:
 - 1. Except as specifically noted, provide and pay for:
 - a. Labor, materials, equipment, and all transportation.
 - b. Tools, construction equipment and machinery.
 - c. Other facilities and services necessary for proper execution and completion of work.
 - 2. Pay legally required sales, consumer, and use taxes.
 - 3. Secure and pay for, as necessary for proper execution and completion of work, and as applicable at time of receipt of bids:
 - a. Government fees.
 - b. Licenses.
 - 4. Give required notices.
 - 5. Comply with codes, ordinances, rules, regulations, orders and other legal requirements of public authorities which bear on performance of work.

- 6. Promptly submit written notice to Contracting Officer of observed variance of Contract Documents from legal requirements. It is not Contractor's responsibility to make certain that Drawings and Specifications comply with codes and regulations.
 - a. Appropriate Modifications to Contract Documents will adjust necessary changes.
 - b. Assume responsibility for work known to be contrary to such requirements, that is completed without notice.
- 7. Enforce strict discipline and good order among employees. Do not employ on work:
 - a. Unfit persons.
 - b. Persons not skilled in assigned task.
- 1.02 WORK BY OTHERS:
 - A. Owner may employ other contractors to complete work in additional and separate contracts. Fully cooperate with workers engaged in concurrent contracts to assure expedient completion of both.
- 1.03 CONTRACTOR USE OF PREMISES:
 - A. Confine operations at site to areas permitted by:
 - 1. Law.
 - 2. Ordinances.
 - 3. Permits.
 - 4. Contract Documents.
 - B. Keep all corridors free of construction debris to allow free exiting in emergency situations.
 - C. Assume full responsibility for protection and safekeeping of products stored on premises.
 - D. Obtain and pay for use of additional storage or work areas needed for operations.

PROJECT COORDINATION

- PART 1 GENERAL
- 1.01 GENERAL
 - A. If requirements specified herein conflict with Contract Conditions, then Contract Conditions shall govern.
- 1.02 RELATED SECTIONS
 - A. Section 01010 Summary of Work
 - B. Section 01045 Cutting & Patching
 - C. Section 01095 Reference Standards
 - D. Section 01200 Project Meetings
 - E. Section 01310 Construction Schedules
 - F. Section 01340 Shop Drawings, Product Data & Samples
 - G. Section 01370 Schedule of Values
 - H. Section 01500 Temporary Construction Facility
 - I. Section 01546 Safety and Health
 - J. Section 01600 Materials & Equipment
 - K. Section 01630 Substitutions
 - L. Section 01700 Contract Closeout
 - M. Section 01710 Cleaning
 - N. Section 01720 Project Record Documents
 - O. Section 01730 Operating & Maintenance Data
 - P. Section 01740 Warranties & Bonds

1.03 CONSTRUCTION ORGANIZATION AND START-UP

- A. Establish on-site lines of authority and communications including the following:
 - 1. Schedule and conduct pre-construction meeting and progress meetings as specified in Section 01200.

- 2. Establish procedures for intra-project communications including:
 - a. Submittals
 - b. Reports & Records
 - c. Recommendations
 - d. Coordination drawings
 - e. Schedules
 - f. Resolution of conflicts
- 3. Contract Documents interpretations:
 - a. Consult with The Contracting Officer to obtain interpretation.
 - b. Assist in resolution of questions or conflicts which may arise.
 - c. Transmit written interpretations to subcontractors and to other concerned parties.
- 4. Control use of site:
 - a. Supervise field engineering and project layout.
 - b. Allocate field office space and work and storage areas for use of each subcontractor.

1.04 COORDINATING SUBCONTRACTORS' WORK

- A. Coordinate the work of all subcontractors and make certain that, where the work of one trade is dependent upon the work of another trade, the work first installed is properly placed, installed, aligned, and finished as specified or required to properly receive subsequent materials applied or attached thereto.
- B. Direct subcontractors to correct defects in substrates they install when subcontractors of subsequent materials have a reasonable and justifiable objection to such surfaces.
- C. Do not force subcontractor to apply or install product to improperly placed or improperly finished substrate that would result in an unsatisfactory or unacceptable finished product.

1.05 CLOSE-OUT DUTIES

- A. Mechanical and Electrical Equipment start-up:
 - 1. Coordinate check-out of utilities, operational systems, and equipment.
 - 2. Assist in initial start-up and testing.
 - 3. Record starting dates of systems and equipment operation.
- B. At completion of work of each subcontract, conduct inspection to assure that:
 - 1. Work is acceptable.
 - 2. Specified cleaning has been accomplished.
 - 3. Temporary facilities and debris have been removed from site.
- C. Substantial Completion:
 - 1. Conduct inspection and prepare list of work to be completed or corrected.
 - 2. Assist Contracting Officer in inspection.
 - 3. Supervise correction and completion of work as established in Contracting officer's inspection reports.
- D. Final Completion:
 - 1. Assist Contracting Officer in inspection.

REFERENCE STANDARDS

PART 1 - GENERAL

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

1.02 DEFINITIONS

- A. General: Basic contract definitions are included in the Conditions of the Contract.
- B. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on the Drawings; or to other paragraphs or schedules in the Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference. Location is not limited.
- C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by the Contracting Officer, requested by the Contracting Officer, and similar phrases.
- D. "Approved": The term "approved," when used in conjunction with the Contracting Officer's action on the Contractor's submittals, applications, and requests, is limited to the Contracting Officer's duties and responsibilities as stated in the Conditions of the Contract.
- E. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": The term "furnish" means to supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": The term "install" describes operations at the Project site including the actual unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.

- I. "Installer": An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, who performs a particular construction activity including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.
 - 1. The term "experienced," when used with the term "installer," means having successfully completed a minimum of 5 previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.
 - 2. Trades: Using terms such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
 - 3. Assigning Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements over which the Contractor has no option. However, the ultimate responsibility for fulfilling contract requirements remains with the Contractor.
 - a. This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the Work. It is also not intended to interfere with local trade-union jurisdictional settlements and similar conventions.
- J. "Project site" is the space available to the Contractor for performing construction activities, either exclusively or in conjunction with others performing work as part of the Project. The extent of the Project site will be based on the Contractor's needs for stockpiling. Suitable oudoor storage space is available for use by the Contractor.
- K. "Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.03 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 16-division format and "MasterFormat" numbering system.

- B. Specification Content: These Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be interpolated as the sense requires. Singular words shall be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.
 - 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.04 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with the standards in effect as of the date of the Contract Documents.
- C. Conflicting Requirements: Where compliance with 2 or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different but apparently equal to the Contracting Officer for a decision before proceeding.
 - 1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Contracting Officer for a decision before proceeding.

- D. Copies of Standards: Each entity engaged in construction on the Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source and make them available on request.
 - E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-generating organization, authorities having jurisdiction, or other entity applicable to the context of the text provision. Refer to Gale Research Inc.'s "Encyclopedia of Associations," which is available in most libraries.
 - F. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. The following abbreviations and acronyms, as referenced in the Contract Documents, mean the associated names. Names and addresses are subject to change and are believed, but are not assured, to be accurate and up-to-date as of the date of the Contract Documents.

ALSC	American Lumber Standards Committee P.O. Box 210 Germantown, MD 20875	(301) 972-1700
ANSI	American National Standards Institute 11 West 42nd St., 13th Floor New York, NY 10036	(212) 642-4900
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers 1791 Tullie Circle, NE Atlanta, GA 30329-2305	(800) 527-4723
ASME	American Society of Mechanical Engineers 345 East 47th St. New York, NY 10017	(212) 705-7722
ASTM	American Society for Testing and Materials 100 Barr Harbor Dr. West Conshohocken, PA 19428	(610) 832-9585
AWI	Architectural Woodwork Institute P.O. Box 1550 13924 Braddock Rd., No. 100 Centerville, VA 22020	(703) 222-1100

AWS	American Welding Society 550 LeJeune Rd., NW Miami, FL 33126	(305) 443-9353
FGMA	Flat Glass Marketing Assoc. (Now GANA)	
FM	Factory Mutual 1151 Boston-Providence Turnpike P.O. Box 9102 Norwood, MA 02062	(617) 762-4300
GA	Gypsum Association 810 First St., NE, Suite 510 Washington, DC 20002	(202) 289-5440
IEEE	Institute of Electrical and Electronic Engineers 345 E. 47th St. New York, NY 10017	(212) 705-7900
NAAMM	National Association of Architectural Metal Manufacturers 11 South LaSalle St., Suite 1400 Chicago, IL 60603	(312) 201-0101
NEC	National Electrical Code (Available from NFPA)	
NECA	National Electrical Contractors Assoc. 3 Bethesda Metro Center, Suite 1100 Bethesda, MD 20814-5372	(301) 657-3110
NEMA	National Electrical Manufacturers Assoc. 2101 L St., NW, Suite 300 Washington, DC 20037	(202) 457-8400
NFPA	National Fire Protection Assoc. One Batterymarch Park P.O. Box 9101 Quincy, MA 02269-9101	(800) 344-3555 (617) 770-3000
SMACNA	Sheet Metal and Air Conditioning Contractors' National Assoc. 4201 Lafayette Center Dr. P.O. Box 221230 Chantilly, VA 22022-1230	(703) 803-2980
SSPC	Steel Structures Painting Council 4516 Henry St. Pittsburgh, PA 15213	(412) 687-1113

UL	Underwriters Laboratories 333 Pfingsten Rd. Northbrook, IL 60062-2096	(708) 272-8800
WWPA	Western Wood Products Assoc. Yeon Building 522 SW 5th Ave. Portland, OR 97204-2122	(503) 224-3930

G. Federal Government Agencies: Names and titles of Federal Government standards- or specification-producing agencies are often abbreviated. The following abbreviations and acronyms referenced in the Contract Documents indicate names of standards- or specification-producing agencies of the Federal Government. Names and addresses are subject to change and are believed, but are not assured, to be accurate and up-to-date as of the date of the Contract Documents.

CPSC	Consumer Product Safety Commission East West Towers 4330 East-West Hwy	
	Bethesda, MD 20814	(800) 638-2772
DOC	Department of Commerce 14th St. and Constitution Ave., NW Washington, DC 20230	(202) 482-2000
FS	Federal Specification Unit (Available from GSA) 470 East L'Enfant Plaza, SW, Suite 8100 Washington, DC 20407	(202) 755-0325
PS	Product Standard of NBS (U.S. Department of Commerce) Government Printing Office Washington, DC 20402	(202) 512-0000

1.05 SUBMITTALS

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

PROJECT MEETINGS

PART 1 - GENERAL

- 1.01 REQUIREMENTS INCLUDE
 - A. Pre-construction Conference.
 - B. Coordination Meetings.
 - C. Progress Meetings.

1.02 PRE-CONSTRUCTION CONFERENCE

- A. The Owner, Contracting Officer will schedule conference following offerer's selection.
- B. The Owner, Contracting Officer, Contractor and major subcontractors are to attend Pre-construction Conferences.
- C. Agenda:
 - 1. Submittal of executed bonds and insurance certificates.
 - 2. Execution of contract.
 - 3. Distribution of Contract Documents.
 - 4. Submittal of list of Subcontractors, list of products, schedule of values, and construction schedule.
 - 5. Designation of responsible personnel.
 - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal requests, change orders, and Contract closeout procedures.
 - 7. Scheduling.

1.03 COORDINATION MEETINGS

- A. Conduct project Coordination Meetings at a regularly scheduled time convenient to all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes.
- B. Request representation at each meeting by every party currently involved in the coordination or planning for the construction activities involved.

C. Record meeting results and distribute copies to everyone in attendance and to others affected by decisions of actions resulting from each meeting.

1.04 PROGRESS MEETINGS

- A. Conduct Progress Meetings at the Project site at regularly scheduled intervals. Notify the Owner and Contracting Officer. Coordinate the dates of meetings with the preparation of the payment request.
- B. Attendees to include the Owner and Contracting Officer, the Contractor's project representative, each sub-contractor concerned with current activities or planned future activities.
- C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. In including topics for discussion as appropriate to the current status of the Project.
 - 1. Review Contractor's construction schedule.
 - 2. Interface Requirements.
 - 3. Deliveries.
 - 4. Hours of Work.
 - 5. Owner's on-site activities.
 - 6. Quality and Work standards.
 - 7. Change Orders.
 - 8. Documentation of information for payment requests.
- D. Report no later that 3 days after each progress meeting date, distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
- E. Update the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

SECTION 01310 CONSTRUCTION SCHEDULES

PART 1 - GENERAL

- 1.01 DESCRIPTION OF WORK
 - A. Related Requirements Specified Elsewhere:
 - 1. Summary of Work, Section 01010.
 - 2. Project Meetings, Section 01200.
 - 3. Shop Drawings, Project Data & Samples, Section 01340.
 - 4. Schedule of Values, Section 01370.
 - B. Provide projected construction schedules for entire work, revised periodically.

1.02 FORM OF SCHEDULES

- A. Prepare in form of horizontal bar chart.
 - 1. Provide separate horizontal bar column for each trade or operation.
 - 2. Order: Table of Contents of Specifications.
 - 3. Identify each column:
 - a. By major Specification section number.
 - b. By distinct graphic delineation.
 - 4. Horizontal time scale: Identify first work day of each week.
 - 5. Scale and spacing: To allow space for updating.
- B. Required Sheet Size: 11 inches x 17 inches

1.03 CONTENT OF SCHEDULES

- A. Provide complete sequence of construction by activity.
 - 1. Shop Drawings, Project Data and Samples:
 - a. Submittal dates.
 - b. Dates reviewed copies will be required.

- 2. Decision dates for:
 - a. Products specified by allowances.
 - b. Selection of finishes.
- 3. Product procurement and delivery dates.
- 4. Dates for beginning, and completion of, each element of construction, specifically:
 - a. Dates utilities will be disrupted.
- B. Provide a disruption schedule for each planned disruption of utilities serving the complex.
 - 1. Provide a 4 week schedule.
 - 2. Revise schedule weekly to adjust to construction schedule.
- C. Provide a phasing schedule for construction sequencing that accommodates owner occupancy requirements.
 - 1. Integrate hazardous materials scheduling with construction scheduling.
 - 2. Provide time for relocation of owner functions to interim spaces.
 - 3. Work with Owner and Contracting Officer to work out mutually acceptable schedule and phasing.

1.05 SUBMITTALS

- A. Submit first construction and disruption schedules within fifteen (15) days after date of Notice to Proceed.
 - 1. Contracting Officer will review schedules and return review copy within ten (10) days after receipt.
 - 2. If required, resubmit within seven (7) days after return of review copy.
- B. Submit phasing schedule following initial meeting with Owner.
- C. Submit periodically updated schedules accurately depicting progress to first day of each month.

SECTION 01340 SHOP DRAWINGS, PROJECT DATA AND SAMPLES

PART 1 - GENERAL

- 1.01 DESCRIPTION OF WORK
 - A. Submit to the Contracting Officer shop drawings, project data and samples on each product specified or used on the project following submittal requirements of each specification section.
 - B. Related Requirements Specified Elsewhere:
 - 1. Construction Schedule, Section 01310.
 - 2. Project Record Documents, Section 01720.
 - C. Designate in Construction Schedule dates for submission and dates for review of shop drawings, project data and samples as required for each product.

1.02 SHOP DRAWINGS

- A. Original drawings, prepared by Contractor, subcontractor, supplier or distributor, which illustrate some portion of the work; showing fabrication, layout, setting or erection details.
 - 1. Prepared by qualified detailer.
 - 2. Identify details by reference to sheet and detail numbers shown on Contract Drawings.
 - 3. Minimum Sheet Size: 18" x 24".

1.03 PROJECT DATA

- A. Manufacturer's standard schematic drawings:
 - I. Modify drawings to delete information which is not applicable to project.
 - 2. Supplement standard information to provide additional information applicable to project.
- B. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data.
 - 1. Clearly mark to identify pertinent materials, products or models.
 - 2. Show dimensions and clearances required.

- 3. Show performance characteristics and capacities.
- 4. Show wiring diagrams and controls.

1.04 SAMPLES

- A. Physical examples to illustrate materials, equipment or workmanship, and to establish standards by which completed work is judged.
 - 1. Office Samples: Of sufficient size and quantity to clearly illustrate:
 - a. Functional characteristics of product or material, with integrally related parts and attachment devices.
 - b. Full range of color samples.
 - c. After review, samples may be used in construction of project.

1.05 CONTRACTOR RESPONSIBILITIES

- A. Review Shop Drawings, Project Data and Samples prior to submission.
- B. Verify:
 - 1. Field measurements.
 - 2. Field construction criteria.
 - 3. Catalog numbers and similar data.
- C. Coordinate each submittal with requirements of work and of Contract Documents.
- D. Contractor's responsibility for errors and omissions in submittals is not relieved by Contracting Officer's review of submittals.
- E. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by Contracting Officer's review of submittals, unless Contracting Officer gives written acceptance of specific deviations.
- F. Notify Contracting Officer, in writing at time of submission, of deviations in submittals from requirements of Contract Documents.
- G. Begin no work which requires submittals until return of submittals with Contracting Officer's stamp and initials or signature indicating review have been received.

1.06 SUBMISSION REQUIREMENTS

- A. Schedule submissions at least fifteen (15) working days before dates reviewed submittals will be needed.
- B. Submit one reproducible transparency and one opaque print of shop drawings, and number of copies of project data which Contractor requires for distribution plus three (3) copies which will be retained by the Owner.
- C. Submit number of samples specified in each Specification section.
- D. Accompany submittals with transmittal letter, in duplicate, containing:
 - 1. Date.
 - 2. Project title and number.
 - 3. Contractor's name and address.
 - 4. The number of each shop drawing, project datum and sample submitted.
 - 5. Notification of deviations from Contract Documents.
 - 6. Other pertinent data.
- E. Submittals shall each include a form created to provide:
 - 1. Date and revision dates.
 - 2. Project title and number.
 - 3. The names of:
 - a. Architect / Engineer.
 - b. Contracting Officer.
 - c. Contractor.
 - d. Subcontractor.
 - e. Supplier.
 - f. Manufacturer.
 - g. Separate detailer when pertinent.
 - 4. Identification of product or material.
 - 5. Relation to adjacent structure or materials.

- 6. Field dimensions, clearly identified as such.
- 7. Specification Section number and Submittal Number.
- 8. Applicable standards, such as ASTM number or Federal Specification.
- 9. A blank space, 4" x 5", for the reviewer's stamp.
- 10. Identification of deviations from Contract Documents.
- 11. Contractor's stamp, signed, certifying review of submittal, verification of field measurements and compliance with Contract Documents.
- 12. Cross our all information not related to submitted product.
- 13. Provide an MSDS (Material Safety Data Sheet) for each product .
- F. Submittal Binder:
 - 1. All submittals shall be submitted in a binder appropriate to the quantity of information submitted.
 - 2. Binder shall be labeled on front and edge with project title, project number, date and facility name.
 - 3. Submit all Division 2 Division 14 items at one time and in one binder, submit all Division 15 items at one time and in one binder and submit all Division 16 items at one time and in one binder.
 - 4. Provide an index using tabs for separate specification divisions.
 - 5. Number separate submittals within each Division sequentially.
 - 6. Limit binder to 3" size. If more information in provided submit in 2 or more binders.
 - 7. If drawing size information is required refer to drawings in the binder submittal information.
- G. Quantity: refer to General Clauses for quantity. Provide extra copies that may be required for Contractor's use.
- H. Refer to Divisions 15 and 16 for additional submittal requirements.

1.07 RESUBMISSION REQUIREMENTS

- A. Shop Drawings:
 - 1. Revise initial drawings as required and resubmit as specified for initial submittal.
 - 2. Indicate on drawings any changes which have been made other than those requested by Owner's reviewer.
- B. Project Data and Samples: Submit new data and samples as required for initial submittal.
- 1.08 DISTRIBUTION OF SUBMITTALS AFTER REVIEW
 - A. Distribute copies of shop drawings and project data which carry reviewer's stamp, to:
 - 1. Contractor's file.
 - 2. Job site file.
 - 3. Record Documents file.
 - 4. Subcontractors.
 - 5. Supplier / Fabricator
 - B. Distribute samples as directed.
- 1.09 OWNER REVIEWER'S DUTIES
 - A. Review submittals with reasonable promptness.
 - B. Review for:
 - 1. Design concept of project.
 - 2. Information given in Contract Documents.
 - C. Review of separate item does not constitute review of an assembly in which item functions.
 - D. Affix stamp and initials or signature certifying to review of submittals.
 - E. Return submittals to Contractor for distribution.

SCHEDULE OF VALUES

PART 1 - GENERAL

- 1.01 DESCRIPTION OF WORK
 - A. Related Requirements Specified Elsewhere:
 - 1. Construction Schedules, Section 01310.
 - B. Submit to Contracting Officer a Schedule of Values, at least fifteen (15) days prior to submitting first the Application for Payment.
 - C. Upon request by Contracting Officer, support values given with data that will substantiate their correctness.
 - D. Submit quantities of stored or other designated materials.
 - E. List quantities of materials specified under unit price allowances.
 - F. Payment for materials stored will be limited to those materials supported by invoice per I.04 below.
 - G. Use Schedule of Values only as basis for Contractor's Application for Payment.
- 1.02 FORM OF SUBMITTAL
 - A. Submit typewritten Schedule of Values on a form provided by Contracting Officer.
 - B. Use Table of Contents of this Specification as basis for format for listing costs of work for SECTIONS under Divisions 2 through 16.
 - C. Identify each line item with number and title as listed in Table of Contents of this Specification.
- 1.03 PREPARING SCHEDULE OF VALUES
 - A. Itemize separate line item cost for each of following general cost items:
 - 1. Performance and Payment Bonds.
 - 2. Field Supervision and Layout.
 - 3. Temporary Facilities and Controls.
 - 4. Insurance.

- B. Itemize separate line item cost for work required by each section of this Specification.
- C. Round off figures to nearest dollar.
- D. Make sum of total costs of all items listed in Schedule equal to total Contract Sum.
- E. Include in each line item a directly proportional amount of Contractor's overhead and profit.
- F. Revise schedule to list Change Orders for each application for payment.

1.04 PREPARING SCHEDULE OF STORED MATERIALS

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

SECTION 01500 TEMPORARY CONSTRUCTION FACILITIES

PART 1 - GENERAL

1.01 GENERAL

- A. Comply with governing codes and regulations
- B. Pay required fees and easement assessments
- C. Enforce safe and sanitary practices.
- D. Maintain clean facilities.
- E. Prevent wasteful utility uses.
- F. Should owner occupy part of facility, owner will pay his proportional utility costs.

1.02 FIELD OFFICE

- A. General:
 - 1. Provide substantial, weather tight office building located within construction area at contractor's discretion.
 - 2. Provide with heat, electric light, and janitor service.
 - 3. At contractor's option, portable buildings or mobile homes suitable for office use may be used.

1.03 TEMPORARY TELEPHONE

- A. Provide non-coin operated system as follows:
 - 1. 1 direct-line instrument in contractor's field office building.
 - 2. At contractor's option, coin-operated instruments for employee's use.
- B. Subcontractor shall provide and pay for any separate additional instruments that they may require.
- C. Allow those connected with work to use, provided they pay for toll calls.
- D. Install when work is started, maintain until full completion, pay all charges.
- E. Provide wall-mounted directory at each instrument listing name and business phone number of at least the following:
 - 1. Each contractor and subcontractor.
 - 2. Architect.

- 3. Architect's consulting engineers.
- 4. Owner's representative.
- 5. Testing laboratories.
- 6. Physicians.
- 7. Hospitals.
- 8. Ambulance
- 9. Local Fire Department

1.04 TEMPORARY TOILET FACILITIES

- A. Provide toilet and washing facilities in accordance with governing regulations.
- B. For enclosures accommodating more than 1 person, provide privacy screens for each toilet fixture.
- C. If both men and women are working, provide separate facilities for each sex.
- D. Maintain each toilet with toilet tissue on suitable dispenser.
- E. Remove temporary toilets and use building fixtures as soon as feasible.
- F. Where necessary, disinfect premises after toilet removal and restore to specified condition.

1.05 TEMPORARY BARRICADES

A. Provide all necessary to protect public and workers against injury and to protect project against damage and unauthorized intrusion.

1.06 TEMPORARY EXTERIOR ENCLOSURES

A. Provide sufficient enclosures to prevent unauthorized entry into project, to prevent infiltration of rainwater, wind and other elements, and to prevent undue heat loss from within enclosed area.

1.07 TEMPORARY FIRE PROTECTION

A. Provide and maintain necessary facilities and equipment to safeguard project against fire damage.

1.08 TEMPORARY ELECTRICITY

- A. Power:
 - 1. Provide and maintain structurally and electrically sound, code-approved, temporary power distribution system as follows:
 - a. Sufficient 20 amp load centers that any work area can be reached with 100 ft. long extension cord. General contractor and each subcontractor shall provide their own grounded, UL approved extension cords.
 - b. Load centers shall include:
 - Weatherproof distribution boxes
 - Circuit breakers for each outlet
 - Equipment grounding continuity for entire system
 - Power at proper voltage for:
 - Temporary field offices
 - Temporary storage and construction buildings
 - Temporary lighting and power
 - Temporary heating and ventilating
 - Pumping
 - Testing and checking equipment
 - Owner's facilities continuous operation during electrical services change-over
 - 2. General contractor and each subcontractor shall provide their own power and distribution system for field welders and any other special power beyond that specified herein.
- B. Lighting:
 - 1. Provide and maintain temporary lighting at least as follows:
 - a. 30 ft. candles measured 3 ft. above floor in spaces during work. Energize permanent lighting fixtures prior to painting, except where fixtures are mounted on walls or ceilings to be painted. Maintain from 15 minutes prior to until 15 minutes past scheduled work hours.

- b. 5 ft. candles measured 3 ft. above floor where necessary to prevent damage or injury. Maintain when authorized personnel are present. Provide light control switches at area entrances and successive areas so personnel access to project can be through lighted areas.
- c. Unless otherwise protected, cover exposed, interior lamps with guards.
- C. Wiring:
 - 1. Prevent conflict with general construction.
 - 2. Maintain cords clear of walkways and other heavy-traffic areas.
- D. Power Source:
 - 1. Ascertain where electrical service is available, provide required meters and connections, and extend system to work area.
 - 2. Power costs shall be paid by contractor.

1.09 TEMPORARY HEATING AND VENTILATING

- A. Provide temporary heat and ventilation throughout enclosed construction areas to:
 - 1. Facilitate work progress.
 - 2. Protect work and products against dampness and cold.
 - 3. Prevent moisture condensation on surfaces.
 - 4. Provide suitable ambient temperatures and humidity levels for installation and curing of products.
 - B. Expedite work so permanent facilities will be structurally, mechanically, and electrically sound throughout and ready to provide "temporary" services as soon as possible.
 - C. Operate no permanent heating or ventilating equipment without mechanical engineer's authorization that equipment is properly installed, has clean air filters, and is otherwise properly prepared. Replace any temporary air filters with new units and restore system to like-new condition immediately prior to turning project over to owner.
 - D. Provide temporary portable heaters, as may be required.

- E. Continue temporary heating and ventilating until owner occupies or finally accepts project, whichever is sooner.
- F. Maintain ventilated areas in clean condition to avoid undue circulation of dust and air-borne particles.
- G. Minimum temperatures to be maintained:
 - 1. Generally, 24 hours a day: 40 degrees F.
 - 2. Temperatures required for work of various trades: see specific specification sections.
- H. Permanent building system may be used provided system is properly maintained and protected with clean air filter. Immediately prior to substantial completion of project replace air filters with new units.
- I. Fuel costs shall be paid by contractor.

1.10 TEMPORARY VERTICAL TRANSPORTATION

A. General contractor shall provide and pay costs for temporary stairs, ramps, chutes, etc., required for execution of work of all trades. Subcontractors shall provide their own material hoists, ladders, and scaffolds.

1.11 TEMPORARY EQUIPMENT

- A. Thermometer:
 - 1. Maintain one 10 inch minimum size outdoor thermometer. Mount at convenient location not in direct sunlight.
 - 2. Temperature range: minus 60 degrees F to plus 110 degrees F.
- B. Protective headgear:
 - 1. Provide for visitors' use 6 adjustable-band, OSHA approved protective helmets.

1.12 TEMPORARY FACILITIES REMOVAL

- A. Remove temporary facilities at project completion or sooner, if directed.
- B. Repair damage, if any, resulting from temporary facilities.

SAFETY AND HEALTH

PART 1 - GENERAL

- 1.01 APPLICABLE PUBLICATIONS
 - A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.
 - 1. Code of Federal Regulations (CFR),
 - a. OSHA General Industry Safety and Health Standards (29 CFR 1910), Publication V2206; OSHA Construction Industry Standards (29 CFR 1926). One source of these regulations is OSHA Publication 2207, which includes a combination of both Parts 1910 and 1926 as they relate to construction safety and health. It is for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.
 - b. National Emission Standards for Hazardous Air Pollutants (40 CFR, Part 61).
 - c. Environmental Protection Agency (EPA) Final Rule (40 CFR Part 761) dated July 17, 1985.
 - 2. Federal Standard (Fed. Std.):
 - a. 313A Material Safety Data Sheets (MSDS), Preparation and the Submission of.

1.02 QUALITY ASSURANCE

- A. Safety Meeting: Representatives of the Contractor shall meet with the Contracting Officer prior to the start of work under this contract for the purpose of reviewing the Contractor's safety and health programs and discussion implementation of all safety and health provisions pertinent to the work to be performed under the Contract. The Contractor shall be prepared to discuss, in detail, the measures he/she intends to take in order to control any unsafe or unhealthy conditions associated with the work to be performed under the contract. If directed by the Contracting Officer, this meeting may be held in conjunction with other meetings which are scheduled to take place prior to start of work under this contract. The level of detail for the safety meeting is depended upon the nature of the work and the potential inherent hazards. The Contractor's principal on-site representative(s), the general superintendent and his/her safety representative(s) shall attend this meeting.
- B. Compliance with Regulations: All work, including contact with and handling of hazardous materials, the disturbance or dismantling of structures containing hazardous material and/or the disposal of hazardous materials shall comply with the applicable requirements of 29 CFR 1910/1926 and 40 CFR 761. Work

involving the disturbance, dismantling of asbestos or asbestos-containing materials; the demolition of structures containing asbestos; and/or the disposal and removal of asbestos, shall also comply with applicable state and municipal safety and health requirements. Where there is a conflict between applicable regulations, the most stringent shall apply.

C. Contractor Responsibility: The Contractor shall assume full responsibility and liability for compliance with all applicable regulations pertaining to the health and safety of personnel during the execution of work, and shall hold the Owner harmless for any action on his/her part or that of his/her employees or subcontractors, which results in illness, injury or death.

1.03 SUBMITTALS

- A. Accident Reporting: A copy of each accident report, which the Contractor or subcontractors submit to their insurance carriers, shall be forwarded to the Contracting Officer as soon as possible, but in no event later than seven (7) calendar days after the day the accident occurred.
- B. Permits: If hazardous material are disposed of off site, submit copies of permits from applicable Federal, State or municipal authorities and necessary certificates that the material has been disposed of as per regulations.
- C. Other Submittals: If agreed to in writing at the safety meeting, other submittals shall be required. One such submittal which may be included is a plan of action for handling hazardous materials which may be discovered as a result of the work which was not anticipated in the Contract Documents.

PART 2 - PRODUCTS

- 2.01 MATERIALS AND EQUIPMENT
 - A. Special facilities, devices, equipment, clothing, and similar items used by the Contractor in the execution of work shall comply with the applicable regulations.

2.02 HAZARDOUS MATERIALS

A. The Contractor shall bring to the attention of the Contracting Officer any material suspected of being hazardous which he/she encounters during execution of the work. A determination will be made by the Contracting Officer as to whether the Contractor shall perform tests to determine if the material is hazardous. If the Contracting Officer directs the Contractor to perform tests, and/or if the material is found to be hazardous and additional protective measures are needed, a contract change may be required, subject to applicable provisions of this Contract.

PART 3 - EXECUTION

- 3.01 STOP WORK ORDERS
 - A. When the Contractor and his/her subcontractors are notified by the Contracting Officer of any noncompliance with the provision of the Contract and the actions(s) to be taken, the Contractor shall immediately, if so directed, or within 48 hours after receipt of a notice of violation, correct the unsafe or unhealthy condition. If the contractor fails to comply promptly, all or any part of the work being performed may be stopped by the Contracting Officer with a "Stop Work Order". When, in the opinion of the Contracting Officer, satisfactory corrective action has been taken to correct the unsafe and unhealthy condition, a start order will be given immediately. The Contractor shall not be allowed any extension of time or compensation for damages by reason or in connection with such work stoppage.

3.02 PROTECTION

- A. The Contractor shall take all necessary precautions to prevent injury to the public, building occupants, or damage to property of others. For the purposes of this Contract, the public or building occupants shall include all persons not employed by the Contractor or a subcontractor working under his/her direction.
- B. Storing, positioning or use of equipment, tools, materials, scraps, and trash in a manner likely to present a hazard to the public or building occupants by its accidental shifting, ignition, or other hazardous qualities is prohibited.
- C. Work shall not be performed in any area occupied by the public or Owner employees unless specifically permitted by the contract or the Contracting Officer and unless steps are taken for the protection of the public or Owner employees.
- D. Wherever practicable, the work area shall be barricaded or otherwise blocked off from the public or building occupants to prevent unauthorized entry into the work area.
- E. Alternate Precautions: When the nature of the work prevents isolation of the work area and the public or building occupants may be in or pass through, under or over the work area, alternate precautions such as the posting of signs, the use of signal persons, the erection of barricades or similar protection around particularly hazardous operations shall be used as appropriate.

MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.01 GENERAL

- A. Materials and equipment incorporated into work shall:
 - 1. Conform to applicable specifications and standards.
 - 2. Comply with size, make, type, and quantity specified, unless otherwise approved in writing.
- B. Manufactured and Fabricated Products:
 - 1. Manufacture like parts of duplicate units to standard sizes and gauges, and to be interchangeable.
 - 2. Two or more items of same kind shall be identical, and by same manufacturer.
 - 3. Products shall be suitable for service conditions.
 - 4. Equipment shall comply with capacity, sizes, and dimensions shown or specified, unless otherwise approved in writing.
- C. Do not use materials or equipment for any purpose other than that for which designed or specified.

1.02 RELATED WORK

- A. Section 01010 Summary of Work
- B. Section 01340 Shop Drawings, Product Data, & Samples
- C. Section 01630 Product Substitutions
- D. Section 01710 Cleaning

1.03 CONTRACTOR'S OPTIONS

- A. For products specified only by referenced standard, select any product meeting standard.
- B. For products specified by naming several products, select any one complying with specification.
C. For products specified by naming one or more products and "or approved", select any one specified product or submit request for substitution as specified in Section 01630 - Product Substitutions.

1.04 INAPPROPRIATE PRODUCTS & METHODS

- A. If contractor believes that any specified product, method, or system is inappropriate for use he shall, if possible, so notify The Contracting Officer at least 5 working days prior to bid opening, and if not possible such notice shall be given before performing work in question.
- B. If notice of objection is not received within the time limits specified above, it will be assumed by the owner that the contractor agrees that the specified products, methods, and systems are not inappropriate for use on this project.

1.05 QUANTITY OF PRODUCTS REQUIRED

A. Whenever in specifications a product is referred to in singular number, such reference shall include as many such products as are shown on drawing or are required to complete the work.

1.06 PRODUCTS LIST

A. Before contractor's first request for payment, submit to Contracting Officer complete list of major products proposed for use; include proprietary product names, manufacturer's name, and installing subcontractor's name.

1.07 MANUFACTURER'S INSTRUCTIONS

- A. Perform work in accordance with manufacturer's instructions.
- B. Do not omit preparatory or installation procedures required by manufacturer, unless specifically modified or exempted by contract documents.
- C. When contract documents require work to comply with manufacturer's instructions, obtain and distribute such instructions to parties performing work including 2 copies to Contracting Officer. Maintain 2 set at jobsite during installation and until acceptance.
- D. Handle, install, connect, clean, condition, and adjust products in strict accord with such instructions and in conformance with specified requirements.
- E. Should job conditions or specified requirements conflict with manufacturer's instructions, consult Contracting Officer for further instructions.
- F. Do not proceed with work without clear instructions.

1.08 TRANSPORTATION & HANDLING

- A. Arrange product deliveries in accord with construction progress schedule; coordinate to avoid conflict with work and site conditions.
- B. Delivery products undamaged, in manufacturer's original containers or packaging, and with legible identifying labels intact.
- C. Immediately upon delivery, inspect shipments to assure compliance with contract documents and approved submittals requirements, and assure that products are properly protected and undamaged.
- 1.09 STORAGE & PROTECTION
 - A. Follow manufacturer's instructions.
 - B. Maintain product identity labels intact.
 - C. Store products subject to weather-damage in weather tight enclosures.
 - D. Maintain storage room temperature and humidity within ranges required by manufacturer's instructions.
 - E. Maintain reasonable protection against product theft and vandalism.
 - F. Exterior storage:
 - 1. Store fabricated products above ground, on blocking or skids; prevent product damage and discoloration.
 - 2. Cover products subject to deterioration with impervious sheet coverings; provide adequate ventilation to prevent condensation.
 - 3. Store loose granular materials in well-drained area on solid surface to prevent mixing with foreign matter.
 - G. Inspection of Stored Products:
 - 1. Arrange storage to permit easy access for inspection.
 - 2. Make periodic inspections of stored products to assure that products are maintained as specified and are free from damage, discoloration, and deterioration.
 - H. Protection after installation:
 - 1. Provide substantial covering as necessary to protect installed products against damage and discoloration. Remove covering when no longer needed.

SECTION 01630

SUBSTITUTIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for handling requests for substitutions made after award of the Contract.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 01095 Reference Standards
 - 2. Section 01310 Construction Schedules
 - 3. Section 01600 Materials & Equipment

1.03 DEFINITIONS

- A. Definitions in this Article do not change or modify the meaning of other terms used in the Contract Documents.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction required by the Contract Documents proposed by the Contractor after award of the Contract are considered to be requests for substitutions. The following are not considered to be requests for substitutions:
 - 1. Substitutions requested during the bidding period, and accepted by Addendum prior to award of the Contract, are included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.
 - 2. Revisions to the Contract Documents requested by the Owner or Contracting Officer.
 - 3. Specified options of products and construction methods included in the Contract Documents.
 - 4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.04 SUBMITTALS

- A. Substitution Request Submittal: The Contracting Officer will consider requests for substitution if received within 60 days after commencement of the Work. Requests received more than 60 days after commencement of the Work may be considered or rejected at the discretion of the Contracting Officer.
 - 1. Submit 3 copies of each request for substitution for consideration. Submit requests in the form and according to procedures required for change-order proposals.
 - 2. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers.
 - 3. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
 - a. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate contractors, that will be necessary to accommodate the proposed substitution.
 - b. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements, such as performance, weight, size, durability, and visual effect.
 - c. Product Data, including Drawings and descriptions of products and fabrication and installation procedures.
 - d. Samples, where applicable or requested.
 - e. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
 - f. Cost information, including a proposal of the net change, if any in the Contract Sum.
 - g. The Contractor's certification that the proposed substitution conforms to requirements in the Contract Documents in every respect and is appropriate for the applications indicated.
 - h. The Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.

- 4. Contracting Officer's Action: If necessary, the Contracting Officer will request additional information or documentation for evaluation within one week of receipt of a request for substitution. The Contracting Officer will notify the Contractor of acceptance or rejection of the substitution within 2 weeks of receipt of the request, or one week of receipt of additional information or documentation, whichever is later. Acceptance will be in the form of a change order.
 - a. Use the product specified if the Contracting Officer cannot make a decision on the use of a proposed substitute within the time allocated.

PART 2 - PRODUCTS

- 2.01 SUBSTITUTIONS
 - A. Conditions: The Contracting Officer will receive and consider the Contractor's request for substitution when one or more of the following conditions are satisfied, as determined by the Contracting Officer. If the following conditions are not satisfied, the Contracting Officer will return the requests without action except to record noncompliance with these requirements.
 - 1. Extensive revisions to the Contract Documents are not required.
 - 2. Proposed changes are in keeping with the general intent of the Contract Documents.
 - 3. The request is timely, fully documented, and properly submitted.
 - 4. The specified product or method of construction cannot be provided within the Contract Time. The Contracting Officer will not consider the request if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
 - 5. The request is directly related to an "or-equal" clause or similar language in the Contract Documents.
 - 6. The requested substitution offers the Owner a substantial advantage, in cost, time, energy conservation, or other considerations, after deducting additional responsibilities the Owner must assume. The Owner's additional responsibilities may include compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner, and similar considerations.
 - 7. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
 - 8. The specified product or method of construction cannot be provided in a manner that is compatible with other materials and where the Contractor certifies that the substitution will overcome the incompatibility.

- 9. The specified product or method of construction cannot be coordinated with other materials and where the Contractor certifies that the proposed substitution can be coordinated.
- 10. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provides the required warranty.
- 11. Where a proposed substitution involves more than one prime contractor, each contractor shall cooperate with the other contractors involved to coordinate the Work, provide uniformity and consistency, and assure compatibility of products.
- B. The Contractor's submittal and the Contracting Officer's acceptance of Shop Drawings, Product Data, or Samples for construction activities not complying with the Contract Documents do not constitute an acceptable or valid request for substitution, nor do they constitute approval.

SECTION 01700

CONTRACT CLOSEOUT

PART 1 - GENERAL

- 1.01 DESCRIPTION OF WORK
 - A. Substantial Completion Inspection
 - B. Final Inspection
 - C. Closeout Submittals
 - D. Instruction
 - E. Evidence of Payment and Release of Liens
 - F. Final Adjustment of Accounts
 - G. Final Application for Payment
 - H. Final Certificate for Payment
 - I. Post-Construction Inspection

1.02 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

- A. Time of Final Payment The Agreement.
- B. Completion; Waiver of Claims General Clauses
- C. Liquidated Damages General Clauses
- D. Schedule of Values Section 01370.
- E. Cleaning Section 01710.
- F. Project Record Documents Section 01720.
- G. Operation and Maintenance Data 01730
- H. Spare Parts and Maintenance Materials The respective sections of Specifications.
- I. Closeout Submittals Required of Trades The respective sections of Specifications.

1.03 SUBSTANTIAL COMPLETION

- A. Contractor:
 - 1. Submit written certification to Contracting Officer that project, or designated portion of project is substantially complete.
 - 2. Submit list of major items to be completed or corrected.
- B. Contracting Officer will make an inspection within seven (7) working days after receipt of certification.
- C. Should Contracting Officer consider that work is substantially complete:
 - 1. Contractor shall prepare, and submit to Contracting Officer, a list of items to be completed or corrected, as determined by the inspection.
 - 2. Contracting Officer will prepare and issue a Certificate of Substantial Completion, complete with signatures of Owner and Contractor, accompanied by Contractor's list of items to be completed or corrected, as verified and amended by Contracting Officer.
 - 3. Owner occupancy of project or designated portion of project:
 - a. Contractor shall:
 - (1) Obtain Certificate of Occupancy.
 - (2) Perform final cleaning in accordance with Section 01710.
 - 4. Contractor: Complete work listed for completion or correction, within designated time.
- D. Should Contracting Officer consider that work is not substantially complete:
 - 1. He/she shall immediately notify Contractor, in writing, stating reasons.
 - 2. Contractor: Complete work, and send second written notice to Contracting Officer, certifying that project, or designated portion of project, is substantially complete.
 - 3. Contracting Officer will re-inspect work at contractor's expense.

1.04 FINAL INSPECTION

- A. Contractor shall submit written certification that:
 - 1. Contract Documents have been reviewed.
 - 2. Project has been inspected for compliance with Contract Documents.

- 3. Work has been completed in accordance with Contract Documents.
- 4. Equipment and systems have been tested in presence of Owner's Maintenance Personnel and are operational. List dates and names of persons present.
- 5. All required submittals have been made and receipt acknowledged.
- 6. Project is completed, and ready for final inspection.
- B. Contracting Officer will make final inspection within seven (7) days after receipt of certification.
- C. Should Contracting Officer consider that work is finally complete in accordance with requirements of Contract Documents, he shall request Contractor to make Project Closeout submittals.
- D. Should Contracting Officer consider that work is not finally complete:
 - 1. He shall notify Contractor, in writing, stating reasons.
 - 2. Contractor shall take immediate steps to remedy the stated deficiencies, and send second written notice to Contracting Officer certifying that work is complete.
 - 3. Contracting Officer will re-inspect work at Contractor's expense.

1.05 CLOSEOUT SUBMITTALS

- A. Project Record Documents: See requirements of Section 01720.
- B. Operation and Maintenance Data:
 - 1. Submit in accordance with individual specification sections.
 - 2. Include all O&M data in a series of 3-ring binders organized by CSI divisions with covers labeled as required for submittals reference Section 01340.
 - 3. Refer to individual sections for submittal requirements.
 - 4. Provide separate binders for Divisions 15 and 16 in accordance with the specific requirements of those divisions.
 - 5. O&M data shall be submitted a minimum of 14 working days prior to final completion.
- C. Warranties and Bonds: In accordance with submittal requirements of individual sections.

- 1. Provide duplicate, notarized copies. Execute Contractor's submittals and assemble documents executed by Subcontractors and Suppliers. Provide table of contents and assemble in binder with durable plastic cover.
- 2. Submit material prior to final Application for Payment. For equipment put into use with Owner permission during construction, submit within 10 days after first operation. For items of Work delayed materially beyond Date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty.
- D. Deliver Certificate of Insurance for Products and Completed Operations.

1.06 INSTRUCTION

- A. Instruct Owner's designated maintenance personnel in operation of all systems, mechanical, electrical and other equipment.
 - 1. Refer to individual sections for personnel instruction and training.
 - 2. Conduct personnel instruction and training sessions a minimum of seven (7) days and a maximum of fourteen (14) days after approved operation and maintenance data have been submitted to the Contracting Officer.
 - 3. Contractor shall schedule instruction and training sessions with Contracting Officer a minimum of twenty one (21) days in advance.
 - 4. Contractor shall provide a sign-up sheet at each training session for personnel attendees. Submit one (1) copy of each list to the Contracting Officer within seven (7) working days after the final training session.
 - 5. Instruction/training sessions shall be conducted by knowledgeable personnel who have been trained in the operations of the systems, equipment and/or product in which he/she is demonstrating.

1.07 EVIDENCE OF PAYMENTS, AND RELEASE OF LIENS

- A. Provide a completed Contractor's Affidavit of Payment of Debts and Claims form.
- B. Provide a completed Contractor's Affidavit of Release of Liens form with:
 - 1. Consent of Surety to Final Payment form.
 - 2. Contractor's Release or Waiver of Liens.

- 3. Separate releases or waivers of liens for subcontractors, suppliers, and others with lien rights against property of Owner, together with list of those parties.
- C. All submittals shall be duly executed before delivery to Contracting Officer.
- 1.08 FINAL APPLICATION FOR PAYMENT
 - A. Contractor shall submit final application in accordance with requirements of the Bidding and General Clauses.
- 1.09 FINAL CERTIFICATE FOR PAYMENT
 - A. Contracting Agency will issue final certificate in accordance with provisions of General Clauses.
 - B. Should final completion be materially delayed through no fault of Contractor, the Contracting Officer may issue a Semi-Final Certificate for Payment.
- 1.10 POST-CONSTRUCTION INSPECTION
 - A. Prior to expiration of one year from Date of Substantial Completion, Contracting Officer will make visual inspection of project to determine whether correction of work is required, in accordance with provisions of General Conditions.
 - B. For guarantees beyond one (1) year, Contracting Officer will make inspections at request of Owner personnel at the site.
 - C. Contracting Officer will promptly notify Contractor, in writing, of any observed deficiencies.

SECTION 01710

CLEANING

- PART 1 GENERAL
- 1.01 DESCRIPTION
 - A. Related Requirements Specified Elsewhere:
 - 1. Summary of Work Section 01010.
 - 2. Cutting and Patching Section 01045.
 - 3. Contract Closeout Section 01700.
 - 4. Cleaning for Specific Products or Work Specification section for that work.
 - B. Maintain premises and public properties free from accumulations of waste, debris, and rubbish, caused by operations.
 - C. At completion of work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave project clean and ready for occupancy.

1.02 SAFETY REQUIREMENTS

- A. Maintain project in accordance with all applicable safety and insurance standards.
- B. Hazards Control:
 - 1. Store volatile wastes in covered metal containers, and remove from premises daily.
 - 2. Prevent accumulation of wastes which create hazardous conditions.
 - 3. Provide adequate ventilation during use of volatile or noxious substances.
- C. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
 - 1. Do not burn or bury rubbish and waste materials on project site.
 - 2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
 - 3. Do not dispose of wastes into streams or waterways.

PART 2 - PRODUCTS

- 2.01 MATERIALS
 - A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

PART 3 - EXECUTION

3.01 DURING CONSTRUCTION

- A. Execute cleaning to ensure that building, grounds, and public properties are maintained free from accumulations of waste materials and rubbish.
- B. Wet down dry materials and rubbish to lay dust and prevent blowing dust.
- C. At reasonable intervals during progress of work, clean site and public properties, and dispose of waste materials, debris and rubbish.
- D. Provide on-site containers for collection of waste materials, debris and rubbish.
- E. Remove waste materials, debris and rubbish from site and legally disposes of at public or private dumping areas off Owner's property.
- F. Handle materials in a controlled manner with as few handling as possible; do not drop or throw materials from heights.

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 GENERAL

- A. Maintain at project site for owner, 1 record copy of:
 - 1. Contract drawings and specifications.
 - 2. Addenda.
 - 3. Change orders and other contract modifications.
 - 4. Field orders and other written instructions.
 - 5. Approved shop drawings, product data, and samples.
 - 6. Field test reports.

1.02 RELATED WORK

- A. Section 01340 Shop Drawings, Product Data & Samples
- B. Section 01730 Operating & Maintenance Data

1.03 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Store in contractor's field office apart from documents used for construction.
- B. Provide files, shelving and cabinets necessary to safely and securely store documents and samples.
- C. Maintain documents clean, dry, legible, and in good order.
- D. Do not use record documents for construction purposes.
- E. Make documents available at all time for Contracting Officer's inspection.
- F. Contracting Officer will monitor record documents prior to each contractor's application for payment. Up-to-date record documents are prerequisite to acceptance and approval of payment application.

1.04 DRAFTER'S QUALIFICATIONS

- A. Drafting must be accurate and legible.
- B. If Contracting Officer deems submitted drafting to be unacceptable, redraft until acceptable at no additional cost to owner.

1.05 WORK SET MARKING DEVICES

- A. Waterproof, felt-tip pens
- B. Color code, unless otherwise directed or approved:
 - 1. Red: document changes.
 - 2. Green: work deleted.
 - 3. Blue: dimensional and other notations.

1.06 RECORD DRAWINGS

- A. Maintain 1 black-line or blue-line print of contract drawings as work-set; use marking devises specified above to record all contract changes.
- B. Show actual conditions where installation varies substantially for work shown on drawings. Give particular attention to concealed work that would be difficult or impossible to record at later date. Record backing and other concealed items required for installation of future work by owner.
- C. Mark whichever contract drawing or shop drawing is most appropriate and most capable of accurately and clearly showing actual "field conditions". Where shop drawings are used to record changes, record cross-reference on appropriate contract drawing.
- D. Where applicable, indicate change order numbers with each change.
- E. Note related specification or product data revisions, where applicable.
- F. Prior to submittal, transfer recorded information to computer diskette. Architects and Engineers will supply original CADD drawings on diskettes to contractor, and contractor shall pay for preparing the drawings in CADD format.
- G. Contractor may retain work-set for his/her records.

1.07 RECORD SPECIFICATIONS

- A. Maintain 1 complete copy of project manual including specifications; any addenda; and other written documents such as change orders, supplemental instructions, and similar written modifications issued during course of work.
- B. Mark documents to show actual conditions where installation varies substantially from specified work. Give particular attention to concealed work that would be difficult or impossible to record at later date.
- C. Note related record drawing and product data revisions, where applicable.

1.08 RECORD PRODUCT DATA

- A. Maintain 1 copy of each product data submittal.
- B. Mark documents to show actual conditions where installation varies substantially from contract specifications or drawings. Include any variations in installed products or in manufacturer's installation instructions. Give particular attention to concealed work that would be difficult or impossible to record at later date.
- C. Note related record drawing and specifications revisions, where applicable.

1.09 RECORD SAMPLES

A. Immediately prior to substantial completion date, contractor shall arrange jobsite meeting with Contracting Officer to determine which, if any, contractor-maintained samples shall be submitted for owner's permanent record.

1.10 RECORDING

- A. Label each document PROJECT RECORD in neat, large, printed letters.
- B. Record information concurrently with construction progress.
- C. Do not conceal any work until required information is recorded.
- D. Legibly mark drawings to record the following actual construction:
 - 1. Depth of foundation elements in relation to building floor elevations.
 - 2. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 3. Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure.
 - 4. Field changes of dimensions and details.
 - 5. Changes made by change order or field order.
 - 6. Details not shown on original contract drawings.
- E. Legibly mark specifications and any addenda to record the following:
 - 1. Manufacturer, trade name, catalog number, and supplier of each product actually installed.
 - 2. Changes made by change order or field order.

1.11 SUBMITTAL

- A. Organize record documents into manageable sets, bind together with durable cover sheet, and print on cover of each set the following:
 - 1. Project title.
 - 2. Date.
 - 3. Contractor's name and address.
 - 4. Title and number of each record document.
 - 5. Name of person who prepared sheet.
 - 6. Signature of contractor or his authorized representative.
- B. Submit to Contracting Officer for forwarding to owner.

SECTION 01730

OPERATING & MAINTENANCE DATA

- PART 1 GENERAL
- 1.01 GENERAL
 - A. Compile product data and related information appropriate for owner's maintenance and operation of products furnished under contract.
 - B. Prepare as specified herein and in other specification sections.
 - C. Instruct owner's personnel in maintenance of products and in operation of equipment and systems.

1.02 RELATED WORK

- A. Section 01340 Shop Drawings, Product Data & Samples
- B. Section 01700 Contract Closeout
- C. Section 01720 Record Documents
- D. Section 01740 Warranties & Bonds
- E. Divisions 15 & 16 Demonstrating Mechanical & Electrical Equipment, respectively.

1.03 QUALITY ASSURANCE

- A. Data preparation shall be done by personnel:
 - 1. Trained and experienced in maintenance and operation of described products.
 - 2. Completely familiar with requirements of this section.
 - 3. Sufficiently skilled as technical writer to communicate essential data.
 - 4. Sufficiently skilled as drafter to competently prepare required drawings.

1.04 FORM OF SUBMITTALS

- A. Prepare data in form of instructional manual for use by owner's personnel.
- B. Format:
 - 1. Size: 8 1/2 x 11 inches

- 2. Paper for typing: 20 lb minimum and white.
- 3. Text: Manufacturer's printed data or neatly typed.
- 4. Drawings:
 - a. Reinforced edges against tear-out.
 - b. Bind-in with text.
 - c. Fold larger drawings to match size of text pages.
- 5. Provide fly-leaf for each separate product.
- 6. Cover: Identify each volume with typed or printed title "Operating and Maintenance Instructions", and list:
 - a. Project title
 - b. Identity of separate structures
 - c. Identity of general subject matter contained in manual

1.05 BINDERS

- A. Commercial quality, 3-ring type with durable and cleanable plastic covers.
- B. When multiple binders are used, correlate data into related consistent groupings.
- 1.06 MANUAL CONTENT, GENERAL
 - A. Neatly typewritten Table of Contents for each volume, arranged in systematic order.
 - B. List:
 - 1. Contractor, name of responsible principal, address, and telephone number.
 - 2. Each product including name, address, and telephone number of:
 - a. Subcontractor or installer.
 - b. Recommended maintenance contractor
 - c. Local source for replacement parts

- 3. Product name and other identifying symbols as set forth in contract documents.
- C. Product data:
 - 1. Include only those sheets which are pertinent to specific product.
 - 2. Annotate each sheet to:
 - a. Clearly identify specific product or part installed.
 - b. Clearly identify data applicable to installation.
 - c. Delete references to inapplicable data.
- D. Drawings:
 - 1. Supplement product data with drawings where necessary to clearly illustrate:
 - a. Relations of component parts.
 - b. Control and flow diagrams.
 - 2. Do not use project record documents as maintenance drawings.
- E. Written text:
 - 1. Provide where necessary to supplement product data and drawings.
 - 2. Write all text in English.
 - 3. Organize in consistent format under separate headings for different procedures.
 - 4. Provide logical sequence of instructions for each procedure.
- F. Warranties, bonds, & Maintenance Contracts:
 - 1. Provide copy of each.
 - 2. Include the following:
 - a. Proper procedures in event of failure.
 - b. Instances which might affect validity of warranties, bonds, or contracts.

1.07 MANUAL FOR ARCHITECTURAL MATERIALS & FINISHES

- A. Include the following manufacturer's data:
 - 1. Catalog number, size & composition.
 - 2. Color & texture designations.
 - 3. Required reordering information
 - 4. Recommended cleaning materials & methods.
 - 5. Cautions against detrimental cleaning materials & methods.
 - 6. Recommended cleaning and maintenance schedule.
- B. Submit specified information for products requiring operation or maintenance by owner.

1.08 MANUAL FOR WEATHER PROTECTION MATERIALS

A. Include manufacturer's instructions for inspection, maintenance & repair.

1.09 MANUAL FOR MECHANICAL EQUIPMENT & SYSTEMS

- A. Include the following manufacturer's data:
 - 1. Description of unit and component parts including:
 - a. Function, normal operating characteristic, and limiting conditions.
 - b. Performance curves, engineering data, and tests.
 - c. Complete nomenclature and commercial number of replacement parts.
 - 2. Operating procedures including:
 - a. Start-up, break-in routine, and normal operating instructions.
 - b. Regulations, control, stopping, shut-down and emergency instructions.
 - c. Summer and winter operating instructions.
 - d. Special operating instructions.

- 3. Maintenance procedures including:
 - a. Routine operations.
 - b. Trouble-shooting guide.
 - c. Disassembly, repair, and reassembly.
 - d. Alignment, adjusting, and checking.
 - e. Servicing and lubricating schedule, including recommended lubricants.
 - 4. Manufacturer's printed operating and maintenance instructions.
 - 5. Control systems operation sequences.
 - 6. Parts list, illustrations, assembly drawings, and diagrams necessary for maintenance, including:
 - a. Life expectancy of parts subject to wear.
 - b. Items recommended to be stocked as spare part.
 - 7. As-installed control system diagrams.
 - 8. Color-code legend, if any.
 - 9. Valve tag number chart, with location and function of each valve.
 - B. Submit specified information for the following:
 - 1. Mechanical equipment specified in Divisions 11, 15, & 16.
- 1.10 MANUAL FOR ELECTRICAL EQUIPMENT & SYSTEMS
 - A. Include the following manufacturer's data:
 - 1. Description of unit and component parts including:
 - a. Function, normal operating characteristics, and limiting conditions.
 - b. Performance curve, engineering data and test.
 - c. Complete nomenclature and commercial number of replacement parts.

- 2. Panel board circuit directories indicating:
 - a. Electrical service
 - b. Controls
 - c. Communications, if any
 - 3. As-installed wiring color-code legend, if any.
 - 4. Operating procedures, including:
 - a. Routine and normal operating instructions
 - b. Sequences required
 - c. Special operating instructions
 - 5. Maintenance procedures including:
 - a. Routine operations
 - b. Trouble-shooting guide
 - c. Disassembly, repair, and reassembly
 - d. Adjustment and checking
 - 6. Manufacturer's printed operating and maintenance instructions.
 - 7. Parts List, including current prices, and recommended spare parts to be maintained in storage.
- B. Submit specified information for the following:
 - 1. Electrical equipment specified in Divisions 11, 15, and 16.

1.11 ADDITIONAL DATA

- A. Prepare and include the following:
 - 1. Additional data when need becomes apparent during instruction of owner's personnel.
 - 2. Additional data specified in other sections of specifications to be included.

1.12 SUBMITTAL SCHEDULE

- A. Preliminary Draft:
 - 1. Submit 2 copies of proposed format.
 - 2. Contracting Officer will review, and return 1 copy with comments.
- B. Final Submittal:
 - 1. Submit, in final form, 1 copy of complete data 15 days prior to final inspection.
 - 2. Copy will be returned with comments.
 - 3. Submit 4 copies in approved final form, within 10 days of final inspection.
- 1.13 INSTRUCTION OF OWNER'S PERSONNEL
 - A. Prior to final acceptance, instruct owner's personnel in necessary operation, adjustment, and maintenance of products, equipment, and systems.
 - B. Operating & maintenance manual shall constitute basis of instruction. Submit training materials and instruction schedule for Contracting Officer's review and acceptance at least 30 days prior to training session.
 - C. Training:
 - 1. Location: at project site.
 - 2. Review manual contents with owner's personnel in detail to explain all aspects of operations and maintenance.
 - D. At least 48 hours prior to training meeting, notify Contracting Officer of meeting time and location.

SECTION 01740 WAR

WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Compile specified warranties and bonds.
- B. Compile specified services and maintenance contracts.
- C. Review submittals to verify compliance with contract documents.

1.02 RELATED WORK

- A. Bid Bond
- B. Perform Bond, Labor, and Material Payment Bond, General Warranty of Construction
- C. Section 01700 Contract Closeout
- D. Section 01730 Operating & Maintenance Data
- E. Warranties & Bonds required for Specific Products: see respective specification sections.

1.03 SUBMITTAL REQUIREMENTS

- A. Assemble warranties, bonds, and services and maintenance contracts, executed by each of the respective manufacturer's, suppliers and subcontractors.
- B. Number of original signed copies required: provide 1 for each volume of owner's maintenance manual as specified in Section 01730.
- C. Table of Contents: neatly type in orderly sequence.
- D. Provide complete information for each item:
 - 1. Product or work item.
 - 2. Firm, with name of Principal, address, and telephone number
 - 3. Beginning date of warranty, bond, or service and maintenance contract.
 - 4. Duration of warranty, bond or services and maintenance contract.

- 5. Provide the following information for Owner's personnel:
 - a. procedure in case of failure or malfunction
 - b. Instances which affect warranty or bond validity.
- 6. Contractor, name of responsible principal, address, and telephone number.
- 1.04 SUBMITTAL FORM
 - A. Punch sheet for standard 3-ring binder.
 - B. Size: 8 1/2 x 11 inches
 - C. Fold larger sheets to fit into binder.
 - D. Cover: Identify each packet with printed title "WARRANTIES & BONDS".
 - E. List:
 - 1. Title of project
 - 2. Name of contractor

1.05 SUBMITTAL TIME

- A. See Section 01730.
- 1.06 SUBMITTAL LOCATION
 - A. Bind into Owner's maintenance manuals specified in Section 01730.

1.07 MANUFACTURER'S WARRANTIES

A. In addition to contractor's warranty, manufacturer's warranties shall pass to owner and shall not take effect until affected work has been accepted in writing by Owner.

SECTION 02230 SITE CLEARING AND GRUBBING

PART 1 GENERAL

1.01 SUMMARY

- A. Description
 - 1. This work consists of all labor, material, tools and equipment necessary for the clearing and grubbing of trees, shrubs, organic matter and debris in preparation for earthwork activities. Clearing and grubbing activities shall follow the intent shown on the Drawings.

1.02 QUALITY ASSURANCE

- A. Conform to applicable local, state and federal requirements.
- B. Coordinate all clearing work with Owner's Representative and utility companies.
- C. Conform to applicable requirements for hauling and disposal of debris to any offsite disposal areas.
- D. Conform to the Storm Water Pollution Prevention Plan.
- D. Provide verification of reestablished survey monuments by a licensed surveyor in the state of Alaska, if applicable.
- PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

- 3.01 EXAMINATION
 - A. Identify temporary waste area for placing removed materials.
 - B. Verify existing survey monuments to remain or be replaced.
 - C. Identify clearing limits as shown on the Drawings with flagging or staking.

3.02 PROTECTION

- A. Protect existing shrubs, vegetation and plant growth adjacent to and outside of construction limits of work that are designated to remain.
- B. Protect survey benchmarks, property corners, existing structures and improvements to remain from damage or displacement.
- C. Provide continuous vehicle passage along the DNR Roadway.

3.03 CLEARING

A. Clear areas required for access to site and execution of Work.

- B. Clearing shall consist of cutting and disposing of all trees, downed timber, stubs, brush, bushes and debris from all areas designated.
- C. In order to minimize damage to the trees that are to be left standing, trees shall be felled toward the center of the area to be cleared. Trees unavoidably falling outside the specified limits shall be removed and disposed of. The trees and brush in areas designated for clearing only shall be cut to a height of not more than 6 inches above surrounding ground unless otherwise specified.

3.04 GRUBBING

- A. Remove and dispose of roots larger than 1 inch in diameter, matted roots, designated stumps and other organic root mass from the indicated grubbing areas.
- B. Excavate this material together with logs, organic and metallic debris, brush, and refuse and removal of all organic root mass.
- D. Notify the Owner's Representative immediately in the event that hazardous or contaminated material are encountered or suspected. Conform to procedures applicable to local, state and federal regulations when handling, transporting and disposing of hazardous or contaminated materials.
- E. Grub all areas within the clearing limits as indicated on the plans.

3.05 REMOVAL

- A. Primary method of disposal shall be burning all vegetation onsite in a safe, controlled manner. Burning of vegetation material will require the Contractor to obtain local, state and federal permits as required by each governing entity. Contact the local fire protection authority by writing and phone five days prior to burning.
- B. All other debris such as rock, burned vegetation matter and non-burnable material may be buried onsite contingent upon adequate area required for placement of debris. All debris shall be disposed of outside the footprint of any fill or structure and the excavation is permafrost free. Drawings identify the potential area for onsite bury disposal location.
- C. The Contractor may request an additional location or alternate location for onsite disposal. Request shall be made in writing 15 days before work begins.
- D. Waste generated from clearing activities that cannot be burned or buried may be removed from the site and disposed of at an approved location. The Contractor shall contact the City of McGrath and Owners Representative to determine the offsite disposal area.
- E. The cost of hauling and placing waste material, according to the City of McGrath standards is incidental to this section.
- F. Continuously clean up and remove waste materials from site. Do not allow materials to accumulate on site.

3.06 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated or re-graded per drawings, without mixing with foreign materials for use in finish grade surfacing.
- B. Do not excavate wet topsoil.
- C. Temporary stockpile topsoil on site to height not exceeding 10 feet and protect from erosion. Stockpile material on impervious material and cover until reuse.
- D. Excess topsoil may be used to flatten slopes if runoff and draingeways are not adversely impacted. Otherwise dispose of excess material in an approved offsite location that is able to accept such material.

3.07 EXISTING SURVEY MONUMENTS

- A. The contractor will be responsible for re-establishing all monuments, corners or property corners destroyed, damaged or removed during construction in accordance with Alaska Statutes 19.10.230 and 34.65.040 and local regulations.
- B. Provide all reference points outside construction work areas for replacement at the end of the project.
- C. Any survey monuments removed during construction shall be reestablished within a monument box according to State and local government regulations.

SECTION 02300 EARTHWORK AND GRADING

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. The extent of earthwork as shown on the Plans and Specifications.
- B. Earthwork includes, but is not limited to: Preparation of existing ground or subgrade for initial fill placement, backfill, site grading, compaction, construction staking and related surveys for the development of building pad, parking areas, driveways and utilities.
- C. Geotextile Fabric for embankment separation.
- D. Imported classified material

1.02 RELATED SECTIONS

- A. Section 02230 Site Clearing
- B. Section 02374 Erosion Control Devices.
- C. Section 02610 Pipe Culverts

1.03 REFERENCES

- A. Northern Geotechnical Engineering .: Geotechnical Report; McGrath Health Clinic, McGrath, Alaska, dated January 2009.
- B. Standard Specifications for Highway Construction. (ADOTPF-SSHC).
- C. American Society for Testing and Materials:
 - 1. ASTM C127 D2487 Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 - 2. ASTM C127 D422 Dry and wet Sieve Analysis for soil classification.
 - 3. ASTM D1557 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.

1.04 QUALITY ASSURANCE

- A. Contractor shall employ an independent certified testing firm or laboratory to test classified materials and in-place soil density tests. The cost of obtaining a testing firm is the responsibility of the Contractor.
- B. Contractor shall cooperate by rerouting equipment or by temporarily closing the immediate Work area being tested.
- C. Allow testing service to inspect and approve each layer and lift of fill/backfill before further fill/backfill or construction Work is performed.

D. Areas where test results indicate noncompliance shall be corrected before placing additional fill/backfill.

1.05 SUBMITTALS

- A. Test Reports: Submit the following reports directly to the Engineer and Owners Representative from the testing services, with copy to Contractor:
 - 1. The Contractor shall submit a gradation test according to sub-section 1.06 Testing for each type and source of material used in fills, backfills and any other classified materials. If the Contractor obtains classified fill from an established material source with an approved testing standards then these results may be submitted for review.
 - Field reports; in-place soil density tests, gradation tests and compaction test plan in accordance with the "Quality Assurance" paragraph of sub section 1.04. The field reports shall include location and if re-testing for a failed prior tests.
 - 3. At any time the Contractor changes the source and/or stockpile from which materials are obtained, certificates of gradation for these new sources shall also be required. The Contractor shall make allowances in his unit bid prices for these items to cover expenses incurred in having this certification made and no additional compensation will be allowed.
 - 4. During construction, the Owner may elect to have further gradation testing completed on the materials being furnished by the Contractor. This testing will be at the expense of the Owner, however, the Contractor shall provide material samples that may be necessary to complete this testing and these material samples will be furnished from material available on the job site or from the Contractor's source and/or supplier.
 - 5. Name and contact information for the independent material testing firm or laboratory used for testing of classified and backfill soils shall be submitted to the Owner and Engineer 15 days before work begins for approval. The Owner has the authority to reject the Contractors proposed selection of the Independent testing firm. The Contractor will submit subsequent selections to the Owner for approval.

1.06 TESTING

- A. Soil tests shall be conducted in accordance with the following standards:
 - Classified material and Unclassified material: Moisture-Density Relations and Soil-Aggregate Mixtures, Using 10-pound Rammer and 18-inch drop per ASTM D 1557.
 - 2. In-Place Soil Density: Rubber Balloon Method per ASTM D 2167 or Nuclear Method per ASTM D 1556.

- 3. Water Content of Soil and Rock: Laboratory determination per ASTM D 2216 or In-Place determination by Nuclear Method per ASTM D 3017.
- B. Quality control monitoring of fill/backfill materials and construction shall be performed by certified independent firm approved by Owner's Representative, secured and paid for by the Contractor.
- C. Minimum frequency for testing classified material is stated below. Additional testing may be necessary depending on circumstances and failure rate.
 - 1. Mechanical Analysis on Imported Material
 - a. One sample for approval, prior to use of the following, plus regular checks as shown:

<u>Material</u>	Frequency
Backfill gravel	One per 2000 tons.
Foundation rock	One per 500 S.F.
Gravel bedding	One per 500 S.F
Unclassified Fill	One per 1000 tons
Crushed aggregate base	One per 1000 tons

- 2. In-Place Soil Density Building footprint
 - a. Minimum of one every 1000 S.F. for each lift of classified material.
- 3. In-Place Soil Density Utility Trench Bedding and Backfill
 - a. Minimum of two tests per trench at opposing ends for trenches less than 100 feet. One additional test every additional 50 L.F. of trench. Tests shall be located bottom of first lift of bedding material, spring line, mid trench and surface.
- 4. In-Place Soil Density Driveway and Parking Lot
 - a. One test per 2000 S.F. on each lift of classified or unclassified material.
 - b. One test per 2000 S.F. on prepared subgrade prior to approval of placement of classified or unclassified material.

1.07 PROJECT CONDITIONS

A. Existing Utilities: Locate existing underground utilities in areas of excavation work. Coordinate all utility location work with the Owner's Representative and applicable utility owners. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.

Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with the Owner's Representative and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

Coordinate all work within the project limits of work, including the placement of fill, excavation, or utility work, with the Owner's Representative. Coordinate any utility interruptions and/or road closures with the Owner's Representative.

Do not interrupt existing utilities serving facilities within the project limits of work, or others off-site during occupied hours, except when permitted in writing by the contracting officer, and then only after acceptable temporary utility services have been provided. Provide a minimum 48-hour notice to utility company and the contracting officer, and receive written notice to proceed before interrupting any utility.

- B. Use of Explosives: Use of Explosives is not permitted.
- C. Protection of Persons and Property:
 - 1. Barricade open excavations occurring as part of this work and post with warning lights or adequate flagging.
 - 2. Protect structures, utilities, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
 - 3. Provide traffic warning signs, barricades, warning lights, or other devices as might be required to provide for the safety and protection of persons or property. Signing and barricades shall be in accordance with ADOTPF-ATM.

1.08 COLD WEATHER CONSTRUCTION CONSIDERATIONS

- A. Cold Weather Protection
 - 1. All fill shall be unfrozen when it is placed and compacted.
 - 2. The subgrade must be kept from freezing during construction.
 - 3. All subgrade, which is allowed to freeze, shall be thawed and re-compacted to specified density.
- B. Cold Weather Construction Plan:

Whenever work is necessary or proposed to be completed when temperatures are expected to be below 35 degrees Fahrenheit, the Contractor shall submit a written plan for the Owner's approval. The Contractor shall provide details of the special materials, precautions, procedures and techniques employed to assure that all work performed at low temperatures will meet similar quality standards specified for work performed at higher temperatures.

PART 2 PRODUCTS

2.01 GENERAL

- A. Subgrade: The surface upon which classified or unclassified material is placed.
- B. Classified Material: Imported material from offsite sources or excavated material may be used to the extent possible for fill and backfill, or as directed. Excavated material not used shall be wasted as directed, provided, that no material shall be wasted without prior approval. Soil material shall be well-graded, non-frost susceptible materials, free from frozen lumps consisting of sand, gravel, broken stone, or similar material.
- C. Unclassified Material:

This material may be obtained by excavation of onsite material. This material shall be used as indicated on the plans in locations such as; backfill for utility trenches and in some locations below hard surfaced or improved areas. This material may consist of gravel, silt, and sands encountered in the excavation that do not meet the specified requirements of classified material. The material shall not contain topsoil, organics, debris, roots, wood, scrap materials, vegetable matter, refuse or frozen backfill.

- D. Unsatisfactory Materials: Soil materials that do not qualify as classified or unclassified. Unsatisfactory materials include materials classified in ASTM D 2487 as Pt, OH, OL, GC, SC, and any other materials considered not acceptable by the Owner.
- Fill Material:
 Material placed above the existing ground surface or above the prepared subgrade.
 This material may either classified or unclassified material.
- F. Backfill Material: Soil removed from excavation that is replaced. This material is unclassified unless tested and verified by an independent testing firm as identified under sub-section 1.04.
- G. Aggregate Base Course: Classified material utilized for roadway and road surface construction.
- H. Utility Trench Bedding: Classified material utilized for bedding of utility pipes.
- I. Non-frost susceptible (NFS) materials shall be free of ice, snow, organic material, and other deleterious debris, in accordance with the Plans and Specifications.
- J. Moisture contents for all fill materials shall be no more than 2% above optimum moisture, as determined by the State of Alaska's Test Method T-S and ASTM D-1557.

2.02 GEOTEXTILE FABRIC MATERIAL FOR EMBANKMENT CONSTRUCTION

A. Shall meet ADOTPF-SSHC requirements for separation geosynthetics as described in section 729.

2.03 SUBBASE MATERIAL

- A. Subbase material may consist of suitable native material obtained from areas of excavation or imported material. Use all suitable existing onsite material before importing off-site materials.
 - 1. Onsite excavation material for fills may include sand, rock, gravel, silt, and other inorganic material acceptable to the Engineer. Suitable material shall meet the minimum gradation requirements in 2.03 Sub base Material A.2.B. per ASTM C 136:
 - 2. Unsuitable excavation material for fill include any material containing vegetable or organic matter, such as muck, peat, organic silt, or sod. Such material, when approved by the Engineer, may be used on the embankment

slope.

B. Imported classified fill and backfill material shall consist of suitable material conforming to the following gradation:

US Standard Sieve Size	Percent Passing by Weight
3-inch	95-100
No. 10	25-70
No. 50	0-50
No. 200	0-6

B. Pit-run material may be used provided the material meets the requirements specified.

2.04 AGGREGATE BASE COURSE:

- A. Aggregate Base Course: Crushed aggregate base course shall be placed as shown on the Construction Plans.
 - 1. Aggregates shall consist of clean, sound, durable particles of crushed stone or crushed gravel and shall be free from vegetable matter, excess coatings of clay, silt, and other objectionable materials and shall contain no clay balls, organic matter, or other deleterious matters.
 - 2. Fine aggregate passing the No. 4 sieve shall consist of fines from the operation of crushing the course aggregate. If necessary, fine aggregate may be added to produce the correct gradation.
 - 3. Fine aggregate shall be produced by crushing stone and gravel and meet the following requirements:
 - a. Minimum degradation value of 45 when tested in accordance with ATM 313.
 - b. Maximum percent wear of 50 as determined by AASHTO T-96.
 - c. No evidence of disintegration or loss greater than 9% when subjected to 5 cycles of sodium sulfate accelerated soundness test using AASHTO T 104.
 - d. The fine aggregate shall have a minimum sand equivalent value of 35 when tested in accordance with ASTM D 2419.
 - 4. Crushed aggregate portion which is retained on the No. 4 sieve shall have at least 75% by weight with 2 fractured faces as determined by WAQTC TM 1.
 - 5. Crushed aggregate shall meet the following requirements:
 - a. Percentage of wear shall not be greater than 45% when tested in accordance with AASHTO T-96.
 - b. The sodium sulfate soundness loss shall not exceed 9% after 5 cycles, when tested in accordance with AASHTO T 104..
 - c. Minimum degradation value of 45 when tested in accordance with ATM 313.
 - d. Portion which is retained on the NO. 4 sieve shall have at least 75% by weight with 2 fractured faces as determined by WAQTC TM 1.
 - e. The fraction passing the No. 40 sieve shall have a liquid limit no greater than 25 and a plasticity index of not more than 4 when tested in accordance with ASTM D 4318.

B. Gradation

1. Crushed aggregate base course material shall meet the following gradation requirements when tested in accordance with ASTM C 117 and C 136:

Sieve	Percentage by Weights Passing Sieves	
Designation (Square Openings)	C-1	D-1
1.5-in	100	100
1.0-in	70-100	100
3/4-in	60-90	70-100
3/8-in	45-75	50-80
No. 4	30-60	35-65
No. 8	22-52	20-50
No. 50	8-30	8-30
No. 200	0-6	0-6

- 2. Unless otherwise specified, Gradation D-1 shall be used.
- 3. The final gradation shall be continuously well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on an adjacent sieve or vice versa.
- 2.05 UTILITY TRENCH BEDDING:
 - A. Bedding material for utility pipes shall consist of course and fine sands and conform to the following gradation or requirement.
 - 1.

Percentage by Weights Passing Sieves	
100	
60-100	
40-85	
25-70	
5-40	
0-6	
	Percentage by Weights Passing Sieves 100 60-100 40-85 25-70 5-40 0-6

2.06 CLASS 1 RIPRAP

- A. Evenly graded stones that are hard, angular and have no more than 50% wear at 500 revolutions as determined by AASHTO T 96. Use stones with breadth and thickness at least 1/4 of its length. Do not use rounded boulders or cobbles on slopes steeper than 3:1.
- B. Material shall meet the following gradation. Percents are by total weight, weights are for each stone.
 - 1. 0-50% weighing up to 25 pounds
 - 2. 0-10% weighing more than 50 pounds.
PART 3 EXECUTION

3.01 PREPARATION

- A. Indentify contours, grades, datum and features of site.
- B. Identify known underground, above ground, and aerial utilities. Stake and flag locations.
- C. Protect above and below grade utilities which are to remain.
- D. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.
- 3.02 EXCAVATION GENERAL
 - A. No excavation shall be started until the site has been staked out by the Contractor.
 - B. Subbase Preparation:
 - 1. In areas of excavation, the subgrade shall be compacted to depth shown and to a density of not less than 95% of the maximum density as determined by ASTM D 1557. All other areas and finished grade surfaces shall be compacted to the corresponding soil/material classification requirements.
 - 2. The in-place field density shall be determined in accordance with ASTM D 2922 or ASTM D 1557.
 - 3. ASTM D 3017 shall be used to test moisture when ASTM D 2922 is used for density measurement.
 - 4. The in place moisture shall be determined by ASTM D 2216 when using other than the nuclear gauge method for density.

3.03 STABILITY OF EXCAVATIONS

- A. General: Comply with all laws, local codes, ordinances, and requirements of agencies having jurisdiction.
- B. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. When multiple agencies conflict with codes, ordinances, and requirements, the most restrictive shall apply.
- C. Shoring and Bracing: Shore and brace or use a trench box, where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling. Provide materials for shoring and bracing, such as sheet pilling, uprights, stringers, and cross braces, in good serviceable condition, if necessary, to stabilize utilities, structures, or excavations.

D. Maintain necessary shoring and bracing in excavations regardless of when time period excavations will be open. Extend shoring and bracing as excavation progresses.

3.04 DEWATERING

A. Groundwater flowing into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in-situ material. Excavation shall be performed in the dry. Excavations shall be kept free from ponding until the permanent work in the excavations has been completed and accepted, and the excavations have been completely backfilled. The contractor will be responsible for obtaining necessary permits from the Department of Environmental Conservation and other necessary regulatory agencies.

3.05 STORAGE OF EXCAVATED MATERIALS

- A. Stockpile excavated materials acceptable for backfill and fill where directed. Place, grade, and shape stockpiles for proper drainage.
- B. Locate and retain soil materials away from edge of excavations.
- C. Do not store screened or structural materials on ground surface. Provide a buffer between the ground surface and the material to be stored to minimize intermixing of soils. The buffer shall be at least one foot in depth and be constructed from the same soil material to be stored.
- 3.06 FILL AND BACKFILL CONSTRUCTION
 - A. Fill and Backfill Materials:
 - 1. See sub section 2 for specific material classifications.
 - B. Fill and Backfill Placement:
 - 1. Fill and Backfill shall be formed in successive horizontal layers of not more than 8-inches in loose depth for the full width of the cross section, unless otherwise approved by the Engineer.
 - 2. Areas to receive Fill and Backfill and backfill shall be free of unsuitable materials; the receiving surface shall be uniformly graded and free of soft or yielding areas.
 - 3. Any Fill and Backfill improperly placed, or compacted, or where settlement occurs shall be removed to the depth required by the Engineer for proper compaction, refilled and re-compacted to the satisfaction of the Engineer.
 - 4. The Contractor shall keep all Fill and Backfill and backfill well shaped, drained, and maintained. Mound trench backfill in uniform, smooth fashion to provide for drainage and anticipation of settlement in non-traffic areas.

- 5. Operations on earthwork shall be suspended at any time when satisfactory results cannot be obtained because of rain, freezing, or other unsatisfactory conditions of the field.
- C. Compaction and Testing:
 - 1. Fill and Backfill shall be compacted by rolling.
 - a. See subsection 1.06 Testing for frequency and testing requirements for all classified and unclassified materials.
 - 2. Fill and Backfill material in the layer shall be within +/-2% of the optimum moisture content before rolling to obtain the prescribed compaction.
 - a. In order to achieve uniform moisture content throughout the layer, wetting or drying of the material and manipulation shall be required when necessary.
 - b. Should the material be too wet to permit proper compaction or rolling, all Work on all of the affected portions of the embankment shall be delayed until the material has dried to the required moisture content.
- 3.07 AGGREGATE BASE COURSE CONSTRUCTION
 - A. General:
 - 1. Placing and spreading operations shall not commence until the underlying course has been accepted by the Engineer and satisfactory compaction test results are provided.
 - 2. Any ruts or soft areas shall be corrected and compacted to the required density before placing the base course.
 - 3. No material shall be placed on frozen subgrade.
 - 4. The aggregate shall be uniformly blended to meet Specifications during crushing operations or mixed in a plant.
 - B. Aggregate Base Course Placement:
 - 1. Material shall be placed on the approved subgrade in uniform, equal depth layers, each not exceeding 6-inches of compacted depth.
 - 2. Each previously constructed layer shall be cleaned of loose and foreign material prior to placing the next layer.
 - 3. The surface of each compacted layer shall be kept moist until covered with the next layer.
 - 4. In no case shall thin layers of material be added to the top of base course to meet grade.
 - a. If the compacted elevation of the top layer is 0.05-feet or more below grade, it shall be scarified to a depth of at least 3-inches, new material added, and the layer shall be blended and compacted to bring it to grade.
 - b. If the finished surface is above plan grade, it shall be cut back to grade and re-compacted.
 - C. Compaction and Testing:

- 1. Aggregate Base Course shall be compacted by rolling.
 - a. Rolling operations shall be continued until the material is compacted to not less than 95% of the maximum density.
 - b. See subsection 1.06 Testing for frequency and testing requirements.
- 2. The thickness of the finished base course will be no less than 2 inches or not more than 6 inches.
 - a. The compacted thickness of the base course shall be within ½-inch of the design thickness.
 - b. Where the thickness is deficient by more than ½-inch it shall be corrected to within the specified tolerances at Contractor's expense.
- 3. After the course has been completely compacted, the surface will be tested for smoothness and accuracy of grade and crown.
 - a. The finished surface shall not vary more than 3/8-inch from a 16-foot straightedge when applied to the surface parallel with, and at right angles to, the centerline.
 - b. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be corrected to within the specified tolerances.

3.08 EXCAVATION REQUIREMENTS

- A. Unsuitable Material encountered during excavation of roadways, access roads, parking lots, building pads, pipe installation and other structures shall be removed to suitable soil or per an excavation depth recommended by the Geotechnical Engineer.
- B. Replace removed unsuitable material with Unclassified Material and compact in accordance with this section.
- C. Unsuitable Material excavated may be placed on the surface of fill slopes after slopes per the Drawings have been constructed. Unsuitable Material that cannot be placed on fill slopes or no fill slopes are constructed, may be hauled and disposed at designated locations. See 3.11 this sub-section.

3.09 GRADING

- A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition area. Smooth finished surface within specified tolerances, compact with uniform levels or slopes to the contours shown on the fill and grading plan between points where elevations are indicated, or between such points and existing grades.
- B. Grading: Finish surfaces free from irregular surface changes. Shape surface area to line, grade and cross section indicated on Plans. Finish grade slopes shall be per plan drawings.
- C. Compaction: After grading, compact subgrade surfaces to the depth and Indicated percentage of maximum or relative density for each area classification.
- D. Drainage: Surface water shall be directed away from excavation and construction sites so as to prevent erosion and undermining of foundations. Diversion ditches, dikes and grading shall be provided and maintained as necessary during construction. Excavated slopes and backfill surfaces shall be protected to prevent

erosion and sloughing. Excavation shall be performed so that the site and the area immediately surrounding the site and affecting operations at the site shall be continually and effectively drained.

3.10 FIELD QUALITY CONTROL

- A. Quality Control Testing During Construction: The Contractor shall schedule and allow the testing laboratory representative to inspect and approve each subgrade and fill layer before further backfill or construction work is performed
- B. If, in the opinion of the Owner's Representative, based on testing service reports and inspection, subgrade or fills have been placed and are below specified density, Contractor shall perform additional compaction and testing until specified density is obtained.
- C. Failed Tests: The Contractor shall remove and replace non-conforming materials and shall recompact and retest failed and replaced areas until the specified degree of compaction is obtained.

3.11 DISPOSAL OF EXCESS AND WASTE MATERIALS

- A. Dispose of excess excavated soil material and materials not acceptable for use as backfill or fill, at the City of McGrath disposal site or an approved location able to accept such material.
- B. The Contractor will be responsible for removing any additional excess soil material from the site once the designated temporary and onsite waste areas have been utilized to capacity.

3.12 TEMPORARY EROSION CONTROL

A. Provide temporary erosion control Best Management Practices (BMP's) methods in accordance with requirements of ADOT/PF 1992 Stormwater Contractor Guidance, Temporary Erosion and Pollution Control.

3.13 MAINTENANCE

- A. Protection of Graded Areas: protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.
- C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

SECTION 02310 TRENCHING, BACKFILLING, AND COMPACTION FOR UTILITIES

PART 1 GENERAL

1.01 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

- A. Section 02300: Earthwork and Grading
- B. Section 02310: Sanitary Sewerage

1.02 QUALITY CONTROL ASSURANCE

A. Conform to Section 02300, Earthwork and Grading, and as specified herein.

1.03 SUBMITTALS

A. Conform to Section 02300, Earthwork and Grading.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials used for trench backfill may be native materials or classified material as described herein and described in Section 02300, Earthwork and Grading.

PART 3 EXCECUTION

- 3.01 TRENCHING
 - A. General:
 - 1. All material excavated from trenches and piled adjacent to the trench or in a roadway or public thoroughfare shall be piled and maintained so that the toe of the slope of the stockpiled material is at least 2 feet from the edge of a trench six feet deep or less. Stockpiled material shall be located 8 feet from the edge of trenches or excavations deeper than 6 feet deep.
 - 2. Excavated material shall be piled in such a manner that will cause a minimum of inconvenience to public travel, and provision shall be made for merging traffic where such is necessary.
 - 3. Free access shall be provided to all fire hydrants, water valves and meters, and clearance shall be left to enable the free flow of storm water in all conduits, and natural watercourses.
 - B. All rocks, boulders, or stones shall be removed to provide a minimum clearance of 6 inches under and around the pipe.
 - C. Unsuitable materials excavated from the trench shall be replaced with excess usable excavation from other portions of the project or with unclassified

material as directed by the Engineer. All costs for backfilling operations shall be considered as incidental to this item.

3.02 TRENCHING FOR SEWER LINES

- A. All trenches shall be excavated true to lines and grades in accordance with the grades indicated on the Drawings.
- B. Trenches shall be of sufficient width to permit proper jointing of the pipe and backfilling of material along the sides of the pipe.
- C. Trenches shall be excavated with ditch sides straight and vertical unless otherwise required by OSHA.
- D. Trench width at the surface of the ground shall be kept to the minimum amount necessary to install the pipe in a safe manner.
- E. Trench width at the bottom of the trench and up to a point 6 inches above the crown of the pipe shall not exceed 1-1/2 times the outside diameter of the pipe plus 18 inches, except as shown on the Drawings.
- F. The depth of trenching for sewer lines shall be such as to give a minimum cover of 4 feet over the top of the pipe, unless otherwise specified. No additional compensation will be allowed where deeper excavation is required.
- G. Unless otherwise specified, the trenches shall be excavated below the specified grade a sufficient distance to provide for bedding material as specified.
- H. The length of trench excavated in advance of the pipe laying shall be kept to a minimum, and in no case shall more than 150 feet of trench be open unless specifically authorized by the Engineer.

3.03 TRENCHING FOR STORM DRAINS AND CULVERTS

- A. All trenches shall be excavated true to lines and grades in accordance with the grades indicated on the Plans.
- B. Trenches shall be of sufficient width to permit proper jointing of the pipe and backfilling of material along the sides of the pipe.
- C. Trenches shall be excavated with ditch sides straight and vertical unless otherwise required by OSHA. Utilize shoring if required in accordance with OSHA.
- D. Trench width at the surface of the ground shall be kept to the minimum amount necessary to install the pipe in a safe manner.
- E. Trench width at the bottom of the trench and up to a point 6 inches above the crown of the pipe shall not exceed 1-1/2 times the outside diameter of the pipe plus 18 inches, except as shown on the Drawings.

- F. Unless otherwise specified, the trenches shall be excavated below the specified grade a sufficient distance to provide for bedding material as specified.
- G. The length of trench excavated in advance of the pipe laying shall be kept to a minimum, and in no case shall more than 100 feet of storm drain line trench be open unless specifically authorized by the Engineer
- H. Depth of Storm Pipe installation shall be as shown on the Drawings.

3.04 FOUNDATION MATERIAL

- A. Material unsuitable for foundation purposes below the depth required for the specified bedding shall be removed. Unsuitable excavated materials shall be disposed of at the approved disposal site(s) and all costs involved in the excavating and wasting of this material shall be considered as incidental to the installation.
- B. Proper preparation of foundation and placement of foundation material shall precede the installation of all pipe. This shall include the preparation of the native trench bottom and/or the top of the foundation material to a uniform grade so that the entire length of pipe rests firmly on a suitable properly compacted material. Backfill material around the pipe shall be placed in a manner to meet requirements specified in respective sections for installation of pipeline.
- C. Replace unsuitable material existing at and below the depth required for the specified bedding with Gravel Bedding as shown on the Plans or as directed by the Engineer. Maximum depth of the foundation material will be as determined by the Engineer based upon actual field conditions.
- 3.05 BEDDING MATERIAL
 - A. Placement of bedding material in the pipe zone shall be as specified in the section regarding the type of pipeline being constructed.
 - B. Bedding material shall be as described in Section 02300 Earthwork and Grading.
- 3.06 GENERAL BACKFILLING REQUIREMENTS
 - A. Placement and compaction of bedding material to 6 inches over the top of the pipe shall be completed before backfilling operations are started.
 - B. The Contractor shall take all necessary precautions to protect the pipe from any damage, movement, or shifting.
 - C. In general, backfilling shall be performed by pushing the material from the end of the trench into, along and directly over the pipe so that the material will be applied in the form of a rolling slope rather than by side filling which may damage the pipe. Backfilling from the sides of the trench will be permitted after sufficient material has been carefully placed over the pipe to such a depth to protect the pipe.

- D. All brush, stumps, logs, planking, disconnected drains, boulders, etc., shall be removed from the material to be used for backfilling the trench. The cost of removal and disposal of these items shall be considered incidental to the construction and no further compensation shall be allowed.
- E. Classified and unclassified material shall be as specified in Section 02300, Earthwork and Grading, and shall be used only upon approval by the Engineer. All costs for backfilling operations shall be considered as incidental to this item.
- F. Unsuitable excavated material shall be disposed of in accordance with section 02300 Earthwork and Grading sub-section 3.11. The cost of removal and disposal of this material shall be considered incidental to the construction and no further compensation shall be allowed.
- G. Where a trench is excavated in a paved roadway, sidewalk, or other area where minor settlements would be detrimental and where the native excavated material is not suitable for compaction as backfill, the trench shall be backfilled to such depth as the Engineer may direct with classified material or unclassified excavation from other portions of the project.
- H. Replace classified material to the original depths or as instructed by the Engineer.
- I. Concrete pavement layers shall be replaced with new material and as required by this specification and Drawings if damaged during construction efforts.

3.07 USABLE EXCAVATION

- A. Any usable excavation generated will be stockpiled on site for reuse on other portions of the project.
- B. Usable excavation shall meet the requirements of unclassified material as identified in section 02300 Earthwork and Grading.
- C. Usable Excavation shall consist of excess excavated material free from organic material (muskeg), muck, frozen material, roots, sod, or other extraneous or objectionable materials. It shall have such characteristics of size and shape that it will compact readily; Usable Excavation may consist of excess excavated rock material.
- D. Usable Excavation shall be segregated at the secured site such that it remains uncontaminated by unsuitable material.
- E. Any stockpiled Usable Excavation remaining after all work on the Project is complete will be handled according to Section 02300 Earthwork and Grading.

3.08 MECHANICAL COMPACTION REQUIREMENTS

A. The density of compacted backfill material shall meet the percentage of the maximum dry density in accordance with Section 02300, Earthwork and Grading.

- B. Placement of trench backfill, usable excavation, classified material, unclassified material and utility trench bedding material shall be in lift depths as follows:
 - 1. Utility trench bedding: 6-inch lift maximum depth.
 - 2. Trench backfill, unclassified material and classified material: 12-inch lift maximum depth.
- C. Any trench in which 95% density cannot be achieved with existing backfill, the top four feet shall be replaced with classified material mechanically compacted to 95%.
- D. All classified material shall be mechanically compacted to 95% of maximum density.
- E. Trench backfill in easements and lawn areas which do not support vehicle traffic may be mechanically compacted to 90% of maximum density.
- F. The Contractor shall be responsible to provide the proper size and type of compaction equipment and select the proper method to attain the required compaction density. In no case shall compaction by bucket tamping be allowed.
- G. In-place compaction tests shall be made as required in Section 02300, Earthwork and Grading. Contractor shall remove, replace, and re-compact any material that does not meet specified requirements.
- H. When working in an existing traveled roadway, restoration and compaction must be achieved as the trench is backfilled in order to maintain traffic.

SECTION 02374 EROSION CONTROL DEVICES

- PART 1 GENERAL
- 1.01 SUMMARY
 - A. This section supplements the Storm Water Pollution Prevention Plan as required by the Contractor to obtain prior to construction.
 - B. Section Includes:
 - 1. Sediment Ponds (if required).
 - 2. Sediment Traps (if required).
 - C. Related Sections:
 - 1. Section 02230 Site Clearing.
 - 2. Section 02300 Earthwork.

1.02 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T88 Standard Specification for Particle Size Analysis of Soils.
 - 2. AASHTO T180 Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. American Society for Testing and Materials:
 - 1. ASTM C127 Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate.
 - ASTM D698 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kNm/m3)).
 - ASTM D1557 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kNm/m3)).
 - 4. ASTM D2922 Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - 5. ASTM D3017 Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.03 QUALITY ASSURANCE

- A. Perform Work in accordance with requirements of Sections 02230 and 02300.
- B. Perform Work in accordance with State of Alaska Department of Transportation & Public Facilities standards.

PART 2 PRODUCTS

2.01 ROCK AND GEOTEXTILE MATERIALS

A. Furnish materials in accordance with Section 02300 Earthwork and Grading.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01310 Project Management and Coordination: Verification of existing conditions before starting work.
- B. Verify compacted sub grade is acceptable and ready to support devices and imposed loads.
- C. Verify gradients and elevations of base or foundation for other work are correct.

3.02 DIVERSION CHANNELS

- A. Windrow excavated material on low side of channel.
- B. Compact sub grade to 95 percent maximum density.

3.03 SEDIMENTATION POND

A. Install Work in accordance with the Storm Water Pollution Prevention Plan.

3.04 SEDIMENT TRAPS

- A. Clear site, as specified in Section 02230.
- B. Place coarse aggregate or rock as indicated on Drawings.
- C. Place geotextile fabric.
- D. When required, obtain excavation for formation of embankment.
- E. On entire sediment trap area, apply soil supplements and sow seed.
- F. Mulch seeded areas.

3.05 SITE STABILIZATION

- A. Incorporate erosion control devices indicated in the Storm Water Pollution Prevention Plan at the earliest practicable time.
- B. Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.
- C. Stockpile and waste pile heights shall not exceed 35 feet. Slope stockpile sides at 2:1 or flatter.
- D. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 20 days.
 - 1. During non-germinating periods, apply mulch at recommended rates.

- 2. Stabilize disturbed areas which are not at finished grade and which will be disturbed within one year.
- 3. Stabilize disturbed areas, which are either at finished grade or will not be disturbed within one year with permanent seeding.
- E. Stabilize diversion channels, sediment traps, and stockpiles immediately.
- 3.06 FIELD QUALITY CONTROL
 - A. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.
 - B. Compaction Testing: As specified in Section 02300.
 - C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- 3.07 CLEANING
 - A. When sediment accumulation in sedimentation structures has reached a point onethird depth of sediment structure or device, remove and dispose of sediment.
 - B. Do not damage structure or device during cleaning operations.
 - C. Do not permit sediment to erode into construction or site areas or natural waterways.
 - D. Clean channels when depth of sediment reaches approximately one half channel depth.

SECTION 02530 SANITARY SEWERAGE

- PART 1 GENERAL
- 1.01 SUMMARY
 - A. Description:
 - 1. This work includes all the labor, material, tools and equipment necessary for the installation of the wastewater system as shown on the Drawings.

1.02 REFERENCES

- A. Geotechnical Report for the proposed McGrath Health Center, McGrath, Alaska, dated January 2009.
- B. Alaska Department of Environmental Conservation Regulations 18 AAC 72.
- C. Section 02300 Earthwork
- D. Section 02310 Trenching, Backfill and Compaction for Utilities.
- E. American Society for Testing and Materials:
 - ASTM D1557 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kNm/m3)).
 - 2. ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
 - 3. ASTM D2564 Standard Specification for Solvent Cements for Poly(Vinyl Chloride)(PVC) Plastic Piping Systems
 - 4. ASTM D2855 Making Solvent-Cemented Joints with PVC Pipe and Fittings
 - 5. ASTM D3212 Specifications for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
 - 6. ASTM F402 Standard Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings
 - 7. ASTM F481 Standard Practice for Installation of Thermoplastic Pipe and Corrugated Pipe in Septic Tank Leach Fields

1.03 DEFINITIONS

- A. Soil Absorption System: Subsurface wastewater disposal process.
- B. Distribution Piping: Solid pipe and pipe fittings installed with tight joints between the building and absorption bed, but not including, leaching piping.

- C. ABS Acrylonitrile Butadiene Styrene Pipe
- D. PVC: Polyvinyl chloride.
- E. HDPE: High Density Polyethylene Pipe

1.04 SUBMITTALS

- A. Product Data: The Contractor shall submit for approval manufacturer's specifications, drawings, and recommendations for materials incorporated into the project. It shall include manufacturer's published data, engineering data, letter of certification or certified test laboratory report indicating that the material complies with specified standards and other requirements. Shop drawings shall be submitted for all fabricated work. Items shall include, but not limited to:
 - 1. Septic tank.
 - 2. Pipe and fittings.
 - 3. Filter fabric.
 - 4. Infiltrator Units
 - 5. Bonding agent of butt-fusion method to connect pipes/fittings.
- B. Coordination Drawings: Show piping, underground structures, and other utilities. Indicate size and invert elevations of piping and structures.
- C. Provide still photos, identified under the Quality Assurance section, to Engineer and Owners Representative within five days. As a means to better understand the photo content, each photo(s) will be placed in a Word document with the following information, these are the minimum requirements:
 - 1. Cardinal direction photo is facing (i.e., north, southeast, etc)
 - 2. Location photo is taken from
 - 3. Identify main component(s) in photo.
 - 4. Phase of construction photo was taken
 - 5. Date of photo
- D.

1.05 CONTRACTOR RECORD DRAWINGS

A. The Contractor shall document any changes from the design Plans required to complete a Record Drawing Set of the wastewater system. Changes to the design plans shall be competed in short hand with red ink and placed on a full size set of plans. The original design information shall be strikethrough with the new information placed adjacent.

1.06 QUALITY ASSURANCE

- A. Perform work in accordance with Drawings and these specifications.
- Additional design information needed to construct this wastewater system shall refer to Alaska Department of Environmental Conservation Regulations - 18 AAC 72.

C. Installer shall take a minimum of 8 pictures during the installation of the phases described below: These are for documentation purposes for the Engineer to approve the system.

PHASE

- 1. Prior to placing the infiltrators. Bottom of SAS shall be prepared according to section 3 of this specification.
- 2. After installation of the piping and septic tank from the building to the SAS, uncovered, and clearly showing all bends and fittings. At least one picture shall show the 'inlet' or 'outlet' stenciling on the outside of the tank.
- 3. After the infiltrators are installed and uncovered.
- 4. Entire system after earthwork activities are complete, clearly showing all monitor tubes, capped and at the specified depth above adjacent finished ground.

1.07 QUALIFICATIONS

- A. Installer:
 - 1. Company or contractor specializing in performing work of this section and knowledge with Alaska Department of Environmental Conservation Regulations 18 AAC 72 a minimum of five years.
 - 2. Posses a current "Certified Installers" certificate. This requirement may be waived if requested in writing to the Engineer at least 30 days prior to the installation date of the wastewater system.
- PART 2 PRODUCTS
- 2.01 GENERAL
 - A. Installation of the wastewater system includes all piping, fittings, septic tank and infiltrators required to meet the design and intent of the Drawings.
 - B. Contractor shall coordinate with manufacture of wastewater system for recommended installation practices and system construction onsite.
- 2.02 PRIMARY TREATMENT TANK
 - A. Option 1. Description: Two-chamber, steel construction; fabricated for septic tank application, with two monitor tube penetrations at top, opposing ends. The septic tank shall be sized to accommodate liquid volume specified on the Drawings. Tank and appurtenances shall be manufactured by Anchorage Tanks & Welding, or approved equal. Tank shall be built per Uniform Plumbing Code.
 - B. Option 2. Description: Two-chamber, fiberglass construction; fabricated for septic tank application, with two monitor tube penetrations at top, opposing ends. The septic tank shall be sized to accommodate liquid volume specified on the Drawings. Tank and appurtenances shall be manufactured by Anchorage Tanks & Welding, or approved equal. Tank shall be built per Uniform Plumbing Code and with a minimum thickness of 3/16-inch.

2.03 PIPING FOR WASTEWATER SYSTEM

- A. Piping for wastewater system, above and below ground, shall conform to the following standards or Engineer-approved equal.
 - 1. ASTM D-3034 (PVC), Schedule 40

- 2. ASTM D-789 (PVC), Schedule 40
- 3. ASTM D-2662 (ABS), SIDR 15 or equivalent to Schedule 80.
- 4. ASTM F810 (HDPE), SDR 11 or equivalent to schedule 80.
- B. All pipe shall be solid with no perforations or gouges.

2.04 SOIL ABSORPTION SYSTEM

- A. Infiltrator: Infiltrator Systems Inc. [™] 3050 Chamber or approved equal. Requests to use alternate chambers or manufactures must be made to the engineer in writing 15 days before installation and include product data as described in sub-section 1.04 Submittals.
- PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine site conditions for consistency with the Site Plan. Excavate test hole and examine soil strata to verify uniformity throughout soil absorption system area.
 Engineer or Owner Representative must verify absence of water table within 4 feet of bottom of soil absorption system and absence of impermeable layer within 6 feet of bottom of soil absorption system before construction. Contractor must inform the Owner Representative or Engineer 48 hours before excavation initiates.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean outside surface of piping, septic tank, and other structures and protect as necessary to ensure freedom from damage and deterioration at time of final inspection and project completion.

3.03 EARTHWORK

- A. Excavating, trenching, and backfilling for the septic system are specified in Division 2 Section 2300-Earthwork and Section 02310 – Trenching Backfilling and Compaction for Utilities.
- B. Excavating and Backfilling for Septic Tank: As follows:
 - 1. Over-excavate septic tank dimensions to provide sufficient working room during installation.
 - 2. Prepare level surface prior to setting tank. Compact prepared surface to 95% maximum dry density, according to ASTM D 1557.
 - 3. Bedding requirements: see sub-section 3.06, Bedding and Backfill Requirements.
 - 4. Install septic tank according to inlet elevation and horizontal location. Inlet side shall face the direction in which the sewerage flow originates (upstream).

- 5. Repair any scratches or damage to surface of tank per manufacturers recommendations.
- 6. Backfill with excavated soil, mounding soil above original grade to provide positive slope away from trench excavation.
- 7. Document construction activities by taking photographs of a specified in Part 1 Quality Assurance.
- 3.04 SEPTIC TANK INSTALLATION
 - A. Install septic tank level; coordinate with Earthwork, part 3 of this specification.
 - B. Provide shoring around septic to limit any movement during backfilling operations. Shoring shall not damage septic tank in any way. Rocks, concrete and similar type material with sharp and pointed edges shall not be used to shore or hold the tank in position.
- 3.05 PIPING APPLICATIONS
 - A. Install solid piping to connect septic tank, and manifold header for the absorption field with closed joints.
 - B. Connect to sewer line just inside foundation or just outside foundation. Coordinate with contractor installing sewer piping within building foundation.
- 3.06 BEDDING AND BACKFILL REQUIREMENTS
 - A. Bedding for solid pipe
 - 1. Shall conform to Trenching, Backfilling and Compaction for Utilities under Section 02310 and the Plan Sheets.
 - 2. Prepare excavated trenches by removing all large rocks and create a smooth bottom floor.
 - B. Bedding for septic tank shall have a minimum of one foot of bedding material. Insitu material may be substituted for bedding material if the Contractor can verify material conforms to gradation in section 02300 – Earthwork and Grading..
- 3.07 PIPE JOINT CONSTRUCTION AND PIPING INSTALLATION
 - A. Join and install HDPE pipe with fused joints or couplings, according to ASTM D 2321 and ASTM F 481.
 - B. Join and install solvent-cement-type PVC pipe and fittings according to ASTM D 2855 and ASTM F 402.
 - C. Join gasket PVC pipe and fittings with electrometric seals according to ASTM D 3212.
 - D. Install leaching PVC piping according to ASTM D 2321 and ASTM F 481.
 - E. Join dissimilar pipe materials with standard manufactured couplings and fittings made for that purpose.

3.08 INFILTRATION CHAMBER INSTALLATION

- A. Plow bottom surface of excavated soil absorption trench maximum 6 inches. Do not compact surface of soil absorption system.
- B. Bottom of excavated soil absorption system trenches shall be level within each trench. Adjacent trenches may have an elevation difference as shown on the plans.
- C. Place infiltrator chamber on level trench floor and in accordance with manufacturer's recommendations. Installation of the Infiltration chambers shall be such that they will not move once backfill is placed around the sides and top.
- D. Install monitor tubes in the locations and to the height above the adjacent finished grade as shown on the Drawings.

3.09 DISTRIBUTION PIPING

- A. Install distribution piping a minimum of 2 percent unless otherwise shown on the Drawings.
- 3.10 CLEANOUT INSTALLATION
 - A. Install cleanouts and vertical extension from piping to cleanout at grade as indicated on the Drawings.
 - B. Install a clean out a minimum of every 100 feet or less for all the non-pressurized pipe. See Plan sheets for exact spacing of cleanouts. Install cleanout sweeping in the direction of flow.
- 3.11 CONNECTIONS
 - A. Connect sanitary sewerage piping to septic tank.
 - B. Connect piping between septic tank, distribution piping and infiltration chambers

3.12 FIELD QUALITY CONTROL

A. System Test: Perform testing of completed septic tank system piping and structures according to authorities having jurisdiction and these specifications.

3.13 CLEANING

- A. Clear interior of piping and fittings of dirt and other deleterious material prior to installation and as work progresses.
- B. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of workday or when work stops.

SECTION 02610 PIPE CULVERTS

PART 1 GENERAL

- 1.01 DESCRIPTION OF WORK
 - A. Installation of pipe culverts at the locations and elevations shown on the Drawings.

1.02 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

- A. Division I Specifications
- B. Section 02230: Clearing and Grubbing
- C. Section 02300: Earthwork and Grading
- D. Section 02310: Trenching, Backfilling, and Compaction for Utilities

1.03 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced; the publications are referred to in the text by basic designation only.
 - 1. ASTM A-760: Standard Specification for Corrugated Steel Pipe, Metalic-Coated for Sewers and Drains
 - 2. ASTM A-761: Standard Specification for Corrugated Steel Structural Plate, Zinc-Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches.
 - 3. ASTM A-762: Standard Specification for Corrugated Steel Pipe, Polymer Precoated for Sewers and Drains.
 - 4. ASTM A-885: Standard Specification for Steel Sheet, Zinc, and Aramind Fiber Composite Coated for Corrugated Steel Sewer, Culvert, and Underdrain Pipe.
 - 5. ASTM B-745: Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains (AASHTO M 196).
 - 6. AASHTO M 36: Corrugated Steel Pipe & Fittings
 - 7. AASHTO M 190: Standard Specification for Bituminous-Coated Corrugated Metal Culvert Pipe and Pipe Arches.
 - 8. AASHTO M 196: Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains (ASTM B 754)
 - 9. AASHTO M 219: Standard Specification for Corrugated Aluminum Alloy Structural Plat for Field-Bolted Pipe, Pipe-Arches, and Arches.
 - 10. AASHTO M 245-82: Precoated Galvanized Steel Culverts for Underdrains
 - 11. AASHTO M 246-80: Precoated Galvanized Steel Sheets for Culverts and Underdrains
 - 12. AASHTO M 252: Standard Specification for Corrugated Polyethylene Drainage Pipe.

13. AASHTO M 294: Standard Specification for Corrugated Polyethylene Pipe, 300-mm to 1500-mm Diameter.

1.04 QUALITY ASSURANCE

- A. Testing By Manufacturer:
 - 1. Pipe manufacturer shall test all pipe as required by these specifications and the standards referenced.
 - 2. Pipe manufacturer shall submit to the Engineer one copy of all test results which shall include a certification that material to be delivered is represented by the samples tested and that such delivered materials meets or exceeds the specification requirements.
 - 3. No pipe shall be ordered or delivered until test results and certifications have been approved by the Engineer in writing.
- B. Final Acceptance:
 - 1. Prior to final inspection all pipelines shall be cleaned with all debris removed.
 - 2. Any corrections required in line and grade shall be made at the expense of the Contractor.
- 1.05 DEFINITIONS
 - A. Culvert Pipe: For the purposes of this Specification culvert piping shall be considered piping used to transport storm water between two above-grade drainage paths.
- 1.06 SUBMITTALS
 - A. General Requirements: Product Data.
 - B. Furnish Manufacturer's "cut sheets", information and design data, including complete installation instructions.
 - C. Testing requirements under sub section 1.04 Quality Assurance.

PART 2 PRODUCTS

- 2.01 PIPE MATERIAL
 - A. Culvert Pipe: High density corrugated polyethylene pipe, Type S (CPEP) double walled or corrugated metal pipe (CMP).
- 2.02 PIPE BEDDING AND BACKFILL MATERIAL
 - A. Conform to Section 02300, Earthwork and Grading and Section 02310, Trenching, Backfilling and Compaction for Utilities and this Section.
 - B. Pipe bed shall be roughly shaped to fit the pipe, and a bedding blanket of sand or fine granular material as shown on the Drawings. Minimum bedding depth shall not be less than 3 inches.
- 2.03 BACKFILL

- A. Conform to Section 02300, Earthwork and Grading and Section 02310, Trenching, Backfilling and Compaction for Utilities and this Section
- B. Material for backfill shall be fine, readily compactable soil, or granular material selected from the excavation or as source of the Contractor's choosing.
- C. Backfill material shall not contain frozen lumps, stones that would be retained on a 2-inch sieve, chunks of highly plastic clay, or other objectionable material.
- 2.04 CORRUGATED METAL PIPE
 - A. Corrugated steel pipe shall be galvanized and conform to the requirements of ASTM A 760 (AASHTO M 36), 16 gauge or less.
 - B. Corrugated aluminum pipe shall conform to the requirements of AASHTO M 196.
 - C. Pipes with Coating:
 - 1. Coated uniformly inside and out with asphalt coating to meet the requirements of AASHTO M190.
 - 2. The Contractor may substitute a polymer coating such as "Black Klad" if approved by the Engineer.
 - 3. All fittings and couplings shall be coated.
 - D. Joining for the corrugated steel and aluminum pipe shall be made through the use of coupling bands. Coupling band shall meet the requirements of ASTM A 760 and wide enough to cover at least two annular corrugations. Gasket shall be provided and conform to the requirements of ASTM D 1056, for the "RE" closed cell grades.
 - E. Galvanized Steel and Aluminum End Sections:
 - 1. End sections shall be flared, beveled shop-assembled units to serve as structural, hydraulic, and aesthetic end treatment to corrugated metal pipe culverts.
 - 2. End sections shall be attached to corrugated metal culverts by threaded rods or bands per manufacturer's standard procedure.
 - 3. End sections shall have a turned down lip or toe plate at the wide end to act as a cut-off.
 - 4. The material for steel end sections shall be galvanized steel meeting the requirements of ASTM A 760 (AASHTO M 36) or same gauge as pipe.
 - 5. The material for aluminum end sections shall comply with the provisions of AASHTO M 196.

2.05 CORRUGATED POLYETHELNE PIPE

- A. Shall conform to AASHTO M-252 and rated for:
 - 1. Use under public roadways H20

- E. Polyethylene End Sections:
 - 1. End sections shall be flared, beveled shop-assembled units to serve as structural, hydraulic, and aesthetic end treatment to CPEP.
 - 2. They may be attached to CPEP by threaded rods, by riveting, or bolting per manufacturer's standard procedure.
 - 3. End sections shall have a turned down lip or toe plate at the wide end to act as a cut-off.
 - 4. The material for CPEP end sections shall be of the same material meeting the requirements of AASHTO M 294.

PART 3 EXECUTION

- 3.01 INSTALLATION
 - A. Storm drain piping shall be installed to ensure proper drainage as shown on the Construction Plans.
 - B. Culverts shall be installed to properly restore existing drainage patterns.

3.02 EXCAVATION

- A. Pipe Trench
 - 1. The width of the pipe trench shall be sufficient to permit satisfactory jointing of the pipe and thorough tamping of the bedding material under and around the pipe.
 - 2. Minimum trench width is equal to the external diameter of the pipe plus 12-inches on each side.
 - 3. The trench walls shall be approximately vertical to the extent practical given soil conditions and maintaining safe working conditions.
 - 4. Where rock, hardpan, or other unyielding material is encountered, the Contractor shall remove it from below the foundation grade for a depth of at least 12 inches or ½ inch for each foot of fill over the top of the pipe, whichever is greater, but for no more than 75% of the nominal diameter of the pipe.
 - a. The excavation below grade shall be backfilled with selected fine compressible material, such as silty clay or loam, and lightly compacted in layers not over 6 inches in uncompacted depth to form a uniform by yielding foundation.
 - 5. Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unstable soil, the unstable soil shall be removed and replaced with approved granular material for the full trench width.
 - a. The Engineer shall determine the depth of removal necessary.
 - b. The granular material shall be compacted to provide adequate support for the pipe.
 - 6. The excavation for pipes that are placed in embankment fill shall not

be made until the embankment has been completed to a height above the top of the pipe as shown on the Construction Plans.

3.03 BEDDING FOR PIPE

- A. Bedding for solid pipe
 - 1. Shall conform to Trenching, Backfilling and Compaction for Utilities under Section 02310 and the Plan Sheets.
 - 2. Prepare excavated trenches by removing all large rocks and create a smooth bottom floor.
- A. Unless otherwise ordered, bedding material shall be carefully placed under the pipe and to a depth of at least 6 inches over the top of the pipe.
- B. Bedding material shall be thoroughly compacted around the pipe with the proper tools and equipment, so as to provide firm and uniform support over the full length of all pipes, valves and fittings.
- C. Placement:
 - 1. Bedding shall be placed in more than one lift.
 - 2. The first lift is to provide at least 6-inch thickness under any portion of the pipe and shall be placed before the pipe is installed. The first lift shall be spread smoothly so that the pipe is uniformly supported along the barrel.
 - 1. Subsequent lifts of not more than 6-inch thickness shall be installed to 6 inches over the crown of the pipe and individually compacted to 95% of maximum dry density.
 - 2. Bell holes shall be dug to assure uniform support along the pipe barrel.
 - 3. No blocking of any kind shall be used to adjust the pipe to grade.
- D. Where unauthorized excavation has been made below the established grade, the Contractor shall place and compact suitable bedding material to the proper grade elevation at his own expense.

3.04 PIPE LAYING

- A. During the progress of the Work, Contractor shall have instruments such as a transit and level for transferring grades from offset hubs or for setting of batter boards or other construction guides from the control points and bench marks provided by the Contractor. Contractor shall employ a person qualified to use such instruments and who is responsible for placing and maintaining the instruments.
- B. If the method of transferring grades from the offset hubs to the pipe requires batter-boards, they shall be at least 1" x 6" supported on 2" x 4" stakes or approved metal rods and shall be placed every 25 feet. At least three boards must be in place at any given time to facilitate checking of line and grade. Both line and grade shall be checked for each piece of pipe laid, expect at tunnels where methods acceptable to Engineer shall be used to carry forward line and grade.

- C. Pipe laying shall begin at the lowest point of the trench and proceed upgraded. 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.
 - 1. The lower segment of the pipe shall be in contact with the bedding throughout its full length.
 - 2. Outside circumferential laps of flexible pipes shall be placed facing upgrade.
- D. The alignment of the installed pipe shall appear straight to visual observations 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.
- E. 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 free from roughness or irregularity.
- F. 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 pipe or fittings.
- G. All pipes shall be laid in accordance with the respective manufacturer's recommendations and these specifications.
- H. Pipe shall not be laid when the bottom of the ditch or the sides to one foot above the pipe are frozen. Backfill containing frozen material shall not be placed, nor shall the trench be left open during freezing weather so that temperature of the material near the pipe goes below freezing.
- I. Elliptical and elliptically reinforced pipes shall be placed with the manufacturer's top of pipe mark within five degrees of a vertical plane through the longitudinal axis of the pipe.
- 3.05 JOINING PIPE
 - A. Metal pipe shall be firmly joined by form fitting bands conforming to the requirements of ASTM A 760 for steel pipe and AASHTO M 196 for aluminum pipe.
 - B. Polyethylene Pipe shall be joined by polyethylene pipe couplings to match corrugations. Width of pipe couplings shall be at least one half the pipe diameter. Connect pipe couplers to pipe with coupling bands with cut washers placed between the nut and the angle bracket or use nuts with integral washers.

3.06 BACKFILLING PIPE TRENCH

- A. Conform to Section 02300, Earthwork and Grading and Section 02310, Trenching, Backfilling and Compaction for Utilities and this Section.
- B. Pipes shall be inspected before any backfill is placed; any pipe found to be out of alignment, unduly settled, or damaged shall be removed and re-laid or replaced at the Contractor's expense.
- C. When the top of the pipe is even with or below the top of the trench, the backfill shall be compacted in layers not exceeding 6 inches on both sides of the pipe and shall be brought up 6 inches above the top of the pipe, unless

the Drawings show additional depth. The requirement for the most fill above the pipe shall override.

- 1. Care shall be exercised to thoroughly compact the backfill material under the haunches of the pipe.
- 2. Material shall be brought up evenly on both sides of the pipe.
- D. When the top of the pipe is above the top of the trench, the backfill shall be compacted in layers not exceeding 6 inches and shall be brought up evenly on both sides of the pipe to 12 inches above the top of the pipe.
 - 1. The width of backfill on each side of the pipe for the portion above the top of the trench shall be equal to twice the pipe's diameter or 12 feet, whichever is less.
- E. Compaction: Backfill shall be compacted in accordance with Section 02300, Earthwork and Grading and Section 02310, Trenching, Backfilling and Compaction for Utilities.

SECTION 02718 SIGN ASSEMBLY

- PART 1 GENERAL
- 1.01 DESCRIPTION
 - A. The work under this Section includes providing all labor, materials, tools, and equipment necessary for removing and installing sign assemblies as shown on the Drawings

1.02 REFERENCES

- A. Alaska Department of Transportation and Public Facilities Standard Specification for Highway Construction, latest edition.
- B. Alaska Traffic Manual.
- C. Alaska Sign Design Specifications.
- D. Manual of Uniform Traffic Control Devices, latest edition.

1.03 PERFORMANCE REQUIREMENTS

- A. Paint Adhesion: Adhere to road surface forming smooth continuous film one minute after application.
- B. Paint Drying: Tack free by touch so as not to require coning or other traffic control devices to prevent transfer by vehicle tires within two minutes after application.

1.04 SUBMITTALS

- A. Section 01330 Submittal Procedures: Requirements for submittals.
- B. Product Data: The Contractor shall submit for approval manufacturer's specifications, drawings, and recommendations for materials incorporated into the project. It shall include manufacturer's published data, engineering data, letter of certification or certified test laboratory report indicating that the material complies with specified standards and other requirements. Shop drawings shall be submitted for all fabricated work. Items shall include, but not limited to:
 - 1. Dimensions of all horizontal and vertical characters and spacing
 - 2. Overall dimensions
 - 3. Sign material and sheeting material type
 - 4. Panel thickness
 - 5. Legend letter series

1.05 QUALITY ASSURANCE

A. Details not shown on the Alaska Sign Design Specifications and Alaska Traffic Manual shall be approved in writing by the Engineer 30 days prior to installation.

1.06 WARRANTY

- A. Section 01700 Execution Requirements: Requirements for warranties.
- B. Furnish one-year manufacturer's warranty for signs and sign surfaces against discoloration, wearing, peeling and similar defects.

PART 2 PRODUCTS

- 2.01 GENERAL
 - A. All material shall conform to the requirements of Drawings and all associated references.
 - B Refer to State of Alaska Department of Transportation and Public Facilities Standard Specifications for Highway Construction and State of Alaska Department of Transportation and Public Facilities Sign Design Specifications.

2.02 SIGN MATERIALS

- A. Sheet aluminum.
 - 1. Use alloy 6061-T6, 5052-H36, 5052-H38, or recycled aluminum meeting alloy 3105, as specified in ASTM B 209. Meet the thickness of aluminum sheet designated on the Plans. Verify alloy and temper designations by mill certification.

Minimum thickness:

- a.) 0.375 inches for signs 18-inches or less in width.
- b.) 0.5 inches for signs greater than 18-inches in width.
- 2. Treat the aluminum base metal sheets with chromate conversion coating for aluminum to meet ASTM B 449, Class 2. Handle the cleaned and coated base metal only by a mechanical device or by operators wearing clean cotton or rubber gloves. After cleaning and coating operations, protect the panels at all times from contact or exposure to greases, oils, dust or other contaminants.
- B. Reflective Sheeting
 - 1. Meet AASHTO M 268.
- C. Letters, Numerals, Arrows, Symbols, Border
 - 1. Letters, numerals, arrows, symbols, border, and other features of the sign messages shall be of the type, size, and series as specified by the Alaska Traffic Manual or the Alaska Sign Design Specifications.
 - 2. Completed letters, numerals, and other units shall be formed to provide continuous stroke width with smooth edges and shall present a flat surface free of warp, blisters, wrinkles, burrs, and splinters.
 - 3. Fabricate the legend on signs using one of the following processes. For signs fabricated using the two screened processes, apply a clear coat over the entire face of each sign using a manufacturer recommended product.

- A. For signs with a black legend, apply opaque black ink to form the legend on the reflective sheeting using the silk screened process.
- B. For signs with a white legend on a colored background, apply transparent ink to all areas of the white reflective sheeting, except the legend, to form the background using the reverse silk screened process.
- C. Apply electronically cut colored films that include adhesive to the reflective sheeting, similar to 1 and 2.
- D. Cut the legends from the requisite color of type IX reflective sheetings and apply them to the reflective sheeting. Orient all elements of the legend in the same direction on the reflective sheeting before cutting them out.
- D. Other Components
 - 1. Concrete. Cast in place with a minimum 3000 psi 28-day compressive strength and in accordance with Section 03300 Cast in Place Concrete.
 - 2. Perforated Steel Posts. Conform to ASTM A-653. Provide tubes fabricated from 0.105 inch thick (12 U.S. Standard Gauge) sheet steel zinc coated on both sides to minimum coating thickness designation G-90. Furnish tubes formed with square cross sections and sheet steels rolled from structural grade steel with 50 ksi yield strength

PART 3 EXECUTION

- 3.01 GENERAL
 - A. Sign assemblies shall be installed at locations shown on the Drawings. The exact sign location will be field marked by the Contractor and approved by the Engineer. The Contractor shall notify the Engineer a minimum of seven days prior to installation of the sign assemblies. The Engineer will not approve the sign assemblies until the street and sidewalk pavement has been placed, and the sideslopes are within four inches of final grade.
 - B. All sign post foundations shall be cast in excavated holes. Depth of embedment shall be as shown on the Standard Details unless otherwise directed by the Engineer.
 - C. All sign assemblies to remain that are damaged by the Contractor shall be reconstructed to per the Drawings.

SECTION 02763

PAINTED PAVEMENT MARKINGS

PART 1 GENERAL

- 1.01 DESCRIPTION
 - A. The work under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and placing painted traffic markings as shown on the Drawings.
 - B. Related Sections:
 - 1. Section 03300 Cast In Place Concrete

1.02 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO M248, type F Standard Specification for Paint Markings
- B. Manual of Uniform Traffic Control Devices, latest edition.
- C. Alaska Department of Transportation and Public Facilities Standard Specification for Highway Construction, latest edition.
- 1.03 PERFORMANCE REQUIREMENTS
 - A. Paint Adhesion: Adhere to road surface forming smooth continuous film one minute after application.
 - B. Paint Drying: Tack free by touch so as not to require coning or other traffic control devices to prevent transfer by vehicle tires within two minutes after application.

1.04 SUBMITTALS

- A. Section 01330 Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit paint formulation for each type of paint.
- C. Test Reports: Submit source and acceptance test results in accordance with AASHTO M248.
- D. Manufacturer's Installation Instructions: Submit instructions for application temperatures, eradication requirements, application rate, line thickness, type of glass beads, bead embedment and bead application rate, and any other data on proper installation.
- E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Details not shown on the Drawings shall be in conformity with the latest edition of the Manual of Uniform Traffic Control Devices (MUTCD) and the Alaska Traffic

Manual Supplement published by the Alaska Department of Transportation and Public Facilities.

B. This work shall also include re-striping all paint markings to their original conditions, if damaged by the contractors operations.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years experience.
- B. Applicator: Company specializing in performing work of this section with minimum three years experience.
- 1.07 DELIVERY, STORAGE, AND HANDLING
 - A. Section 01600 Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- 1.08 ENVIRONMENTAL REQUIREMENTS
 - A. Section 01600 Product Requirements: Environmental conditions affecting products on site.
 - B. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.
 - C. Do not apply exterior coatings during rain or snow when relative humidity is outside humidity ranges, or moisture content of surfaces exceed those required by paint product manufacturer.
 - D. Do not apply paint when temperatures are expected to fall below 60 degrees F for 24 hours after application, unless the product supplier confirms a lower temperature for application.
 - E. Volatile Organic Content (VOC). Do not exceed State or Environmental Protection Agency maximum VOC on traffic paint.

1.09 WARRANTY

- A. Section 01700 Execution Requirements: Requirements for warranties.
- B. Furnish one-year manufacturer's warranty for paint markings.
- PART 2 PRODUCTS
- 2.01 PAINTED PAVEMENT MARKINGS
 - A. Paint markings shall conform to AASHTO M 248, Type F or FSS TT-PD(1) paint, latex acrylic emulsion for exterior use.
 - B. Blue paint pavement markings shall conform to Federal Roadway Standards for accessible access.
- 2.02 EQUIPMENT

- A. Other Equipment:
 - 1. For application of crosswalks, intersections, stop lines, legends and other miscellaneous items by walk behind stripers, hand spray or stencil trucks, apply with equipment meeting requirements of this section. Do not use hand brushes or rollers. Optionally apply glass beads by hand.

PART 3 EXECUTION

3.01 GENERAL

- A. Gaps not marked as a result of template use for spray-applied auxiliary markings shall be filled with marking material after template removal.
- B. Pavement markings shall be free of uneven edges, overspray, or other readily visible defects which detract from the appearance or function of the pavement markings.
- C. Lines shall be sharp, well defined, and uniformly retro-reflective. The width of the applied shall be the width specified plus or minus ¹/₄-inch. Fuzzy lines, excessive overspray, or non-uniform applications are unacceptable.

3.02 PREPARATION

- A. The Contractor shall clean all visible loose or foreign material from the surface to be marked. The pavement marking equipment shall be equipped with an air jet to remove all debris from the pavement in advance of the applicator gun. The air jet shall operate when marking material is being applied and be synchronized with marking material application.
- B. Pavement markings shall be applied only when the surface is clean and dry. The Contractor shall power broom clean all surfaces where edge lines are to be applied. When required by the Engineer, other surfaces shall also be power broom cleaned.
- C. Markings shall not be applied to Portland cement concrete until the concrete in the areas to be marked is clean of membrane curing material and is dry.

3.03 APPLICATION

- A. Agitate paint for 5-15 minutes prior to application to ensure even distribution of paint pigment.
- B. Dispense paint at ambient conditions to wet-film thickness of 20 mils.
- C. Apply markings to indicated dimensions at indicated locations.

- D. Prevent splattering and over spray when applying markings.
- E. Paint handicap wheel chair symbol within the parking stalls designated as ADA accessible. Locate painted symbols according to the Plans.
- F. Unless material is track free at end of paint application convoy, use traffic cones to protect markings from traffic until track free. When vehicle crosses a marking and tracks it or when splattering or over spray occurs, eradicate affected marking and resultant tracking, and apply new markings.
- 3.04 APPLICATION TOLERANCES
 - A. Section 01400 Quality Requirements: Tolerances.
 - B. Maximum Variation from Wet Film Thickness: two mil.
 - C. Maximum Variation from Wet Paint Line Width: Plus or minus 1/2 inch.
 - D. Maximum Variation from Specified Application Temperature: Plus or minus 5 degrees F.
- 3.05 FIELD QUALITY CONTROL
 - A. Section 01400 Quality: Field inspecting, testing, adjusting, and balancing.
 - B. Inspect for incorrect location, insufficient thickness, line width, coverage, retention, uncured or discolored material, and insufficient bonding.
 - C. Repair lines and markings, which after application and curing do not meet following criteria:
 - 1. Incorrect Location: Remove and replace incorrectly placed patterns.
 - 2. Insufficient Thickness, Line Width, Paint Coverage, or Retention: Prepare defective material by acceptably grinding or blast cleaning to remove substantial amount of beads and to roughen marking surface. Remove loose particles and debris. Apply new markings on cleaned surface in accordance with this Section.
 - 3. Uncured or Discolored Material, Insufficient Bonding: Remove defective markings in accordance with this Section and clean pavement surface one foot beyond affected area. Apply new markings on cleaned surface in accordance with this Section.
 - D. Replace defective pavement markings as specified throughout one year warranted period. Replace markings damaged by anti-skid materials, studded tires, tire chains, chemical deicers, and snow plowing or other loss of marking material regardless of cause. When markings are damaged by pavement failure or by Owner's painting, crack sealing, or pavement repair operations, Contractor is released from warranty requirements for damaged work.
 - E. Replace failed or defective markings in entire section of defective markings within 30 days after notification when any of the following exists during warranty period:

- 1. Marking is discolored or exhibits pigment loss, and is determined to be unacceptable by three-member team based on visual comparison with beaded color plates.
- 2. More than 15 percent of area of continuous line, or more than 15 percent of combined area of skip lines, within any 10-foot section of roadway is missing.
- F. Replace pavement-marking material under warranty using original or better type material. Continue warranty to end of original one year period even when replacement materials have been installed as specified.
- G. When eradication of existing paint lines is necessary, eradicate by shot blast or water blast method. Do not gouge or groove pavement more than 1/16 inch during removal. Limit area of removal to area of marking plus 1 inch on all sides. Prevent damage to transverse and longitudinal joint sealers, and repair any damage according to requirements in Section 02740.
- H. Maintain daily log showing work completed that day, results of above inspections or tests, pavement and air temperatures, relative humidity, presence of any moisture on pavement, and any material or equipment problems. Make legible entries in log in ink, sign and submit by end of each workday. Enter environmental data into log prior to starting work each day and at two additional times during day.
- 3.06 PROTECTION OF FINISHED WORK
 - A. Section 01700 Execution Requirements: Requirements for protecting finished Work.
 - B. Protect painted pavement markings from vehicular and pedestrian traffic until paint is dry and track free. Follow manufacturer's recommendations or use minimum of 30 minutes. Consider barrier cones as satisfactory protection for materials requiring more than 2 minutes dry time.

- SECTION 03300 CAST IN PLACE CONCRETE
- PART 1 GENERAL
- 1.01 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.

1.02 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".
- 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:
 - 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.
 - Concrete temperature: Test hourly when ambient air temperature is 40^oF and below, and each time a set of compression test specimens are made.
 - Compression test specimen ASTM C-31: One set of three standard cylinders for each compressive strength test. Field cure.
 - 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.
1.03 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. 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.

1.04 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.

1.05 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

2.01 GENERAL CONCRETE 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:
- B. Hem-Fir number two grade, seasoned.

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.
- 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.

- 2.02 INSULATED CONCRETE FORMS (ICF)
 - A. General
 - 1. Use insulated concrete forms for all foundation walls as indicated on the drawings.
 - 2. Provide new, insulated concrete form units by 'AMVIC', or approved equal:
 - 3. Nominal Size: 48"x16"X11" with 6" core.
 - 4. Furnish Straight reversible blocks, 90 degree corner reversible blocs, 45 corner reversible blocks, taper top blocks and brick ledge blocks as required.
 - B. Material:
 - 1. Expanded Polystyrene
 - a. Testing in accordance with ASTM C578-95.
 - b. Density per ASTM C1622-98: 1.5 lbs/cubic foot.
 - c. Thermal Resistance per ASTM C177-97:4.0 degF-ft2.h/BTU.
 - d. Compressive strength per ASTM D1621-94: 19.8 PSI.
 - e. Flexural Strength per ASTM C2-3-99: 42.57 psi.
 - f. Water Vapor Permeance per ASTM E96-94: 130.1 ng/Pa.s.s2.
 - g. Water Absorption per ASTM C272-91: 2.95% max.
 - h. Dimensional Stability: per ASTM D2126-94: 0.52% max.
 - i. Limiting Oxygen Index per ASTM D2863-97: 37% min.
 - j. Trueness and squareness per ASTM C550-95:
 - i. Edge trueness: 0.0197 in/ft.
 - ii. Face trueness: 0.0197 in/ft.
 - iii. Length and width squareness: 0.0295 in/ft.

2. Plastic Ties

a. Testing per ICBO ES AC116.

b. Fastener withdrawal per ASTM D1761-99: 39.61 lbs with safety factor of 5.

c. Fastener shear strength per ASTM D1761-99: 60.22 lbs with safety factor of 3.2.

d. Tensile Strength per ASTM D638-99: 810lbs at ambient temperature.

3. Fire Testing: Room fire test per UBC 1997 26-3: Pass/Comply.

4. Other Testing

- a. Flammability per ASTM E84.
 - i. Flame Spread: 25 or less.
 - ii. Smoke developed: 450 or less
- b. Fire Burning Characteristics of Plastic Ties.
 - i. Ignition temperature per ASTM D1929-68 752 (F) max.
 - ii. Burn Rate oer ASTM D635-98 20.2 mm/min. max.
 - iii. Smoke density per ASTM D2843-93 25.8% max.

2.03 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.

2.04 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:

Concrete Without			Concrete With			
Location S		<u>Super</u>	plasticizer	Superplasticizer		
a.	Slab on Grade		3 inches	6 to 9 inches		
b.	Footings, Walls, and Beams	Slabs	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, nonfrost 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	Percent by weight passing Laboratory Sieve							
(AASHTO Gradation)	having square openings in inches							
	:	2	1-1/2	1	3⁄4	1/2	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. 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.

- 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. Curing Compound:

MASTERBUILDERS MB 429. Verify compatibility with flooring adhesives.

- 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. 'Forte Fibre' synthetic fiber. Add to mix at rates recommended by fiber manufacturer.

PART 3 EXECUTION

3.01 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:

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.

3.02 NOTICE

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

3.03 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.

3.04 PLACING REINFORCEMENT

A. General:

Comply with specified codes and standards and CRSI recommended placing practices for details and methods of placing reinforcement and supports.

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.
 - 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.

3.05 JOINTS

A. Construction Joints:

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.

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 preformed contraction control joints in slabs to form panels of patterns as shown on the drawings.

- D. Expansion:
 - 1. Expansion joints:

Expansion joints shall be placed where shown on the Drawings. Expansion joint material shall conform to the requirements at ASTM Specification. 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.

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.

3.06 EMBEDDED ITEMS

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.

3.07 PREPARATION OF FORMS

Coat the contact surfaces of forms to be removed 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.

Coat steel forms with a non-staining, rust preventative form oil or otherwise protect against rusting. Rust stained steel formwork will not be acceptable and will be rejected.

3.08 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:

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 three (3) feet, elephant trunks shall be used.

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°F., uniformly heat water and aggregates prior to mixing to maintain mixture temperature not less than 50°F. and not more than 80°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 antifreeze agents or chemical accelerators unless specifically permitted by the Contracting Agency for the particular situation encountered.

3.09 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.

3.10 SLAB FINISHES

A. Scratch Finish:

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.

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:

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. 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:

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.

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:

Apply broom finish to exterior and interior platforms, steps, stoops, walks, and ramps, and elsewhere as shown or scheduled.

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:

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.

- 1. Apply uniformly, using a garden-type sprayer, industrial sprayer or roller.
- 2. Do not add a thinner.
- 3. When using a short-nap roller, if the rolling action starts to create tiny bubbles on the surface, slow down the rolling motion.

- 4. Do not overlap; avoid thick applications.
- 5. Do not "pull" the material when applying.
- 6. 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.

3.11 CURING & PROTECTION

A. General:

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.

- 1. 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.
- 2. Begin final curing procedures immediately following initial curing and before concrete has dried.
- 3. Continue curing for a minimum of 10 days after initial placement unless otherwise permitted in writing by Contracting Agency.
- 4. Avoid rapid drying at end of curing period.
- 5. Maintain concrete surface temperature at least 50^oF. 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:

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:

Cure formed surfaces such as slabs, floor topping and other similar flat surfaces by application of the approved curing method.

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.

3.12 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^oF. 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.

3.13 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 <u>will not</u> 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.

3.14 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:

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

D. Low Areas:

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:

Repair methods not specified may be used, subject to the approval of the Contracting Agency.

3.15 TANK LINING

- A. Clean surface prior to application to remove all dirt, grease, dust and other deleterious material.
- B. Apply to dry surface.
- C. Apply per coating manufacturers recommendations.

END OF SECTION

- SECTION 05100 STRUCTURAL STEEL FRAMING
- PART 1 GENERAL
- 1.01 DESCRIPTION
 - A. Work Included:

Structural metal framing for this Work is indicated in the Drawings and includes but is not necessarily limited to:

- 1. Beams
- 2. Bases
- 3. Structural Steel Accessories
- 4. Columns
- B. Related Work Described Elsewhere:
 - 1. Rough Carpentry: Section 06100
 - 2. Glued Laminated Structural Units: Section 06180

1.02 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.
 - 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:In addition to complying with all pertinent codes and regulations, comply with:

- 1. "Specifications for the Design Fabrication and Erection of Structural Steel for Buildings" of the American Institute of Steel Construction.
- 2. "Code for Welding in Building Construction" of the American Welding Society.

1.03 SUBMITTALS

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

1.04 PRODUCT HANDLING

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.

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

2.01 STRUCTURAL STEEL

- A. Shapes and Plates:Provide steel plates and shapes conforming to ASTM A-36, (Fy) = 36ksi.
- B. Hollow Structural Sections:
 Provide rectangular, square and round steel tubing complying with ASTM A-500, Grade B with yield strength (Fy) = 46 ksi.
- C. Structural Pipe

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

2.02 BOLTS AND NUTS

A. Machine and Anchor Bolts: Comply with ASTM A-307.

2.03 SHEAR STUDS

A. Welded carbon steel 'Nelson Shear Connector Studs" or approved equal.

2.04 PRIMER PAINT

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.

2.05 OTHER MATERIALS

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

3.01 FABRICATION

A. General:

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.

3.02 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.

3.03 EXISTING STRUCTURAL STEEL AND

3.04 JOB CONDITIONS

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.

3.05 ERECTION

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

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

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

SECTION 06010 LUMBER

PART 1 GENERAL

1.01 DESCRIPTION

A. Work Included:

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 06100
2.	Glu-Laminated Beams	Section 06180
3.	Fabricated Wood Trusses	Section 06192
4.	Engineered Wood	Section 06192

1.02 QUALITY ASSURANCE

In addition to complying with applicable codes and regulations, comply with the following standards:

- A. Lumber Grading Rules and Wood Species to be in conformance with ANSI/AF&PA NDS-1997.
- B. Grading rules of the following associations apply to materials furnished under this Section:
 - 1. West Coast Lumber Inspection Bureau (WCLB).
 - 2. American Plywood Association (APA).
- C. Grade marks of the above association shall appear on all wood products furnished under this section.
- D. 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)
- E. Referenced Standards:
 - 1. American Society for Testing and Materials (ASTM)
 - 2. American 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)

1.03 SUBMITTALS

Submit in accordance with Section 01340, the following:

A. Materials List:

A complete list of all the types of materials proposed to be furnished under this section.

PART 2 PRODUCTS

2.01 GRADE STAMPS

- Framing Lumber: Identify all framing lumber by the grade stamp of the West Coast Lumber Inspection Bureau.
- B. Plywood: Identify all plywood by the grade of the American Plywood Association.
- C. Other: Identify all other products by the grade stamp of the appropriate grading agency for that particular product.

2.02 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: 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:

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".

2.03 PLYWOOD

A. Rough Carpentry:

Provide interior type with exterior glue of the grade and type indicated on the Drawings.

- B. Appearance: Where plywood will not be concealed by other work, provide A-B plugged grade with 'A' side showing unless otherwise noted.
- 2.04 SOFFIT BOARDS
 - A. T-111 plywood, 5/8" thick. Class 303-18, 303-18 W Grade.

2.05 FASCIA BOARDS

A. Provide "Hardiplank" 1 x 4 and 1 x 8 fascia board and 7/16" hardipanel siding. James Hardie Building Products, 1-800-9-HARDIE

2.06 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
З.	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

3.01 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.
- C. Damaged Material: Segregate all damaged material to ensure against its incorporation into the Work, until all necessary repairs, where authorized, have been accomplished.

D. Stockpiling:

Stockpile all materials sufficiently in advance to ensure their availability in a timely manner for the work of all related sections.

E. Compliance:

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

- SECTION 06100 ROUGH CARPENTRY
- PART 1 GENERAL
- 1.01 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 Work Specified Elsewhere:

1.	Lumber:	Section 06010
2.	Glue Laminated beams	Section 06180
З.	Fabricated wood trusses	Section 06192
4.	Engineered Wood	Section 06196
5.	Finish carpentry:	Section 06200

1.02 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.

1.03 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
- 2.01 MATERIALS
 - A. Lumber: Refer to Section 06010 "Lumber".
 - B. Metal connector plates, fasteners and anchorages.
 - 1. Connector plate material:

Metal Complying with following requirements, unless otherwise indicated; not less than "0.036" thick, coated thickness at the Contractors option.

- a. Galvanized sheet steel: ANSI/ASTM A 446, Grade A, Coating G60.
- Electrolytic zinc coated steel sheet: ANSI/ASTM A 591, Coating Class C, with minimum structural quality equivalent to ANSI/ASTM A 446, Grade A.
- c. 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.
- PART 3 EXECUTION
- 3.01 PREPARATION

Verify plan layout with approved shop drawings, coordinate with blocking and nailer requirements for various sections of the Work. Promptly notify Architect of discrepancies and do not proceed in questioned areas until fully resolved.

3.02 INSTALLATION

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:

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.

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:

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:

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.

3.03 CLEAN UP

Remove all work related debris and at completion leave work broom clean.

SECTION 06180 GLUE LAMINATED BEAMS

- PART 1 GENERAL
- 1.01 DESCRIPTION OF WORK
 - A. Work included:

The glued laminated structural units (Glulam) required for this Work are indicated on the drawings, and include, but are not necessarily limited to:

- 1. Straight-grained beams including headers, girders and purlins.
- B. Definition:

Glued laminated timber 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 06010
 - 2. Rough carpentry: Section 06100
 - 3. Fabricated wood trusses: Section 06192

1.02 QUALITY ASSURANCE

A. Supervision:

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:

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:

Except as otherwise indicated, comply with PS 56 "Structural Glued Laminated Timber".

- 1. Provide factory-glued structural units, produced by an AITC-licensed firm, qualified to apply the AITC "Quality Inspected" mark.
- 2. 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.

1.03 SUBMITTALS

A. Product data:

Submit manufacturer's data, specifications and installation instructions covering lumber, adhesives, fabrication process, preservative treatment, accessories and protection.

Submit certification, signed by an officer of the manufacturing firm, indicating glued laminated timbers comply with requirements of PS 56.

1.04 DELIVERY, STORAGE, HANDLING

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 weathertight 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.

Time delivery and installation of GLULAM work to avoid extended on-site storage, and to avoid delaying work of other trades whose work must follow erection of GLULAM work.

PART 2 PRODUCTS

2.01 GLUED LAMINATED STRUCTURAL UNITS

A. Lumber:

Comply with PS 56 and applicable lumber association standards cited therein for grades required to achieve GLULAM requirements for allowable stress, appearance, fabrication limitations and species (if any).

B. Stress values:

Provide glued laminated timber members sized as shown on drawings that meet or exceed following stress values:

- 1. Bending (Fc), 2400 psi.
- 2. Horizontal shear (Fv), 165 psi.
- 3. Compression perpendicular to grain (Fc tension face), 650 psi.
- 4. Compression perpendicular to grain (Fc compression face), 650 psi.
- 5. Modulus of Elasticity (E), 1,800,000 psi.
- C. Lumber species:

Douglas Fir.

D. Adhesive:

Comply with PS 56, using wet-use waterproof) adhesive, unless otherwise indicated.

E. End sealer:

Manufacturer's standard transparent, colorless wood sealer, effective in retarding transmission of moisture at cross- grain cuts.

F. Penetrating sealer:

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:

Provide fabricated steel (ANSI/ASTM A 36) shapes, plates and bars, welded into assemblies of types and sizes indicated or, if not indicated, manufacturer's standard units for timber sizes indicated, with steel bolts (ANSI/ASTM A 307), lag bolts (FS FF-B-561), nails (FS FF-N-105), and other standard fasteners as required.

1. Finish:

Except as otherwise indicated, finish fabricated assemblies with rust-inhibitive primer.

2. Wet-Use finish:

Where "Wet Use" GLULAM work is indicated, finish fabricated assemblies with hot-dip zinc coating (ANSI/ASTM A 153), including bolts and other fasteners.

2.02 FABRICATION

A. General:

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. Grade:

Provide Industrial Grade timbers, complying with AITC 110 for all concealed columns and beams, as indicated on the Drawings.

C. Camber:

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:

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:

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.

2.03 FACTORY APPLIED PROTECTION

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.

A. 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

3.01 INSTALLATION

A. General:

Comply with AITC 108 "Standard for Heavy Timber Construction" and manufacturer's instructions.

Install miscellaneous steel connectors, anchors, and accessories as indicated.

B. Cutting:

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".

Where treated members must be cut during erection, apply a heavy brush coat of the same treatment, complying with AWPA Standard M4.

C. Wrapping:

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:

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.

3.02 PROTECTION

Provide necessary heating, ventilating and air conditioning in storage area and in building, in order to avoid damage or deterioration of GLULAM work.

SECTION 06192 FABRICATED WOOD TRUSSES

- PART 1 GENERAL
- 1.01 DESCRIPTION OF WORK
 - A. Definition:

Fabricated wood trusses include but are not necessarily limited to planar structural units consisting of metal plate connected members which are fabricated from dimension lumber. All which have been cut and assembled prior to delivery to the job site. Types of fabricated wood trusses include:

- 1. Top chord and bottom chord, edge bearing, wood trusses per drawings.
- B. Related work described elsewhere:
 - 1. Lumber: Section 06010
 - 2. Rough Carpentry: Section 06100

1.02 QUALITY ASSURANCE

A. Truss design standard:

Design of all trusses shall meet the dimensions and loads indicated on the plans. All designs shall be in accordance with standard engineering practice and the Design Specification for Metal Plate Corrected Wood Trusses published by the Truss Plate Institute (TPI). Complete design calculations showing member forces and stresses and allowable load shall be furnished for each truss design. The design and fabrication of the trusses shall be under the supervision of a professional engineer, registered to practice in the State of Alaska.

B. Wood structural design standard:

ANSI/AF&PA NDS-1997.

C. 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 mark, unless otherwise indicated. (Remove mark during fabrication if necessary.)

D. Truss fabrication standard:

Quality Control Manual published by TPI. Trusses shall be manufactured in a plant approved by the local building official.

E. Fabricator's qualifications:

Minimum of 3 years experience in successful fabrication of trusses comparable to type indicated for this project.

1.03 SUBMITTALS

A. Product data:

Submit fabricator's specifications and installation instructions for required work, covering lumber, metal plates, hardware, fabrication process, treatment (if any), handling and erection.

Submit certification, signed by an officer of fabricating firm, indicating that trusses to be supplied for project comply with indicated requirements.

B. Shop drawings:

Submit shop drawings showing species, sizes and stress grades of lumber to be used; pitch, span, camber configuration and spacing for each type of truss required; type, size, material, finish, design value, and location of metal connector plates; and bearing and anchorage details.

To the extent engineering design considerations are indicated as fabricator's responsibility, submit design analysis and test reports indicating loading, section modulus, assumed allowable stress, stress diagrams and calculations, and similar information needed for analysis and to ensure that trusses comply with requirements.

Provide shop drawings which have been signed and stamped by an engineer licensed to practice in the State of Alaska.

1.04 DELIVERY, STORAGE, HANDLING

Handle and store trusses with care, and in accordance with manufacturer's instructions and TPI recommendations to avoid damage from bending, overturning or other cause for which truss is not designed to resist or endure.

Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying work of other trades whose work must follow erection of trusses.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Lumber:
 - 1. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for dressed lumber, S4S, unless otherwise indicated.
 - 2. Provide seasoned lumber with 19% maximum moisture content at time of dressing.
 - Lumber grade:
 For species used, comply with WWPA No. 1 stress-rated grade.
- B. Metal connector plates, fasteners and anchorages:
 - Connector plate material: Metal complying with following requirements, unless otherwise indicated; not less than "0.036" thick, coated thickness at the Contractors option.
 - a. Galvanized sheet steel: ANSI/ASTM A 446, Grade A, Coating G60.
 - Electrolytic zinc coated steel sheet:
 ANSI/ASTM A 591, Coating Class C, with minimum structural quality equivalent to ANSI/ASTM A 446, Grade A.
 - c. Stainless steel: ANSI/ASTM A 167, Type 304, with minimum structural quality equivalent to ANSI/ASTM A 446, Grade A.
- C. Fasteners and anchorage:

Provide size, type, material and finish indicated, complying applicable Federal Specifications for nails, screws, bolts, nuts and washers and anchoring devices.

2.02 FABRICATION

- A. Cut truss members to accurate lengths, angles and sizes to produce close fitting joints with proper wood-to-wood bearing in assembled units.
- B. Fabricate metal connector plates to proper size, configuration, thickness and anchorage details required for types of joint designs indicated.

- C. Connect truss members by means of metal connector plates accurately located and securely fastened to wood members by means indicated or approved.
- PART 3 EXECUTION
- 3.01 INSTALLATION
 - A. General: Erect and brace trusses to comply with recommendations of manufacturer and the Truss Plate Institute.
 - B. Erect trusses with plane of truss webs vertical (plumb) and parallel to each other, located accurately at design spacings indicated.
 - C. Hoist units in place by means of proper lifting equipment suited to sizes and types of trusses required, applied at proper lift points as recommended by fabricator, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
 - D. Provide temporary bracing as required to maintain trusses plumb, parallel and in proper location, until permanent bracing is installed.
 - E. Anchor trusses securely at all bearing points to comply with methods and details indicated.
 - F. Install permanent bracing and related components to enable trusses to maintain design spacing, withstand live and dead loads including lateral loads, and to comply with other indicated requirements.
 - G. <u>Do not cut remove, or otherwise alter truss or truss members.</u>

SECTION 06196

MANUFACTURED WOOD JOISTS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. Definition: Faqbricated wood joists include planar structural units consisting of 'l' section members which are fabricated from dimension lumber or laminated veneer manufactured lumber flanges, with plywood or oriented strand board webs.
- 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.
- C. Related Work
 - 1. Section 06010 Lumber Sheathing.
 - 2. Section 06100 Rough Carpentry.
 - 3. Section 06180 Glue Laminated Beams.

1.02 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.

1.03 REGULATORY REQUIREMENTS

A. Conform to current edition of ICBO Uniform Building Code for loads, seismic zoning, and other governing criteria.

1.04 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.

1.05 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
- 2.01 MATERIALS
 - A. Lumber Species.- Douglas Fir-Larch.
 - B. Lumber Seasoning: Provide seasoned lumber with I5 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.

2.02 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.

2.03 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.

2.04 ACCESSORIES

- A. Fasteners: Galvanized steel, type to suit application.
- B. Stiffeners: As recommended by joist manufacturer.

2.05 ACCEPTABLE MANUFACTURERS

- A. Trus-Joist Inc.
- B. Boise Cascade Inc.
- C. Substitutions: Under provisions of Section 01600.

2.04 FABRICATION

A. Verify dimensions and site conditions prior to fabrication.

PART 3 EXECUTION

3.01 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.

3.02 PREPARATION

A. Coordinate placement of support items.

3.03 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 spacings 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.
- E. Frame openings between joists with lumber in accordance.
- G. Coordinate placement of decking with work of this Section.

3.04 TOLERANCES

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

SECTION 06200

FINISH CARPENTRY

PART 1 GENERAL

1.01 DESCRIPTION

- A. Work under this section includes furnishing and installing of all finish carpentry items such as loose trim and wood items for field assembly. All work as described and detailed on the drawings and specified herein.
- B. Refer to the following Sections for related work:
 - 1. Section 06100 Rough Carpentry
 - 2. Section 07620 Sheet Metal Flashing, Trim, and Gutters (when applicable)
 - 3. Section 08610 Plastic Window (when applicable)
 - 4. Section 08700 Door Hardware (when applicable)

1.02 QUALITY ASSURANCE

- A. Softwood Timber grades shall conform to WCLB grading rules.
- B. All Architectural Woodwork shall conform to "Custom Grade" as specified by AWI.
- C. Hardwood Timber shall conform to "Custom Grade" as specified by AWI.
- D. Plywood shall meet U.S. Product Standard PS-1 and be grade stamped by the American Plywood Association.
- E. All millwork shall be kiln dried to a moisture content not to exceed 8%.
- F. Keep all millwork and trim under cover and dry and fully protected.
- G. All interior millwork shall be belt or hand sanded.

1.03 SUBMITTALS

- A. Provide moisture certificates if and when requested. Protect finish millwork from excess moisture and damage.
- B. See Division 1 for shop drawing requirements.
- C. Provide moisture certificates for all cedar or redwood material delivered to site.
- D. Provide 12" long samples of millwork and trim with specified finish.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Plywood for mounting mechanical, electrical, and telephone equipment shall be 3/4" MDO B-B Group 2 EXT-APA, PSI-74 000 overlay both faces.
- B. Hardwood for interior edging, and window trim shall be "Custom Grade" birch.
- C. Nails for trim, door & window jambs and soffits shall be hot dipped galvanized, casing nails. Nailing shall be in an organized pattern.
- D. Hardwood plywood shall be 3/4" thickness interior with exterior glue with red oak veneer faces.
- E. Glue shall be water resistant casein or accepted equal.
- F. Trim head screws with non-corrosive phosphate finish as distributed by Sea-Port, 116 Y Street, Vancouver, Washington or equal, shall be used for attaching shelving, cabinets, wood trim, etc., to light gauge studs, metal door jambs, or other metal backing.
- G. Plastic Laminate:
 - 1. 0.050 in. General Purpose Grade and FR Grade in accordance with 'Regulatory Requirements' Article above; satin surface finish; manufactured by Formica, Nevamar, or Wilsonart; Color and pattern as selected. Provide vertical grade or horizontal grade at each applicable location, and aluminum edging & corners.
 - 2. Use poly vinyl acetate (PVA) or contact type adhesive, compatible per Wilsonart contact types.
 - 3. Provide 5/8 in. medium density fiber board (MDF) beneath plastic laminate wainscot to the extent shown on the drawings. Provide solid blocking at MDF and GWB interface between studs.
 - 4. Plastic Laminate Base: Provide Kuehn Flat Black 6 in. Apron beveled edge base. Distributor: Alaska Floor Wall. (907) 272-3030. Construction adhesive to apply substrate with trim head screws. Fill screw recesses with "COLORRITE" caulk to match p-lam.
- H. Plastic Laminate Backing: High pressure paper base laminate without a decorative finish; 0.020 inch thick, smooth surface finish.
- I. Birch hardwood Display boxes, per drawings.
 - 1. Recessed Standards: <u>Rakks</u>, Rangine Corporation, www.rakks.com
 - a. Model: SC-XX*, clear anodized
 - b. Description: "C" style wall standard
 - c. Application: Recess mounted
 - * length per drawings

- 2. Glass shelves Thickness: Tempered glass shelves per 08800 Glazing.
- 3. L-Brackets
 - a. Model: BL-XX
 - b. Description: L-Bracket Shelf Support
 - c. Application: Supports shelves 8 in. to 14 in. deep
 - d. Specification: Rated load is 150# per pair

2.02 HARDWARE

- A. Shelf Standards: 87 ANO except 211 ANO at shelf joints and where noted. manufactured by Knape and Vogt, Garcy, or equal.
- B. Shelf Brackets: 187 ANO, except 211 ANO at shelf joints and where noted, manufactured by Knape & Vogt, Garcy, or equal

2.03 FABRICATION

- A. Run trim and moldings true to profile detailed.
- B. All edges of finish pieces shall be slightly eased and sanded smooth.
- C. Nailing: Use galvanized or stainless steel finishing nails for millwork. Blind nail interior work insofar as possible. Set surface nails. Interior finish work shall be secured to studs, nailing blocks grounds, etc.
- D. Fill nail holes with one drop of Elmer's glue or equal and sand trim lightly to fill nail hole with sanding dust or color matched pre-manufactured nail putty or accepted equal method of filling holes of items to be stained and varnished.
- E. Nailing: Use galvanized nails for exterior work. Blind nail exterior work. Contracting Officer's acceptance required on nailing pattern where visible.

PART 3 EXECUTION

- 3.01 INSPECTION
 - A. Inspect all rough framing to assure blocking and nailers are properly installed before any finish or substrates are applied.
 - B. Coordinate with other trades to assure proper clearance and openings for equivalent.
 - C. Obtain Contracting Officer's acceptance of all millwork prior to painting or staining.

3.02 INSTALLATION

- A. General
 - 1. Fit and place all finish carpentry accurately and in a workmanlike manner. Gouges, dents, hammer marks, splits or other defects will not be permitted in the finish work.
- B. Screw and face plug wall caps, and chair rails.
- C. Interior Wood trim & Other Wood Item Installation.
 - 1. Fit accurately and neatly and installs with screw gun driven 6 ga. Phillips trim head screws. Recess screws and fill holes.
- D. Store oak trim inside of enclosed dry heated building for at least two weeks prior to installation. All moisture producing work shall be completed at least two weeks prior to oak installation. Countersink all nail heads by use of a steel set or use a nail for setting. At metal studs and hollow metal frames secured with trim head screws, countersink and fill.
- E. Use only materials recommended by the manufacturer for installation of window stools.
- 3.03 CLEANUP
 - A. Examine all work; repair or replace any damaged or split pieces.
 - B. Ease all edges and exposed ends of all pieces. Set all exposed nails and countersink all screws. Sand exposed work lightly to remove any rough spots, smooth skips.
 - C. Remove all work related debris.
 - D. Protect all exterior work from rain, spattered mud and from construction dirt until painted as scheduled.

SECTION 07110 SHEET MEMBRANE WATERPROOFING

PART 1 GENERAL

1.01 RELATED SECTIONS

- A. Section 03300 Cast in Place Concrete
- B. Section 07620 Sheet Metal Flashing, Trim, and Gutters

1.02 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this Specification. The Publications may be referred to in the text by basic designations only. In case of conflict the most stringent shall apply.
 - 1. ASTM D146 Methods of Sampling and Testing Bitumen-Saturated Felts and Fabrics Used in Roofing and Waterproofing.
 - 2. ASTM D412 Test Methods for Rubber Properties in Tension.
 - 3. ASTM E96 Test Methods for Water Vapor Transmission of Materials.
 - 4. ASTM E154 Methods of Testing Materials for Use as Vapor Barriers under Concrete Slabs and as Ground Cover in Crawlspaces.

1.03 DESCRIPTION

A. Waterproofing system to provide continuous protection against water intrusion for below-grade concrete walls and floors.

1.04 SUBMITTALS

- A. Product Data: Indicate performance data, materials, recommended use, application instructions, substrate surface preparation, joints, penetrations, terminations and special curing requirements.
- B. Manufacturer and Installer qualifications.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum of five years experience manufacturing and supplying specified products. Also provide list of at least ten project references where specified product was used, including project name, telephone contact, location, date, and product usage.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do not apply waterproofing at ambient temperatures or in conditions other than those recommended in writing by the manufacturer and in no case when temperatures are expected to be below 40 degrees F, in rain or snow, or with dirt, frost or water on surfaces to be coated.

1.07 WARRANTY

- A. Manufacturer to warrant materials are free from defects for a period of five years after Substantial Completion.
- B. Contractor to warrant installation, free from water leaks, for a period of one year after Substantial Completion.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

A. W.R. Grace, "Bituthene Low Temperature Waterproofing Membrane".

2.02 MEMBRANE WATERPROOFING

- A. Pre-manufactured, elastromeric, self-adhering sheet membrane waterproofing composed of high-strength polyethylene bonded to rubberized asphalt recommended by manufacturer for below grade application.
- B. Minimum Total Thickness: 0.060 inches (60 mil): 0.004 inch minimum thickness of high-strength polyethylene film, bonded 0.056 inch minimum thickness of rubberized asphalt.
- C. Water Permeance: 0.1 perm maximum per ASTM E96.
- D. Hydrostatic Head: To withstand 150 feet of water.
- E. Tensile Strength: 250 psi minimum per ASTM D412.
- F. Puncture Resistance: Forty pounds per ASTM E154.
- G. Pliability: 180 degree bend over 1 inch mandrel at 25 F per ASTM D146.

2.03 ACCESSORIES

A. Primers, adhesives, mastics, flashings, sealants, and other accessories necessary for a complete, water-tight application as recommended by membrane manufacturer.

2.04 PROTECTION BOARDS

A. Finish Floor to bottom of footings, protect with minimum 1" thickness of rigid insulation.

PART 3 – EXECUTION

3.01 INSPECTION OF SURFACES

- A. Examine surfaces to receive work for defects that will adversely affect the completed installation and for deviations beyond the allowable tolerances.
- B. Surfaces clean, dry, smooth, cured, and free from voids or projections that would damage or impair bond of membrane.
- C. Concrete to receive waterproofing shall be cured at fifty degrees to seventy degrees Fahrenheit for a minimum of seven days, per American Concrete Institute (ACI) 301, and dry before installation of waterproofing.
- D. Verify that mechanical and electrical penetrations are complete and ready for cover.
- E. Start of work means acceptance of the interfacing surfaces as capable of producing an acceptable job.

3.02 APPLICATION

- A. Complete and in accordance with the approved manufacturer's written recommendations for type of application proposed. Press out membrane with mechanical roller to minimize wrinkles and bubbles.
- B. Install to provide continuous, unbroken, waterproof envelope under floor, outside footings and up outside of walls.
- C. Seal substrate cracks and joints with membrane manufacture's recommended materials.

3.03 INSTALLATION

- A. Primer Application:
 - 1. Apply approved primer to clean sound concrete surfaces in accordance with manufacturer's recommendations.
 - 2. Allow primer to dry one house or until tack free.
 - 3. Prime only areas that will be covered with the membrane on the same day. Areas not covered within twenty-four hours shall be re-primed.
- B. Membrane Application:
 - 1. Apply continuously over cured concrete surfaces in accordance with manufacturer's recommendations. Lap joints to shed water.
 - 2. Apply membrane in double thickness at each control and construction joint, and lap six inches minimum.
 - 3. Vertical and horizontal terminations: press membrane firmly to concrete and apply a trowel bead of mastic to exposed edges.
 - 4. Lap edge and end seams three-inch minimum.

- 5. Adhere membrane with heavy pressure to concrete surfaces without stretching.
- 6. Slit and repair all fishmouths, with a patch lapped six inches in all directions. Seal with manufacturer approved adhesive.
- 7. Corners: apply a double thickness of membrane at all corners. Inside corners shall have a two-inch minimum fillet of mastic.
- 8. Apply a double layer of membrane projecting at least six inches around all floor drains and other floor, wall penetrations. Seal penetrations with mastic.
- 9. Completed work shall be smoothly and completely adhered to concrete surfaces.
- C. Protection Board Installation:
 - 1. Adhere to membrane with approved adhesive to completely cover and protect the membrane.
 - 2. Install immediately after membrane installation.
- 3.04 SHEET MEMBRANE WATERPROOFING SCHEDULE
 - A. Concrete building elements below ground around basements, stairs to basements and mechanical ventways including a minimum five foot lap along adjacent walls. Install membrane against exterior of concrete basement walls and concrete mud slab under basement floors, lapping joints for continuous waterproofing between walls and floors.
- 3.05 PROTECTION BOARD SCHEDULE
 - A. Install protection board over all horizontal (floor) waterproofing, and over basement walls not covered by exterior foundation insulation.

SECTION 07190 VAPOR RETARDER / INFILTRATION BARRIER

PART 1 GENERAL

1.01 DESCRIPTION

- A. Work Included:
 - 1. Sheet materials required to continue vapor retarder from wall to roof, fascia, soffit, and floor construction
 - 2. Sheet materials, required to continue vapor retarder from wall to window, door and louver frames.
- B. Products Furnished but Not Installed Under This Section:
 - 1. Furnish Vapor Retarder Type 2 to Section 03300 for installation under slabs on grade.
- C. Related Work Described Elsewhere:
 - 1. Section 07212 Board Insulation
 - 2. Section 07213 Batt and Blown-in Insulation
 - 3. Section 07900 Joint Sealers
 - 4. Section 08111 Steel Doors and Frames
- D. Reference Standards:
 - 1. Federal Specifications (FS) :
 - a. TT-S-230 Sealing Compound, Synthetic Rubber Base, Single Component, Chemically Cured for Caulking, Sealing and Glazing.
 - b. FF-N-105 Nail, Brads, Staples, and Spikes: Wire, Cut and Wrought.

1.02 SYSTEM DESCRIPTION

- A. Materials of this Section shall provide continuity of building enclosure vapor and are barrier in conjunction with materials in Sections 07212, 07213, and 07214.
- B. Sheet and sealing materials to seal gaps between building enclosure components.

1.03 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions under provisions of Section 01340.
- B. Submit complete description information and a certificate of compliance with requirements of these specifications.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

Vapor Retarder: (Limited Locations) Minimum 6 mil thick clear polyethylene film conforming to physical property requirements of ASTM C171; 0.08 perm rating or lower vapor transmission.

A. Vapor retarder material is limited to locations where the sheet material is in substantial contact with the unexposed surface of the wall or ceiling finish, per IBC 1713 (c), exception 2.

2.02 SEALANTS

- A. Sealant: Provide "TREMCO Acoustical Sealant" at all plates, jambs and other conditions as required to insure continuous seal.
- B. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

2.03 ADHESIVES

- A. Adhesive for Bonding Field Applied Laps and Joints: Conform to recommendations of manufacturer of the vapor retarder material for its intended use; non-flammable when dry, non-corrosive to metals, and non-leaching; suitable for permanent joints in the vapor retarder.
 - 1. Joints bonded with the adhesive material shall remain flexible at temperatures between 0 degrees F. and 120 degrees F and withstand alternate freezing and thawing without detrimental effects.
- B. Mastic for applying on vapor retarder where penetrations are anticipated shall conform to recommendations of manufacturer of the vapor retarder material for its intended use.
 - 1. Adhesives and mastic shall be compatible with the materials to which applied, and shall not corrode, soften or otherwise attack the vapor retarder materials in either the wet or dry state.
- C. Adhesive for Vapor Retarder: Gun grade mastic type compatible with sheet barrier and substrate, permanently noncuring.

2.04 ACCESSORIES

- A. Tape: Oriented polypropylene with acrylic adhesive, providing the following minimum characteristics:
 - 1. 100 percent elongation, 20 lb/in. tensile strength
 - 2. 16 oz./in. 180 degree peel adhesion.
 - 3. Working temperature range: -30 degrees F to 200 degrees F.
 - 4. Moisture vapor transmission: 0.4 gm/100 sq in. in 24 hours at 100 degrees F and 90 percent R.H.

B. Fasteners: Galvanized, large headed roofing nails or staples; FS FF-N-105.

PART 3 EXECUTION

3.01 PREPARATION

- A. Review and coordinate sequencing of work to ensure that everything to be covered by vapor retarder has been accomplished, and that openings, chases, supplementary framing and blocking and similar provisions have been completed. Verify that insulation has been properly installed voids, gaps or sags.
- B. Verify substrate materials are clean and dry, ready to receive work of this Section. Remove loose or foreign matter which impair adhesion.
- C. Coordinate work with other affected Sections. Protect insulation at all times against migration of moisture vapor.
- D. Clean and prime substrate surfaces to receive adhesive and sealants in accordance with manufacturer's instructions. Comply with manufacturer's instructions regarding application temperature limitations.

3.02 INSTALLATION

- A. Secure vapor retarder with compression-type automatic staplers or large headed nails. Adjust pressure of staplers to avoid rupturing or tearing vapor retarder material.
- B. Install over insulation and framing members on all interior faces of exterior thermal walls. At ceilings install vapor barrier on the bottom of the roof structure. At floors install vapor barrier on top of all floor joists on the bottom of the floor underlayment plywood as shown on drawings. Vapor barrier shall run continuous over all framing members and seal tight at all joints, penetrations and where vapor barrier unites with itself or other building materials.
- C. Lap joints minimum 16 in. Provide vapor retarder over the top of interior partitions to provide 16" lap at ceiling vapor retarder. This minimum lapping shall apply to all areas where the vapor retarder material unites with itself or other materials or surfaces such as at corners and wall openings. Repair or replace vapor retarder material with tears, breaks or ruptures. Seal all laps with adhesive or tape, as appropriate to condition to achieve vapor tight construction. Laps to occur over framing or furring.
- D. Install vapor retarder with square internal corners to facilitate installation of finish materials.
- E. Tape termination of vapor retarder to substrate.

- F. Seal fastener and other penetrations (including electrical boxes and pipes) through vapor retarder with adhesive or tape, as appropriate to condition to achieve vapor tight construction.
 - 1. At all mechanical, electrical (including boxes) and all other pipe penetrations provide a double splice patch (one on each side of vapor barrier) by cutting square pieces of vapor barrier 12" wider on all sides than the pipe. Cut a round hole in the center of the square splice patch smaller than the pipe to form a stretched fit. Force thread the pipe through the splice patch and tape all sides to the vapor barrier to the pipe on both sides. Provide solid wood blocking at all mechanical or electrical penetrations.
- G. Apply adhesive in strict accordance with the adhesive manufacturer's printed instructions.
- H. Install vapor retarder between door and window frames and adjacent wall and seal with adhesive. Equal to "Tremco" acoustic sealant. Caulk with sealant to ensure complete seal.
- I. After installation of vapor retarder, adhesive and tape, and minimum 24 hours prior to installing any wall finish, in each area, Contractor shall notify Owner's Representative. Vapor retarder installation will be thoroughly inspected prior to concealment. Any break, rupture, tear, or failure to provide a positive vapor retarder seal shall be sealed vapor tight in an approved manner.
- J. Do not allow finished to be applied over vapor retarder which has not been inspected.

SECTION 07200 THERMAL / ACOUSTICAL INSULATION

- PART 1 GENERAL
- 1.01 DEFINITIONS
 - A. "R" value designates thermal resistance of insulation only, not including air spaces or other factors assumed to result in higher "R" values.

1.02 REGULATORY AGENCY REQUIREMENTS

A. Maximum UL flame spread rating if and where insulation is exposed: 25

1.03 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver to project site in manufacturer's original unopened packages.
- B. Label package wrappers and imprint insulation facing at 24 inch approximate spacing with brand name, insulation type, and thermal rating.
- C. Store materials off ground.
- D. Protect against damage and discoloration.
- E. Immediately remove damaged or wet materials from job site.
- F. Materials should be kept covered / protected from sun.
- 1.04 ENVIRONMENTAL CONDITIONS
 - A. Do not install insulation when surface to receive insulation is wet, or when surface and/or ambient air temperatures are lower than manufacturer's specified minimums.
- 1.05 ADVANCE NOTICES
 - A. Notify Contracting Officer at least 24 hours prior to completing insulation work for inspection.
- PART 2 PRODUCTS
- 2.01 MINERAL FIBER BATT INSULATION
 - A. Manufacturer:
 Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to the following:
 - 1. Owens / Corning
 - 2. Manville
 - 3. U.S Gypsum

- B. Material: Rock or glass fiber.
- C. Manufacturing Standard: ASTM C-665.
- D. Type: Friction-fit blanket or batt.
- E. Length: Full-length, single-piece where practicable.
- F. Factory, Applied vapor retarding facing: None required.
- G. Thickness: As shown on drawings.
- 2.02 THERMALFIBER SOUND ATTENUATION FIRE BLANKET
 - A. Manufacturer & Brand: Certainteed Sound Control Batts, Manville Sound Control Insulation, Owens-Corning Noise Barrier Batts, US Gypsum Thermafiber, or approved.
 - B. Type: Foiled faced.
 - C. Minimum Thickness: 3 inches.
 - D. Extent of Work: provide over ceiling for 24 inches beyond both sides of sound walls.
- 2.03 THERMALFIBER LIGHT FIXTURE INSULATION KIT
 - A. Manufacturer & Brand: Certainteed Sound Control Batts, Manville Sound Control Insulation, Owens-Corning Noise Barrier Batts, US Gypsum Thermafiber, or approved.
 - B. Extent of Work: provide at light fixtures in rooms with acoustical walls on all sides. Exclude light fixtures in 1 hour corridor.
- 2.04 SAFING INSULATION
 - A. Manufacturer Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to the following:
 - 1. US Gypsum Thermafiber
 - B. Material: Foil faced mineral wool.
 - C. Thickness: As required to tightly fill space.
- 2.05 TIE WIRE
 - A. Material: Steel.
 - B. Minimum size: 18 ga.
- 2.06 ADHESIVE
 - A. Type: Recommended by manufacturer of material to be secured.

2.07 AIR INFILTRATION BARRIER

"Tyvek Housewrap" as manufactured by The Dupont Company, Textile Fibers Department, Wilmington, Delaware, or approved equal.

- 1. Air Porosity: 15 seconds or more
- 2. Water Resistance: Over 75 as measured by ASTM D-779.
- PART 3 EXECUTION
- 3.01 EXISTING CONDITIONS
 - A. Verify that work of preceding trades is completed.
 - B. Verify that surfaces and spaces to receive insulation are accurately sized and located, dry, protected against inclement weather, clean, and otherwise properly prepared.
 - C. Do not start work until conditions are satisfactory.

3.02 PROTECTING WORK OF OTHER SECTIONS

- A. Protect against damage and discoloration caused by work of this section.
- B. Maintain the following minimum clearances between insulation and any recessed lighting fixtures, unless fixture is U.L. rated for zero clearance:
 - 1. Side clearance: 3 inches.
 - 2. Top clearance: 24 inches.

3.03 SURFACE PREPARATION

- A. Remove, or protect against, projections that may damage insulation or prevent proper installation.
- 3.04 INSULATION INSTALLATION, GENERAL
 - A. Follow manufacturer's instructions.
 - B. Fit insulation snugly between framing without forcing.
 - C. Permit no gaps for air passage.
 - D. Carefully cut and fit insulation around pipes, conduits, and other obstructions.
 - E. Where pipes, conduit, and other obstructions are located within insulated walls or within other insulated spaces, place insulation between cold-in-winter surface and obstruction, compressing insulation where necessary.
 - F. Except where indicated above, do not compress insulation more than 10%.

3.05 MINERAL FIBER INSULATION INSTALLATION

- A. Install insulation with vapor retarding facing on warm-in-winter side of assembly.
- B. Use full-length, single-piece batts where practicable.
- C. Secure insulation to metal framing using wire and/or adhesives.
- D. Provide additional wire support, as necessary, to prevent insulation displacement or sagging.
- 3.06 VAPOR RETARDING FACING PATCHING
 - A. Patch and seal mineral fiber batt insulation facing punctures, penetrations, tears, and voids with vapor proof tape.
 - B. Permit no openings for vapor transmission.
- 3.07 PRODUCT CLEANING AND REPAIRING
 - A. Including work of other trades, clean, repair, and touch-up, or replace when directed, products that have been soiled, discolored, or damaged by work of this section.
 - B. Remove debris from project site upon work completion, or sooner if directed.

SECTION 07212

BOARD INSULATION

- PART 1 GENERAL
- 1.01 DESCRIPTION
 - A. Work Included:
 - 1. Perimeter foundation wall insulation.
 - 2. Refer to schedule at end of this Section.
 - B. Related Work Described Elsewhere:
 - 1. Section 03300 Cast-In-Place Concrete
 - 2. Section 04230 Reinforced Unit Masonry
 - 3. Section 07190 Vapor Retarder
 - 4. Section 07213 Batt and Blown-in Insulation
 - C. Reference Standards:
 - 1. American Society for Testing and Materials (ASTM):
 - a) C272-53 (1980) Water Absorption of Core Materials for Structural Sandwich Construction.
 - b) C518-76 Steady State Thermal Transmission Properties by Means of the Heat Flow Meter.
 - c) C578-85 Preformed, Cellular Polystyrene Thermal Insulation.
 - d) D1621-73 (1979) Compressive Properties of Rigid Cellular Plastics.
 - e) D2842-69 (1975) Water Absorption of Rigid Celular Plastics.

1.02 SYSTEM DESCRIPTION

- A. Materials of this Section shall provide a continuous thermal barrier at building enclosure elements, in conjunction with insulation specified in Section 07213.
- 1.03 SUBMITTALS
 - A. Submit manufacturer's product data and installation instructions under provision of Section 01340.

PART 2 PRODUCTS

- 2.01 MANUFACTURERS
 - A. The Dow Chemical Company
 - B. UC Industries
 - C. Western Insulfoam
 - D. Substitutions: Under provision of Section 01630.

2.02 INSULATION MATERIALS

- A. Extruded Rigid Insulation: ASTM C578, type VI extruded polystyrene, thickness shown, Styrofoam "SM" or Foamular "400".
 - 1. Minimum density: 2.0 pcf.
 - 2. Minimum compressive strength: 25 psi at 10 percent deformation or yield per ASTM D1621.
 - 3. Maximum water absorption: 1 percent by volume after 96 hr. soak test per ASTM D2842.
 - 4. Minimum aged 'R' value per one in. thickness: ASTM C518 5.0 at 75 degrees F.
- B. Expanded Rigid Insulation: ASTM C578, expanded cellular polystyrene, thickness shown, similar and equal to Western Insulfoam's "Insulfoam II".
 - 1. Minimum density: 2.0 pcf.
 - 2. Minimum compressive strength: 35 psi at 5 percent deformation or yield per ASTM D1621.
 - 3. Maximum water absorption: 1 percent by volume after 96 hr. soak test per ASTM D2842.
 - 4. Minimum 'K' value per ASTM C518: 0.22 at 75 degrees F.

2.03 ADHESIVE MATERIALS

A. Adhesive: As recommended by protection board manufacturer for application, and compatible with insulation and dampproofing materials.

PART 3 EXECUTION

3.01 PREPARATION

- A. Verify substrate and adjacent materials and insulation boards are dry and ready to receive insulation and adhesive.
- B. Verify substrate surface is flat, free of honeycomb, fins, irregularities, and materials that impede adhesive bond.
- C. Verify insulation boards are unbroken, free of damage and with surfaces intact.

3.02 INSTALLATION - EXTRUDED RIGID INSULATION

- A. Apply to inside face of foundation walls below grade in accordance with Drawings and manufacturer's instructions. Do not leave exposed to sunlight.
- B. Apply adhesive in three continuous beads per board length.
- C. Place boards by method to maximize contact bedding. Butt edges and ends tight to adjacent boards and to protrusions.

3.03 SCHEDULE

Location:

A. Interior Side of plumbing Chase:

<u>Type:</u> Extruded Rigid

SECTION 07213

BATT AND BLOWN-IN INSULATION

- PART 1 GENERAL
- 1.01 DESCRIPTION
 - A. Work Included:
 - 1. Thermal insulation in exterior frame wall and attic construction.
 - 2. Sound Attenuation Batts Fiber Glass.
 - 3. Blown Cellulose Insulation.
 - 4. Batt insulation for filling perimeter window and door shim spaces, and crevices in exterior wall and roof assemblies.
 - B. Related Work Described Elsewhere:
 - 1. Section 06112 Framing and Sheathing
 - 2. Section 07190 Vapor Retarder
 - 3. Section 07212 Board Insulation
 - 4. Section 07900 Joint Sealers
 - 5. Section 09255 Gypsum Board Assemblies
 - 6. Section 09511 Acoustical Ceiling
 - C. References:

American Society for Testing and Manufacturing (ASTM) :

- 1. C518-85 Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter.
- 2. C665-86 Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- 3. E84-87 Surface Burning Characteristics of Building Materials.
- 1.02 SYSTEM DESCRIPTION
 - A. Provide thermal barrier at building enclosure elements in conjunction with insulation specified in Section 07212, and vapor retarder materials in Section 07190.
- 1.03 SUBMITTALS
 - A. Submit manufacturer's product data and installation instructions under provision of Section 01340.
- PART 2 PRODUCTS
- 2.01 BATT MATERIAL MANUFACTURERS
 - A. Owens Corning.
 - B. Manville
 - C. CertainTeed.
 - D. Substitutions: Under provision of Section 01630.

2.02 INSULATION MATERIALS

- A. Fibrous Insulation:
 - 1. Thermal insulation: ASTM C665 unfaced, friction fit blanket. Thickness indicated, 1 lb. density.
 - 2. Minimum 'R' value per inch of thickness: 3 per ASTM C518.
 - 3. Flame Spread: 25 maximum per ASTM E84.
- B. Sound Attentuation Batts: Interior partition systems, metal frame construction $3 \frac{1}{2} \times 89$ mm thickness. Complying with ASTM C 665, Type 1 and ASTM E 136.
- 2.03 BLOWN-IN INSULATION
 - A Provide Thermo-Kool of Alaska 907-563-3664, Mono-Therm Cellolose sprayed insulation, to the R-value called at locations shown on the drawings.
- PART 3 EXECUTION

3.01 PREPARATION

- A. Verify adjacent materials are dry and ready to receive installation.
- B. Verify mechanical and electrical services within walls have been installed and tested.

3.02 INSTALLATION

- A. Install batt insulation in accordance with manufacturer's instructions.
- B. Install batt insulation in exterior wall spaces between framing members and elsewhere as indicated, without gaps or voids.
- C. Staple wall insulation at top to prevent sagging.
- D. Trim insulation neatly to fit spaces. Use batts free of damage.
- E. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation. Leave no gaps or voids.
- F. Stuff loose insulation into miscellaneous voids and cavity spaces as indicated. Compact to approximately 40 percent of normal volume.

END OF SECTION

07213 - 2

SECTION 07300

SHINGLES AND ROOFING TILES

PART 1 GENERAL

1.01 Description of Work

Work under this section includes asphalt composition shingles, roofing felt, flashings, sealants, cedar D-style premolded edging, and all work required to provide a water-tight installation.

- 1.02 Related Requirements
 - A. Sections of Division 1
 - B. Section 06100 Rough Carpentry
- 1.03 Quality Assurance

Subcontract roofing to a single applicator who is thoroughly skilled and experienced in similar roofing.

Provide Owner with a 10-year written guarantee for workmanship, materials and any damage caused by leaks during the warranty period signed by both General Contractor and Roofing Contractor. Any damages to the building resulting from roof leaking or failure of any roof component shall be restored by the Contractor without delay and the entire expense to be borne by the Contractor.

1.04 Submittals

Submit manufacturer's specifications and installation instructions for roofing. Submit color samples to Architect.

1.05 Product Delivery, Storage and Handling

Store materials in a dry location, in such a manner as to prevent damage.

PART 2 PRODUCTS

- 2.01 Manufacturers
 - A. Malarkey Legacy
 - B. Approved Substitutions:
 - 1. GAF Material Corporation
 - 2. Pabco Roofing
2.02 Materials

- A. Shingles Malarkey Legacy-35 SBS Modified Laminated Shingle with 3M Algae Block, or equal, with 50 yr. manufacturer warranty, 110 mph Ltd. Wind Warranty and 20 Year Ltd. Algae Warranty.
- B. Saturated Felt Georgia Pacific GP 15 or equal.
- C. Aluminum or Galvanized Flashings, as noted on Drawings, color as selected from manufacturers standard colors.
- D. Ice and Water Shield as manufactured by Grace Construction Products.
- E. All required accessories for complete job.

PART 3 EXECUTION

3.01 Preparation

Prior to installing roof inspect substrates and adjoining construction, and the conditions under which the work is to be installed. Do not proceed with the work until unsatisfactory conditions of the work have been corrected.

Substrates shall be clean of debris which would impair the work.

3.02 Installation

Install roofing per manufacturer's recommendation, to achieve 100 mph wind rating. Shingles shall be cut in a straight true line at valleys.

Install Ice & Water Shield as shown in the drawings, under continuous saturated felt below all asphalt composition shingles.

3.03 Metal Flashings

Fabricate and install metal flashing, as shown, or required to provide a water-tight installation per the Architectural Sheet Metal Manual, Second Edition 1968, as published by SMACNA.

Seal all flashing joints with asphalt mastic sealant. Remove any excess.

3.04 Cleaning

All debris, dirt, and any foreign matter shall be cleaned up and removed from roof and jobsite.

SECTION 07460 SIDING, SOFFIT, FASCIA, AND TRIM

- PART 1 GENERAL
- 1.01 SCOPE
 - A. Furnish and install Siding, Soffits, Fascia, Trim molding and accessories where shown on drawings or as specified herein.
 - B. Coordinate the section with interfacing and adjoining work for proper sequence of installation.
- 1.02 RELATED SECTIONS
 - A. Section 06100 Rough Carpentry
 - B. Section 07190 Vapor Retarder
 - C. Section 07620 Sheet Metal Flashings, Trim, and Gutters
- 1.03 QUALITY ASSURANCE
 - A. Refer to 01340- Shop Drawings, Product Data & Samples.
 - 1. Submit 6" x 6" pieces of claddings in texture and widths shown and specified herein.
 - 2. Submit specifications, installation data, and other pertinent manufacturer's literature.
- 1.04 JOB CONDITIONS
 - A. Nominal 2" x 8" wood framing selected for minimal shrinkage and complying with local building codes, including the use of weather-resistive barriers and vapors barriers where required. Minimum 1 1/2" face and straight, true, of uniform dimensions and properly aligned.
 - B. Install weather-resistive barriers and cladding to dry surfaces.
 - C. Repair any punctures or tears in the weather-resistive barrier prior to the installation of the siding.
 - D. Protect siding from other trades.
- 1.05 WARRANTY
 - A. SIDING AND SOFFIT : Provide James Hardie's limited product warranty against manufacturing defects in Hardiplank lap siding for 50 years, and Harditrim for 10 years.

- B. COLORPLUS FINISH: Provided by James Hardie's limited product warranty against manufacturing finish defects. When used for its intended purpose, properly installed and maintained according to Hardie's published installation instructions, James Hardie's ColorPlus finish with ColorPlus Technology, for a period of 15 years from the date of purchase: will not peel; will not crack; and will not chip.
- PART 2 PRODUCTS
- 2.01 SIDING, FASCIA SHINGLES, AND TRIM
 - A. Non-asbestos fiber-cement siding to comply with ASTM Standard Specification C1186 Grade II, Type A.
 - B. Siding to meet the following building code compliance:
 - 1. National Evaluation Report No. NER 405 (BOCA, ICBO, SBCCI)
 - 2. Non- asbestos fiber-cement siding to be non-combustible when tested in accordance with ASTM test method E136.
 - C. Types for Applications
 - 1. Siding Hardiplank Lap Siding Cedarmill Textured 7 ¹/₄ (actual) 6" exposure Assume 2 siding colors, as selected by Architect from manufacturer's standard colors.
 - 2. Fascia Smooth Texture 7 1/4" (actual) and 11 1/4" (actual)
 - 3. Trim Smooth Texture 3 ¹/₂" (actual) and 11 ¹/₄" (actual) Thickness: ³/₄" (actual)
 - 4. Panel Smooth Texture 4' x 8'. Thickness: 5/16"

2.02 SOFFIT

A. L.P. Smartside Soffit - 4' x 8' Soffit (textured) Thickness: 7/16"

2.03 FASTENERS

A. Wood Framing: 6d common corrosion resistant siding nails.

2.04 FINISH

- A. Product: ColorPlus by James Hardie Assume two colors, per architect
- B. Finish unprimed siding with a minimum one coat high quality, alkali resistant primer and one coat of either, 1—percent acrylic or latex or oil based, exterior grade topcoats or two coats high quality alkali resistant 100 percent acrylic or latex, exterior grade topcoat within 90 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.

C. Finish factory primed siding with a minimum of one coat of high quality 100 percent acrylic or latex or oil based exterior grade paint within 180 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.

2.05 ACCESSORIES

- A. J Channel
 - 1. Supplier: Fry Reglet Corporation
 - 2. Part Number: FCP J Channel
 - 3. Material: Extruded aluminum alloy 6063 T5
 - 4. Length: 10'
 - 5. Width: 1 1/8"
 - 6. Thickness: 0.05"
 - 7. Weight: 108lbs. / lin ft.
 - 8. Finish: Chemical conversion coating (chem.-film), unless otherwise specified.
 - 9. Note: Chem-film coating is required for field painted finish.
- B. Vertical Reveal
 - 1. Supplier: Fry Reglet Corporation
 - 2. Part Number: FCP Vertical
 - 3. Material: Extruded aluminum alloy 6063 T5
 - 4. Length: 10'
 - 5. Width: 2 3/4"
 - 6. Thickness: 0.05"
 - 7. Weight: 247lbs. / lin ft.
 - 8. Finish: Chemical conversion coating (chem.-film), unless otherwise specified.
 - 9. Note: Chem-film coating is required for field painted finish.
- C. Z Flashing
 - 1. Supplier: Fry Reglet Corporation
 - 2. Part Number: FCP Z Flashing
 - 3. Material: Extruded aluminum alloy 6063 T5
 - 4. Length: 10'
 - 5. Width: 1 7/8"
 - 6. Thickness: 0.05"
 - 7. Weight: 095lbs. / lin ft.
 - 8. Finish: Chemical conversion coating (chem.-film), unless otherwise specified.
 - 9. Note: Chem-film coating is required for field painted finish.

PART 3 EXECUTION

- 3.01 SURFACE CONDITIONS
 - A. Correct conditions detrimental to timely and proper completion of work.
- 3.02 INSTALLATION
 - A. Hardiplank Siding
 - 1. Face nail to sheathing.
 - 2. Locate splices at least 12" away from window and door openings.
 - 3. Wind Resistance: Where a specified level of wind resistance is required Hardiplank lap siding is installed to framing members and secured with fasteners described in Table No. 2 in the National Evaluation Service Report No. NER-405.
 - B. LP Smartside
 - 1. Per manufacturer's recommendations.

SECTION 07620 SHEET METAL FLASHINGS, TRIM, AND GUTTERS

- PART 1 GENERAL
- 1.01 DESCRIPTION
 - A. Work Included:
 - 1. Roof copings, reglets and counterflashings.
 - 2. Exterior door drip flashings.
 - 3. Miscellaneous flashings.
 - 4. Raingutters
 - B. Related Work Specified Elsewhere:
 - 1. Section 04230 Concrete Masonry Units
 - 2. Section 06114 Wood Blocking and Curbing
 - 3. Section 06200 Finish Carpentry
 - 4. Section 07900 Joint Sealers
 - 5. Section 08111 Steel Doors and Frames
 - 6. Section 09900 Painting and Finishing
 - 7. Section 15010 General Mechanical
 - 8. Section 16100 Basic Materials and Methods
 - C. References:
 - 1. American Society for Testing and Materials (ASTM):
 - a. A525-86 Steel Sheet, Zinc Coated, Galvanized by the Hot Dip Process.
 - b. B32-87 Solder Metal
 - c. D226-87 Asphalt Saturated Organic Felt Used in Roofing and Waterproofing.
 - d. D1187-82 Asphalt Based Emulsions for Use as Protective Coatings for Metal.
 - 2. Federal Specifications (FS): O-F-506 Flux, Soldering, Paste and Liquid.
 - 3. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): SMACNA Architectural Sheet Metal Manual.

1.02 SYSTEM DESCRIPTION

A. Work of this Section is to physically protect composition or flexible roof flashing and building components from damage that would permit water leakage to building interior.

1.03 QUALITY ASSURANCE

A. Applicator: Company specializing in sheet metal flashing work with 3 years minimum experience.

1.04 SUBMITTALS

- A. Submit shop drawings, product data, installation instructions, color sample, and samples under provisions of Section 01340.
- B. Describe material profile, jointing pattern, jointing details, fastening methods, and installation details.
- C. Provide 12 in. length of full sized sample of metal flashings illustrating typical external corner, internal corner, junction to vertical dissimilar surface, material and finish.

1.05 STORAGE AND HANDLING

- A. Store products under provisions of Section 01620.
- B. Stack preformed and prefinished material to prevent twisting, bending, or abrasion, and to provide ventilation.
- C. Prevent contact with materials during storage which may cause discoloration, staining or damage.

1.06 PERFORMANCE AGREEMENT

- A. Provide two year guaranty under provisions of Section 01750, substantially in the following form:
 - 1. Inspect and make emergency repairs to defects and leaks in building flashings within 24 hours of notice by Owner. As soon as weather permits, make permanent repairs and restore effected area to standards of contract requirements. Work shall be done without additional cost to Owner, unless leaks were caused by abuse or unusual natural phenomena as lightning strikes or hurricane.
- B. Provide 20 year manufacturer's finish warranty for prefinished items under provision of Section 01750.

PART 2 PRODUCTS

2.01 MATERIALS

A. Galvanized Sheet Stock: ASTM A446, Grade C minimum; coating designation G90 in conformance with A525, or 1.9 mil Zincalume coating composed of 45 percent zinc and 55 percent aluminum alloy by weight, per ASTM A792.

- B. Counterflashings:
 - 1. Manufactured: Provide counterflashings similar and equal to Springlok Flashing System as manufactured by Fry Reglet Corp. Flashing shall be made of 26 ga. galvanized steel. Pre-finish where exposed to view form exterior grade and elsewhere as indicated. Flashing shall have a 3 in. factory formed end lap. Provide with prefabricated flashing corners and accessories.
 - 2. Fabricated: Provide counterflashings of galvanized steel as indicated, thickness shown. Pre-finish where exposed to view from exterior grade and elsewhere as indicated. Fabricate as specified below, to shapes shown and as required to maintain building watertight and weatherproof.
 - C. Soffit Vents: Strip-vent Model #SV202 as manufactured by Air Vent, Inc. Peoria Heights, IL 61614 (309)688-5020 or equal. Finish color: As selected by architect.
 - D. Copings: Provide copings of preformed, galvanized sheet stock as indicated, thickness shown. Fabricate as specified below, to shapes shown and as required to maintain building watertight and weatherproof.
 - E. Raingutters: Provide Continuous Aluminum Raingutters. Provide .027 aluminum 5" K-Line gutters, 3105, H14 or equal, 1 mil polyester paint top side with .2 mil wash coat back side, 3-3/4" Tall, 3-5/16" Bottom, with 3" x 4" aluminum downspouts, .019 aluminum 3105, H14 or equal 1 mil. polyester paint tip side .2 mil clear wash coat back side, as shown on the Drawings. Provide baked on enamel finish with Life-Time Warranty. Fasten per manufacturers installation instructions. Color as selected by Architect. Provide concrete a splashblock at each downspout.

2.02 ACCESSORIES

- A. Fastener: Galvanized steel with soft neoprene washers at exposed fasteners. Finish exposed fasteners same as flashing metal.
- B. Underlayment: ASTM D266; No. 15 asphalt saturated roofing felt.
- C. Metal Primer: FS TT-P-641.
- D. Protective Backing Paint: Bituminous, conforming to ASTM D1187, Type A.
- E. Sealant: Refer to Section 07900.
- F. Solder: ASTM B32; 50/50 type.
- G. Flux: FS O-F-506.

2.03 FABRICATION

- A. Form section true to shape, accurate in size, square, and free from distortion or deflects.
- B. Form pieces in longest practicable lengths. Minimum bend radius 2.5 times the thickness of the metal, unless more stringent requirements are specified by coating manufacturer. Form bends at room temperature.
- C. Hem exposed edges on underside 1/2 in.; miter and rivet lap seam corners. Provide sealant in laps as specified in Section 07900.
- D. Form material with cover plate seams.
- E. Where indicated, and at all corner installations, solder and seal metal joints. After soldering, remove flux. Wipe and wash solder joints clean.
- F. Fabricate vertical faces with bottom edge formed outward 1/4 in. and hemmed to form drip.
- G. Provide 24 gauge coping with 22 gauge continuous concealed cleats on exterior face and exposed screw fasteners on interior face, as shown.
- 2.04 FINISH
 - A. Shop prepare and prime exposed ferrous metal surfaces, including galvanized.
 - B. Backpaint concealed ferrous metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.
 - C. Exposed flashings at sloped glazing to match sloped glazing framing color.
 - D. Exposed flashings at louvers to match louver color.
 - E. Prefinishing of Sheet Stock:
 - 1. Exterior surfaces of prefinished flashings shall have a shop applied baked-on epoxy primer (.2 mil) and a baked-on PVF 2 (Polyvinylidene Flouride) finish coat (.8 mil) equal to Glidden "Nubelar", DeSoto "Fluropon", Whittaker "Fluoroceram" and PPG "Duranar"; full 70% Kynar 500, totaling a nominal 1.0 mil dry film thickness.
 - 2. Interior finish consists of .15 mil epoxy primer and .35 mil off-white backer, except match exterior surface finish where exposed.
 - F. Touch Up Finishes: Touch up finish or refinish hardware items and small scratches and abrasions on prefinished metal with an air dry fluorocarbon refinishing system or touch up system, similar and equal to ADS Kynar.
 - G. Backpaint concealed metal surfaces and dissimilar metal contact surfaces with protective backing paint to a minimum dry film thickness of 15 mil

PART 3 EXECUTION

3.01 INSPECTION

A. Beginning of installation means installer accepts existing substrates.

3.02 PREPARATION

A. Field measure site conditions prior to fabricating work.

3.03 INSTALLATION

- A. Install surface mounted reglets and accessories true to lines and levels, at wall/roof connections above top of base flashings.
 - 1. Seal top of reglet as specified in Section 07900 and in accordance with reglet manufacturer's recommendations.
 - 2. Place beads of sealant under holes. Prefinish reinforcing bars to match flashing. Anchor bars to substrate through flashing with round head bolts with neoprene washers into sleeve anchors, of metal compatible with flashing and with heads prefinished color to match flashing.
- B. Secure flashings in place using concealed fasteners unless exposed specifically shown. Fastener size and type must be suitable for the conditions of use. Provide sizes and spacings shown, and where not shown, provide in accordance with applicable requirements of SMACNA manual and FM 1-49 for Wind Zone 2 whichever is the more stringent for the application.
- C. Provide butt joints between coping lengths with minimum 22 ga. cover plates and seal between cover plates and coping with two beads of polyisobutylene sealant each side (four rows of sealant total for each covered joint). Allow for expected expansion and contraction between coping lengths.
- D. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- E. Seal metal joints watertight. Apply sealant between metal flashings as specified in Section 07900.
- F. Conform to drawing details included in SMACNA manual where referenced or where applicable to conditions and not in conflict with Contract Documents.

SECTION 07900

JOINT SEALANTS

- PART 1 GENERAL
- 1.01 DESCRIPTION
 - A. Work Included:
 - 1. Clean and prepare sealant substrate surfaces.
 - 2. Sealant and backing.
 - B. Related Work Described Elsewhere:
 - 1. Section 03300 Cast-In-Place Concrete
 - 2. Section 04230 Concrete Masonry Unit
 - 3. Section 07190 Vapor Retarders
 - 4. Section 07620 Sheet Metal Flashing, Trim, and Gutters
 - 5. Section 08111 Steel Doors and Frames
 - 6. Section 08610 Plastic Windows
 - 7. Section 08800 Glazing
 - 8. Section 09250 Gypsum Wallboard
 - 9. Section 09511 Acoustical Ceiling
 - C. References:
 - 1. American Society for Testing and Materials (ASTM) :
 - a) C790-84 Recommended Practices for Use of Latex Sealing Compounds.
 - b) C804-83 Recommended Practices for Use of Solvent Release Type Sealants.
 - c) D1056-85 Flexible Cellular Materials Sponge or Expanded Rubber.
 - d) D1565-81 (1986) Flexible Cellular Materials Vinyl Chloride polymers and Copolymers (Open Cell Foam).
 - e) E119-83 Fire Tests of Building Construction Materials.
 - 2. Federal Specifications (FS):
 - a) TT-S-001543 Sealing Compound, Silicone Rubber Base.
 - b) TT-S-001657 Sealing Compound, Single Component, Butyl Rubber Based, Solvent Release Type.
 - c) TT-S-00227 Sealing Compound: Elastromeric Type , Multi-Component.
 - d) TT-S-00230 Sealing Compound: Elastromeric Type, Single-Component.

1.02 SUBMITTALS

- A. Submit product data and samples under provision of Section 01340.
- B. Submit product data and samples of each sealant type and sealant colors.
- C. Submit manufacturer's surface preparation and installation instructions under provisions of Section 01340.

1.03 EXTRA STOCK

- A. Furnish tube or equivalent of each type of sealant used on this project under provisions of Section 01750.
- B. Turn over to Owner's Representative at Substantial Completion and receive a receipt therefore.

PART 2 PRODUCTS

- 2.01 SEALANT MATERIALS
 - A. Silicone Sealant: Silicone base, single component, moisture curing, non-sagging, non-staining, non-bleeding; color as selected; conforming to the requirements of FS TT-S-001543A, Class A. Dow Corning 795 Sealant, GE Gesil N 2600, or Tremco Spectrum 2.
 - 1. Dynamic Movement Capability <u>+</u> 50 percent.
 - 2. Service Temperature Range -35 to +140 degrees F.
 - 3. Shore A Hardness Range 15 to 35.
 - B. Polyurethane Sealant: Moisture curing, non-staining, non-bleeding, capable of continuous water immersion, non-sagging type; conforming to the requirements of FS TT-S-00230C, Type 11, Class A. Sonneborn Sonolastic NP II, Tremco Dymeric. Color as selected.
 - 1. Dynamic Movement Capability <u>+</u> 25 percent.
 - 2. Service Temperature Range -60 to +180 degrees F.
 - 3. Shore A Hardness 20 to 35.
 - C. Butyl Sealant: Butyl rubber base, single component, conforming to requirements of FS TT-S-001657, Type 1; Shore A hardness of maximum 30; non-staining; non-bleeding; non-sagging; color as selected. Tremco Butyl Sealant, Pecora BC-158, or Sonneboren Butakauk.
 - D. Acrylic Sealant: Acrylic base, single component, solvent curing, capable of being continuously immersed in water, withstand movement of up to 7.5 percent of joint width and paintable. Tremco Acrylic Latex Caulk or Sonneborn Sonolac.

- E. Sealant Tape: AAMA 804.1, Butyl-polyisobutylene preformed sealant, service temperature range -40 to 200 degrees F; color as selected; Tremco 440 tape, PTI 606, or acceptable substitute. Provide pre-shimmed where required.
- F. Penetration Sealant: Conform to requirements of ASTM E119 or ASTM E 814; provide materials UL Listed with assembly and for equal rating. Seal walls and floors at pipe, conduit and cable penetrations. Where required for rating, provide with mineral wool of ceramic fiber forming material listed. Dow Corning 2000 Fire Stop Sealant, GS Pensil 851, or equal.
- G. Sanitary Sealant: Dow Corning 786 mildew resistant silicone sealant of GE SCS 1702 Sanitary Sealant. Seal joints around plumbing fixtures.
- H. Rated Joint Sealant: Conform to requirements of ASTM E119 or UL 263; provide material UL listed with assembly and for equal rating. Seal walls at control joints in 2 hour CMU or concrete walls. Where required for rating, provide with mineral wool or ceramic fiber forming material listed. Dow Corning 795, Tremco Dymeric, or equal.
- I. Traffic Sealant: Two component, self-leveling type; conforming to the requirements of FS TT-S-00227E, Type I, Class A and ASTM C920 Type S, Grade P, Class 25, Use T; Sonneborn Sonolastic Paving Joint Sealant, Tremco THC-900, "Chem-Calk 550" by Bostik, or equal. Color as selected per architect.
- J. Substitutions: Refer to Section 01630 for substitution procedures.

2.02 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Filler (Backer Rod): Round, open cell polyurethane foam rod; oversized 30 to 50 percent larger than joint width; compatible with joint sealer.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.01 JOB CONDITIONS

- A. Verify joint openings are ready to receive work and field measurements are as shown on Drawings and recommended by manufacturer.
- B. Beginning of installation means installer accepts existing substrate.

3.02 PREPARATION

- A. Clean, prepare, and size joints in accordance with manufacturer's instructions. Remove loose materials and foreign matter which might impair adhesion of sealant.
- B. Verify that joint shaping materials and release tapes are compatible with sealant.
- C. Examine joint dimensions and size materials to achieve required width/depth rations.
- D. Use joint filler to achieve required joint width/depth rations. Provide neck dimension no greater than 1/3 joint width. Verify that joint backing and release tapes are compatible with sealant. Do not puncture backer rod.
- E. Use bone breaker where joint backing is not used.
- F. Perform preparation in accordance with ASTM C804 for solvent release and C790 for latex base sealants as applicable.
- G. Protect elements surrounding the work of this Section from damage or disfiguration.

3.03 INSTALLATION

- A. Perform work in accordance with ASTM C804 for solvent release and C790 for latex base sealants as applicable.
- B. Install sealant per manufacturer's instructions.
- C. Apply sealant within recommended temperature ranges. Consult manufacturer when sealant cannot be applied within recommended temperature ranges.
- D. Tool joints concave.
- E. Joint: Free of air pockets, foreign embedded matter, ridges, and sags.

3.04 CLEANING AND REPAIRING

- A. Clean work under provisions of Section 01710.
- B. Clean adjacent soiled surfaces.
- C. Repair or replace defaced or disfigured finishes caused by work of this Section.
- 3.05 PROTECTION OF FINISHED WORK
 - A. Protect finished installation under provisions of Section 01500.
 - B. Protect sealants until cured.

3.06 SCHEDULE

Location:

- A. Concrete Masonry Exterior Control Joints Exterior Penetrations Interior Control Joints
- B. Vapor Retarder (Reference Section 07190)

Floor/Roof Penetrations

C. Flashing and Metal Trim (Ref. Section 07620)

Metal/Metal (concealed) Metal/Metal (exposed) Metal/CMU

D. Windows (Ref. Sections 08610)

Cap Glazing Bead Heel Glazing Bead Metal/Metal Flashing lap Joints (concealed) Exterior Perimeter/Metal (exposed) Exterior Perimeter/CUM (exposed) Sill/Flashing (concealed) Wood/Wood (exposed) Structural Glazing Interior Perimeter/Metal (exposed)

Silicone Structural Sealant Tape Sealant Polyurethane Polyurethane Butyl Polyurethane Silicone Acrylic

Silicone Weather Seal

E. Door and Relite Frames

Interior Door and Relite Frames/Walls Exterior Door and Relite Frames/CMU Interior Door and Relite Glazing Exterior Door and Relite Glazing Threshold Acrylic Polyurethane Tape Sealant (pre-shimmed) Tape Sealant (pre-shimmed) Butyl

Acrylic Acrylic

Type:

Polyurethane

Polyurethane

Rated Joint Sealant

Sealant Tape Silicone Polyurethane F. Tile

١.

Fixtures, Fittings and Equipment/Substrate Accessories and Partitions/Substrate Control/Expansion Joints Top of Base at Kitchen Sanitary Sealant Sanitary Sealant Polyurethane Sanitary Sealant

G. Penetrations

Cable, Pipe, & Utility/Rated Floor/Wall Voids Between Rated Wall/Roof Sheathing In Acoustical Walls and Ceilings

Acrylic Acrylic

Penetration Sealant

Penetration Sealant

H. P. Lam/Gypsum Board

Horizontal Interior Traffic Joints

Traffic Sealant

J. Provide sealants for other joints between material, assemblies, and components not scheduled above as specified in individual Sections. Where not indicated above or called out in individual Sections, provide acceptable sealant best suited to application.

SECTION 08111

STEEL DOORS AND FRAMES

- PART 1 GENERAL
- 1.01 DESCRIPTION
 - A. Work Included:
 - 1. Fire rated and non-rated rolled steel doors, panels and frames.
 - 2. Interior light frames, sound doors and frames
 - B. Related Work Described Elsewhere:
 - 1. Section 06100 Rough Carpentry
 - 2. Section 07620 Metal Flashing and Trim
 - 3. Section 07900 Joint Sealers
 - 4. Section 08700 Door hardware
 - 5. Section 08800 Glazing
 - 6. Section 09900 Painting and Finishing
 - C. References:
 - 1. American Society for Testing and Materials ASTM :
 - a) E152-81a Methods for Fire Tests of Door Assemblies.
 - b) A525-86 General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
 - 2. Door Hardware Institute (DHI) : The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.
 - 3. National Fire Protection Association (NFPA) :
 - a) 80 Fire Doors and Windows
 - b) 252 Fire Tests for Door Assemblies.
 - 4. Steel Door Institute (SDI):
 - a) 100-85 Recommended Specifications for Standard Steel Doors and Frames
 - b) 105-82 Recommended Erection Instructions for Steel Frames.
 - c) 111 Recommended Standard Details Steel Doors and Frames
 - d) 113-79 Test Procedure and Acceptance Criteria for Apparent Thermal Performance of Steel Door and Frame Assemblies.
 - 5. Underwriters' Laboratories, Inc. (UL): 10B Fire Tests of Door Assemblies.
 - 6. National Association of Architectural Metal Manufacturers (NAAMM): Hollow Metal Technical and Design Manual.

1.02 QUALITY ASSURANCE

- A. Conform to requirements of SDI-100 and NAAMM.
- B. Fire rated door and frame construction: Conform to UL 10B. Fabricate fire rated assemblies in accordance with requirements of Underwriter's Laboratories Inc. (UL).
- C. Installed frame and door assembly: Conform to NFPA 80 for fire rated class indicated in Schedule. Refer to Drawings for Class requirements.
- D. Provide rated double doors tested and approved without astragals.

1.03 SUBMITTALS

- A. Submit complete materials list and shop drawings for all doors and frames, in compliance with Section 01340.
- B. Indicate frame configuration, anchor types and spacing, location of cutouts for hardware, reinforcement, and finish.
- C. Indicate door elevations, internal reinforcement, closure method, insulation, and cutouts for glazing.
- D. Submit manufacturer's certification under provisions of Section 01400. Submit manufacturer's certification that insulated door and frame assemblies proposed have been tested and meet or exceed requirements of SDI-113.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Protect products under provisions of Section 01620.
- B. Provide packaging such as cardboard or other containers, separators, banding spreaders, and paper wrappings to protect hollow metal items. Protect doors and frames with resilient packaging sealed with heat shrunk plastic.
- C. Break seal at site to permit ventilation.
- D. Deliver, store and handle hollow metal work in manner to prevent damage and deterioration and in accord with any special storage and handling requirements of manufacturer.
- E. Store doors upright, in a protected dry area, at least 1 in. or more off the ground or floor and at least 1 in. between individual pieces.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. General: Following products are for general reference only and are subject to compliance with specified requirements.

В.	Exterior Doors:						
	1.	Curriers	Series:	707N			
	2.	Amweld	Series:	2700			
	3.	CECO	Series	Imperial			
	4.	Steelcraft	Series	L-16 (Foam Core)			
C.	Interior Doors (except sound doors)						
	1.	Curriers	Series:	707N & L707N			
	2.	Amweld	Series:	1700			
	3.	CECO	Series:	Imperial/Fuego			
	4.	Steelcraft	Series:	L-18 (Foam Core)			
D.	Interior Sound Doors:						
	1.	Curriers	Series:	707N & L708N			
	2.	Amweld	Series:	5300			
	3.	CECO	Series:	Imperial/Fuego			
	4.	Steelcraft	Series:	L-16 (Foam Core)			
E.	Exterior Frames						
	1.	Curriers	Series:	Flush Frames			
	2.	Amweld	Series:	400			
	3.	CECO	Series:	CF34			
	4.	Steelcraft	Series:	F14 F16			

F. Interior Frames in Gypsum Board Partitions:

1.	Curriers	Series:	Flush Frame
2.	Amweld	Series:	400
З.	CECO	Series:	F34
4.	Steelcraft	Series:	F14, F-16

G. Substitutions: Under provisions of Section 01630.

2.02 DOORS AND FRAMES

- A. Exterior and Vestibule Doors: SDI-100 Grade III Model 4, NAAMM 18 ga. minimum face thickness, galvanized, G60 coating designation in accordance with ASTM A525, and insulated. All doors shall have welded seams and backing plates for closers.
- B. Interior Doors: SDI-100 Grade II Model 4, NAAMM 18 ga. minimum face thickness.
 All doors shall have wolded soams and backing plates for closers.

All doors shall have welded seams and backing plates for closers.

- C. Exterior and Vestibule Frames: Full miter welded 16 ga. galvanized, G60 coating designation.
- D. Interior Frames: Full miter welded 16 ga. galvanized.

2.03 DOOR CORE

- A. Exterior Doors:
 - 1. Core: Polystyrene or polyurethane foam.
 - 2. Maximum "U" factor: .014.
- B. Interior Doors:
 - 1. Core: Polystyrene or polyurethane foam where acceptable for rated and non-rated doors, except provide mineral fiberboard cores where required for fire rating.

2.04 ACCESSORIES

- A. Metal Filler Panels: SDI-100 Grade III Model 2, 16 ga. minimum face thickness, 1-3/8 in. panel thickness, galvanized to G60 coating designation in accordance with ASTM A525, with polystyrene or polyurethane foam core.
- B. Rubber Silencers: Products of door manufacturer, Glynn Johnson, Builders Brass, Quality, Ives, or Russwin.
 - 1. Provide three for each single door frame; two for each pair of door frames without mullion; and three for each door in a pair of doors frame with a mullion.
 - 2. Type: Removable, suitable for metal frames, similar and equal to Glynn Johnson GJ64.
 - 3. Install prior to grouting frames, or make provisions to accommodate installation of silencers.
- C. Filler Panel and Applied Glazing Stops: Rolled steel channel shape, 18 Ga. mitered corners made to a close neat fit; secured with countersunk tamperproof sheet metal screws at minimum 12 in. intervals at glass lites, secured with countersunk style tamperproof sheet metal screws at minimum 6 in. intervals at filler panels. Provide stops with UL label in rated doors and frames.
- D. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat phillips heads for exposed screws and bolts.
- E. Provide anchor types as required for positive fastening to adjacent construction and to comply with scheduled fire label requirements.

2.05 PROTECTIVE COATINGS

A. Primer: Manufacturer's standard baked-on primer, suitable for finish paint specified under Section 09900.

2.06 FABRICATION

- A. Fabricate frames as follows:
 - 1. Exterior frames shall be thermal break type, fabricated with closed cell polyethylene foam, polyvinyl chloride, or other thermal barrier material standard with manufacturer between interior and exterior frame surfaces. Frame connection between jamb and head shall be fully welded, ground smooth and galvanizing touch-up. Frames shall be prepared for plate and pipe or butterfly existing opening type anchors. Coordinate with Section 07214.
 - 2. Fabricate galvanized frames as full miter welded unit type. Frame connection between jamb and head shall be fully welded and seamless. Accurately cope and securely weld butt joints of mullions of glazed lights. Grind welded joints to smooth uniform finish. Provide with 4 in. face at head as required for masonry wall coursing.
- B. Fabricate frames and doors with hardware reinforcement plates welded in place. Provide mortar guard boxes, minimum 26 ga.
 - 1. Hinge reinforcement: Minimum 10 ga.
 - 2. Closer reinforcement: Minimum 12 ga.
 - 3. Lock reinforcement: Minimum 14 ga.
 - 4. Finish Hardware Preparation: Prepare doors and frames to receive mortised and concealed finish hardware in accordance with final finish hardware schedule and templates provided by hardware supplier, surface applied hardware preparations provided with function holes, drilling and tapping to be done in field. Comply with applicable requirements of ANSI A115 for door and frame preparation for hardware.
 - 5. Locate finish hardware as shown on final shop drawings.
 - 6. Removable mullions for double doors specified in Section 08700. Reinforce head sections where mullions occur.
- C. Prepare frame for silencers, three single rubber silencers for single doors on strike side, and two single silencers on frame head at double doors without mullions.
- D. Attach fire rated metal label to each rated frame and door unit where visible when doors are in open position.
 - 1. Provide labeled frames with integral or applied smoke gaskets in accordance with IBC. Coordinate with Section 08700.
 - 2. Refer to Drawings for class requirements.
 - 3. Where oversize metal doors and frames are required, provide certification and information required by applicable authorities for approval.

- E. Close top edge of exterior door flush with inverted steel channel closure. Seal joints watertight. Close bottom edge of exterior door with steel channel closure.
- F. Anchor metal filler panels in place and seal with continuous beads of sealant specified in Section 07900, by "interior dry method", specified in Section 08800, to provide waterproof and weathertight installation.
- G. Doors beveled 1/8 in. in 2 in. at lock edge only.

2.07 FINISH

- A. Exterior Units: Galvanized, ASTM A525, G60 coating designation. Galvanize after fabrication and hardware preparation. Shop prime.
- B. Interior Units: Shop prime.
 - 1. Clean, treat, and paint exposed surfaces of steel door and frame units, including galvanized surfaces and back side of frames, with one coat factory applied baked on rust inhibitive primer paint. Touch up areas where factory coating has been removed due to sanding, welding, or handling.
 - 2. Fill surface depressions with metallic paste filler and grind to smooth uniform finish, ready to receive gloss finish.
- C. Primer: Baked on, compatible with finish coat.
- D. Field painting specified under Section 09900.

PART 3 EXECUTION

3.01 INSPECTION

- A. Installer must examine substrate and conditions under which steel doors and frames are to be installed and must notify Contractor in writing of any conditions detrimental to proper and timely completion of work.
- B. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to installer.

3.02 INSTALLATION

- A. General: Install steel doors, frames and accessories in accordance with final shop drawings and manufacturer's data, and as herein specified.
 - 1. Placing Frames: Comply with provisions of SDI-105 "Recommended Erection Instruction for Steel Frames," and as otherwise indicated.
 - 2. Install rated doors and frames in accordance with NFPA 80.
- B. Install frames in accordance with Drawings, SDI-100, SDI-105, SDI-111, and manufacturer's accepted shop drawings.

- C. Install non-rated doors in accordance with DHI.
- D. Coordinate with all construction for anchor placement.
- E. Coordinate installation of glass and glazing.
- F. Install stiffening roll formed steel reinforcement channels between two abutting frames. Anchor to structure above and to floor.
 - 1. Install steel splice plate reinforcement between abutting frames as required for field splicing.
 - 2. Secure a metal clip angle at bottom of each jamb and permanent mullion member of anchoring to floor, with a minimum of 2 fasteners.
- G. Frames in drywall: Seal frames at sound walls. Provide base anchors for all frames with openings more than 3'-0" wide, plus one compression anchor per jamb for "slip-on" type frames, three anchors per jamb for welded frames, and mullion section base and head anchors. Provide anchors at jambs of borrow lites and sidelites as above, plus two sill anchors. Attach base anchor to floor with power tool.
- H. Frames in CMU: To extent practicable, install concurrently with installation of CMU, with minimum three T-strap, adjustable or wire masonry anchors per jamb. Masonry anchors shall be required for rated frame installation, and a minimum of 7 ga. mild temper steel for wire anchors. In masonry construction, locate three wall anchors per jamb at approximately hinge and strike levels. Frames shall be Galvanized, back primed and solid grouted per manufacturer's recommendations.

3.02 TOLERANCES

- A. Maximum Diagonal Distortion: 1/16 in. measured with straight edge, corner to corner.
 - 1. Fit hollow metal doors accurately in frames, within clearances specified in SDI-100.
 - 2. Place fire-rated doors with clearances specified in NFPA 80.
- 3.03 ADJUSTING AND CLEANING
 - A. Adjust hardware for smooth and balanced door movement.
 - B. Sound Doors:
 - 1. After finish hardware is installed, adjust operating parts for smooth operation and continuous contact between seals and adjoining surfaces.
 - 2. Assure no gaps occur between head, jamb and threshold seals. Visually inspect sound door assemblies in closed position for light leaks to identify potential acoustic leaks. Adjust to achieve light seal.

- 3. Adjust threshold seal to be in full contact with floor or threshold, as appropriate.
- C. Prime Coat Touch Up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.
- D. Final Adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

SECTION 08211

WOOD DOORS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Solid core doors with wood veneer faces.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 08111 Steel Doors and Frames
 - 2. Section 08700 Door Hardware
 - 3. Section 09900 Painting and Finishing

1.03 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of door, including details of core and edge construction, trim for openings and louvers, and factory-finishing specifications.
- C. Shop drawings indicating size, elevation, details of construction, location and extent of hardware blocking, fire ratings and other pertinent data.

1.04 QUALITY ASSURANCE

- A. AWI Quality Standard: "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute for grade of door, core, construction, finish, and other requirements.
- B. Fire Rated Wood Doors: Provide wood doors that comply with NFPA 80; are identical in materials and construction to units tested in door and frame assemblies per ASTM E 152; and are labled and listed by UL, Warnock Hersey, or another testing and inspection agency acceptable to authorities having jurisdiction.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's instructions.
 - 1. Comply with WIC Technical Bulletin 420-R for delivery, storage, and handling of doors.
 - 2. Comply with manufacturer requirement for handling of lead lined wood doors.
- 1.06 PROJECT CONDITIONS
 - A. Conditioning: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.
- 1.07 WARRANTY
 - A. General Warranty: Door manufacturer's warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
 - B. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form signed by manufacturer, Installer, and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) more than 1/4 inch (6.35 mm) in a 42-by-84-inch (1067by-2134-mm) section or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 75-mm) span, or do not conform to tolerance limitations of referenced quality standards.
 - 1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.
 - 2. Warranty shall be in effect for life of installation.

PART 2 – PRODUCTS

- 2.01 MANUFACTURERS
 - A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering doors that may be incorporated in the Work include, but are not limited to, the following:

- B. Solid Core Door Manufacturer: Subject to compliance with requirements, provide doors by one of the following:
 - 1. Algoma Hardwoods Inc.
 - 2. Ampco Products, Inc.
 - 3. Buell Door Co.
 - 4. Chappell Door Co.
 - 5. Eagle Plywood & Door Manufacturing, Inc.
 - 6. Eggers Industries, Architectural Door Division.
 - 7. Fenestra Corporation.
 - 8. Graham Manufacturing Corp.
 - 9. Haley Brothers, Inc.
 - 10. Ideal Wood Products, Inc.
 - 11. IPIK Door Co., Inc.
 - 12. Marlite.
 - 13. Poncraft Door Co.
 - 14. Ragland Manufacturing Co., Inc.
 - 15. V-T Industries Inc.
 - 16. Weyerhauser Co.
- 2.02 INTERIOR FLUSH WOOD DOORS
 - A. Solid Core Doors for Transparent Finish: Comply with the following requirements:
 - 1. Faces: Select Birch, book matched.
 - 2. Grade: Premium.
 - 3. Construction: 5 plies.
 - 4. Core: Glued-block core.
- 2.03 FABRICATION
 - A. Fabricate flush wood doors to comply with the following requirements:
 - 1. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels:
 - a. Comply with clearance requirements of NFPA 80 for fireresistance-rated doors.
 - 2. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI A115-2 series standards, and hardware templates.
 - a. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory machining.
 - B. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.

2.04 FACTORY FINISHING

- A. General: Comply with referenced quality standard's requirements for factory finishing.
- B. Finish wood doors at factory.
- C. Transparent Finish: Comply with requirements indicated for grade, finish system, staining effect, and sheen.
 - 1. Grade: Premium
 - 2. Finish: AWI System TR-6 catalyzed polyurethane.
 - 3. Staining: None required.
 - 4. Effect: Filled Finish
 - 5. Sheen: Semi-gloss
- D. Finish Color and Sheen: Inspect existing doors carefully to match manufacturer's color samples with existing adjacent transparent finished doors.

PART 3 – EXECUTION

- 3.01 EXAMINATION
 - A. Examine installed door frames prior to hanging door:
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
 - 2. Reject doors with defects.
 - B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Hardware: Verify hardware requirements prior to installation. Prepare door for hardware indicated.
- B. Job-Fit 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 with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
 - 1. Fitting Clearances for Non-Fire-Rated Doors: Provide 1/8 inch (3.2 mm) at jambs and heads, 1/16 inch (1.6 mm) per leaf at meeting stiles for pairs of doors, and 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering. Where threshold is shown or

scheduled, provide 1/4-inch (6.4-mm) clearance from bottom of door to top of threshold.

- 2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
- C. Field-Finished Doors: Refer to the following for finishing requirements:
 - 1. Division 9 Section "Painting and Finishing."
- 3.03 ADJUSTING AND PROTECTION
 - A. Operation: Re-hang or replace doors that do not swing or operate freely.
 - B. Finished Doors: Refinish or replace doors damaged during installation.
 - C. Protect doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration at the time of Substantial Completion.

SECTION 08610

PLASTIC WINDOWS

- PART 1 GENERAL:
- 1.01 DESCRIPTION:
 - A. Section Includes: Fiberglass windows with painted exterior and interior finish of casement windows.
- 1.02 RELATED SECTIONS:
 - A. Section 07920 Joint Sealants
 - B. Section 08800 Glazing
- 1.03 REFERENCES:
 - A. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI):
 - 1. ANSI/AAMA 101-99 "Voluntary Specification for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors".
 - B. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):
 - 1. ASTM D 4726-02 "Standard Specification for Rigid Poly(Vinyl chloride) (PVC) Exterior-Profile Extrusions Used for Assembled Windows and Doors".
- 1.04 SUBMITTAL:
 - A. Reference Section 01 33 00–Submittal Procedures; submit following items:
 - 1. Product Data.
 - 2. Shop Drawings: Include window schedule, window elevations, sections and details, and multiple window assembly details.
 - 3. Samples:
 - a. Color Samples: Minimum 1x4 inch (25x100 mm) paint color chips on fiberglass substrate.
 - b. Glass, SunCoat MAX, Azurlite.
 - 4. Quality Assurance/Control Submittals:
 - a. Qualifications: Proof of manufacturer's qualifications.
 - b. U-Factor and structural rating charts required for AAMA and NFRC labeling requirements.
 - c. Installation Instructions AAMA 2400.

- B. Closeout Submittals: Reference Section 01 78 00–Closeout Submittals; submit following items:
 - 1. Temporary window labels marked to identify windows that labels were applied to.
 - 2. Maintenance instructions.
- C. WARRANTIES AND GUARANTEES:
 - 1. Submit manufacturer's standard warranties and guarantees.
 - 2. Submit Project Warranty.
 - 3. Include reviewed, annotated, and executed warranties and guarantees in Operation and Maintenance Manual submittal.

1.05 QUALITY ASSURANCE

- A. Overall Standards: Comply with ANSI/AAMA/NWWDA 101/I.S.2, except as otherwise noted herein.
- B. Qualifications:
 - 1. Manufacturer Qualifications:
 - a. Minimum five years experience in producing fiberglass windows of the type(s) specified.
 - b. Member AAMA, NFRC, SIGMA.
- C. Regulatory Requirements:

D. Certifications for insulated glass windows:

- 1. AAMA: Windows shall be Silver Label certified with label attached to frame per AAMA requirements.
- 2. NFRC: Windows shall be NFRC certified with temporary U-factor label applied to glass and an NFRC tab added to permanent AAMA frame label.
- 1.06 DELIVERY, STORAGE, AND HANDLING
 - A. Reference Section 01 66 00–Product Storage and Handling Requirements.
 - B. Provide cardboard corner boots and full stretch wrap shipping protection.
 - C. Follow manufacturer's instructions on label applied to windows.

1.07 WARRANTY

- A. Commercial Special Warranty:
 - 1. 10 year guarantee.
 - 2. Guarantee windows against defects in materials and workmanship including costs for parts and labor.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Milgard Manufacturing, Inc. Tel: (800) MILGARD (645-4273) 1010 54th Avenue East (253) 922-2030 Tacoma, WA 98424 Fax: (253) 926-0848 E-mail: <u>mgallant@milgard.com</u> Website: http://www.milgard.com/
- B. Window Series: Milgard Ultra[™].
- C. Substitutions: Reference Section 01630 Product Substitutions.

2.02 MATERIALS

- A. Fiberglass: AAMA 305 glass fiber reinforced thermoset profile.
- 2.03 GENERAL PERFORMANCE REQUIREMENTS
 - A. Thermal Performance: Comply with NFRC 100.
 - B. Air Leakage, Water Resistance, Structural Test: Comply with ANSI/AAMA /NWWDA 101/I.S.2.
 - C. Forced-Entry Resistance: Comply with CAWM 301-90.

2.04 WINDOW TYPES

- A. Casement 3510 Series, 1-3/8 inch (35 mm) nail fin setback:
 - 1. Frame: Minimum 3-1/4 inch (83 mm) deep, multi-chambered fiberglass pultrusion.
 - 2. Sash: Minimum 2-3/8 inch (60.3 mm) deep, multi-chambered fiberglass pultrusion.
 - 3. Structural Class: C-C40.
 - 4. Hardware:
 - a. Dual steel arm rotary operator with fold-down handle.
 - b. Single lever, multi-point, locking mechanism.
 - c. Four bar stainless steel hinge.
 - 5. Weatherstripping: Vinyl compression bulb seal.

2.05 GLAZING

- A. Insulated Glass Units: ASTM E 774, Class A, 7/8 inch (22 mm) thick overall:
 - 1. Glazing Type: Clear/SunCoat[™] Low-E, argon gas filled.
 - 2. Spacer Bar: Aluminum spacer.

2.06 INSECT SCREENS:

- A. Provide tight-fitting screen for operating sash with hardware to allow easy removal.
 - 1. Screen Cloth: Charcoal colored fiberglass mesh.
 - 2. Frame: Cambered formed aluminum with rigid plastic corner keys.

2.07 FABRICATION

- A. Fabricate frames and panels with milled and mitered joints and mechanically joined corners. Trim and finish corners to match adjacent surfaces.
- B. Provide concealed metal reinforcement in sash frame for attaching lock mechanism.
- C. Factory exterior wet silicone glaze with snap-on fiberglass glazing stops matching interior sash and frame finish, except where field glazing is required due to large window unit dimensions (over 40 sf (3.72 m²)). Units shall be reglazeable without dismantling sash framing.

2.08 FINISH

- A. Frame and Sash.
 - 1. Exterior: Brownstone and Sand baked on enamel.
 - 2. Interior: White baked on enamel.
- B. Hardware: Satin Chrome.
- C. Screen Frame Color:
 - 1. Interior Mounted Screens: White.

2.09 SOURCE QUALITY CONTROL

A. Inspect windows in accordance with manufacturer's Quality Control Program as required by AAMA Silver Label certification.

PART 3 EXECUTION

- 3.01 EXAMINATION
 - A. Examine openings in which windows will be installed.
 - 1. Verify that framing complies with AAMA 2400.
 - 2.
 - 3. Verify that fasteners in framed walls are fully driven and will not interfere with window installation.
 - B. Coordinate with responsible entity to correct unsatisfactory conditions.

C. Commencement of work by installer is acceptance of substrate conditions.

3.02 INSTALLATION

- A. Install windows in framed walls in accordance with AAMA 2400.
 - 1. Provide continuous shim support along full length of sill.
- B. Do not remove temporary labels.
- C. Install insect screens on operable sash.

3.03 CLEANING

- A. Reference Section 01 74 00-Cleaning and Waste Management.
- B. Remove temporary labels and retain for Closeout Submittals.
- C. Clean soiled surfaces and glass using a mild detergent and warm water solution with soft, clean cloths.

SECTION 08700

DOOR HARDWARE

PART 1 – GENERAL

- 1.01 RELATED DOCUMENTS
 - A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- 1.02 SUMMARY
 - A. 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 08111 Steel Doors and Frames

1.03 REFERENCES

- A. Standards
 - 1. ANSI/BHMA A156.18 1993 Materials and Finishes
 - 2. NFPA 80 1995 Standard for Fire Doors and Windows
 - 3. Underwriters Laboratories Building Materials Directory

1.04 SUBMITTALS

- A. General Requirements: All Submittals shall be in accordance with Section 01340, Submittals.
- B. Product Data: Submit Six (6) copies of manufacturer's data for each item of finish hardware
- C. Hardware Schedule: Submit Six (6) copies of a detailed Finish Hardware Schedule. The submitted Finish Hardware Schedule shall indicate the complete designation of every item required for each door or opening. List each opening individually. Each heading shall indicate opening location, handing, degree of opening, door size, type, fire rating, Door and Frame material. Indicate product Manufacturer and incorporate crossreference to symbols used in paragraph 2.03 Hardware Schedule. A cross reference for any abbreviations or symbols used shall be included. Schedules in coded or horizontal format are unacceptable. Submittals not conforming to these requirements will be returned without review, for resubmittal. The following is a example of the required format:

1	Sgl. Door:	#B146-1	- Corridor B177 to Hall B146 RH 90°
	0		HW-73-0 x 7-0 x 1-3/4" x 20 Minute x Type B
			SC WD x HMF
З	Each Butts:	HA	BB1279 US26D (652) 4.5 x 4.5 x 1/2MS
1	Lockset:	SC	L9070P 06L 626 RH
1	Door Closer	: LCN	4041 Alum. (689) Hinge Face Mounted x STB
1	Kick Plate:	TI	B3EKP - 10 x 34.5 - US32D (.050) x B4E x
			CTSK
1	Wall Stop:		BBW W551X US26D (626)
1	Set Smoke (Gasket:	
		PE	S88D - 17' per Set

The Finish Hardware Submittal shall be kept current throughout the project duration. All revisions incorporated shall be submitted in accordance with the above requirements. Submit only cover sheet and revised pages. All revisions shall clearly identify changes from previous submittal content.

- D. Samples: If requested by the Contracting Officer, submit one (1) sample of each exposed hardware category, finished as required, and tagged with full description for coordination with the hardware schedule. Samples will be reviewed, by the Contracting Officer, for design and finish only, compliance with other requirements is the responsibility of the Contractor. Units which are acceptable and remain undamaged through submittal procedures may be used on the project.
- E. Color Samples: Submit Six (6) set of color charts and physical samples of each product requiring color selection.
- F. Templates: Furnish hardware templates for each fabricator of doors, frames and other work to be factory prepared for the installation of hardware. Upon request, check the shop drawings of such other work to confirm that provisions will be made for the proper installation of hardware.
- G. Key Schedule: A Key Schedule and index shall be included in the Finish Hardware submittals indicating door number and locking function of each Opening for the use of the Owner and/or Contracting Officer in development of a Keying System.
- H. Wiring Diagrams. After receipt of Finish Hardware Schedule Approval, Submit Six (6) copies a separate list of all Electronic Hardware, crossreferenced to the Finish Hardware Submittal and Door Schedule. Include Voltage requirements and along with Product Data and Installation instructions. Where multiple integrated products have been specified, provide terminal-to-terminal wiring diagrams of the system along with riser diagrams and description of system function.
- I. Operations and Maintenance Data.
 - 1. Prior to substantial completion, furnish Four (4) Copies of Maintenance and Operations Manuals, furnished in a clearly marked, tabbed, 3-ringed binder. Manuals shall contain final copy of the Finish Hardware Submittal, Product Data, Templates, Key Schedule, Installation Instructions, Wiring Diagrams, and Warrantees.
- 1.05 QUALITY ASSURANCE
 - A. Supplier: Finish hardware shall be supplied by a recognized builders' hardware supplier who has been furnishing hardware in the same area as the project for a period of not less than five (5) years. They shall be a factory authorized distributor of the Exit Devices, Locksets and Door Closers. The supplier's organization shall include a member of the American Society of Architectural Hardware Consultants who is available at all reasonable times during the course of the work to meet with the Owner, Contracting Officer or Contractor for project hardware consultation.
 - B. Source: Obtain each kind of Hardware (Butts, Locksets, Exit Devices, Door Closers, etc.) from only one manufacturer, although several may be indicated as offering products complying with requirements.
 - C. Installer: Finish hardware shall be installed only by experienced tradesmen in compliance with trade union jurisdictions, either at the door and frame fabrication plant or at the project site.
 - D. Regulatory Requirements:
 - 1. All finish hardware shall comply with applicable local and/or state current building codes.
 - 2. Hardware for fire-rated openings shall also be in compliance with all fire building codes applicable to the district in which the building is located. Provide only hardware which has been tested and listed by "UL" for the types and sizes of doors required, and which complies with the requirements of the door and door frame labels.

1.06 PRODUCT HANDLING AND STORAGE

- A. The final hardware schedule. Basic installation instructions shall be included in the packages.
- B. Storage: Provide a locked room at the jobsite for the storage of the hardware.

1.07 WARRANTY

- A. Finish hardware shall be guaranteed against defects in workmanship and operation for a period of one (1) year, backed by a factory guarantee of the hardware manufacturer. The following products shall be guaranteed for periods beyond One (1) Year:
 - 1. Locks Two (2) Years
 - 2. Door Closers Ten (10) Years
- B. No liability shall be assumed by the hardware supplier where faulty operation is due to improper installation or failure to exercise normal maintenance.

1.08 MAINTENANCE

- A. Furnish the following extra materials, which shall be delivered directly to the Owner prior to substantial completion.
 - 1. Provide One (1) Set of Special Tools required for Installation and Adjustment
 - 2. Extra Hardware:

<u>Quantity</u>	Description
Two (2)	Locksets
Two (2)	Door Closers

PART 2 – PRODUCTS

2.01 MATERIALS

A. Products may be furnished by the Manufacturers as specified below, or equivalent products of type, grade, design and function, from Manufacturers listed as Acceptable substitutions. Any requests for products not listed must be made in accordance with Section 01631, Product Substitutions, prior to bid.

Produ	<u>ct</u>	As Specified	Acceptable Substitutions
1.	Butts	Hager	Stanley, McKinney, Lawrence
2.	Locksets and Cylinders	Schlage	None
3.	Push/Pull Latches	Glynn Johnson	None
4.	Door Closers	LCN	None
5.	Floor and Intermediate Pivot Sets	Rixson	None
6.	Door Pulls, Push and Pull Plates	Builders Brass	Tice, Trimco
		Works Quality,	
7.	Kick & Mop Plates	Tice	Builders Brass Works, Quality,
			Trimco
8.	Wall and Floor Stops	Builders Brass	Glynn Johnson, Quality,
			Trimco

- 9. Overhead Stop and Holders Glynn-Johnson Rixson, ABH
- 10. Electro-Magnetic Dr Release
- 11. Weatherstrip & Thresholds

Rixson-Firemark LCN Pemko National Guard, Reese

- B. Finish: Finish in general to be: US26D, Satin Chrome Plated, except:
 - 1. Locksets, Push Plates, Door Pulls, Kick Plates, Overhead Stops: US32D, Satin Stainless Steel
 - 2. Door Closers: Sprayed Aluminum (BHMA 689)
 - 3. Smoke Gasketing: As Selected.
 - 4. Threshold, Weatherstrip & Door Bottoms: As listed

C. Butts:

1. Quantity (per Leaf):

Door Openings up to 60": 2 Each Door Openings 60 to 90": 3 Each Doors Over 90": Furnish one(1) additional for each 30" increment or fraction thereof.

2. Sizes:

1-3/4" Exterior & Vestibule Doors -- 5 x 4-1/2" 1-3/4" Interior Doors up to and including 36" -- 4-1/2 x 4-1/2" 1-3/4" Interior Doors over 36" -- 5 x 4-1/2"

- 3. Width of Hinges shall be as require to clear projecting trim or other conditions to allow maximum degree of opening
- 4. Out Swinging Locked doors to have non-removable pins (NRP Set Screw in Barrel)
- 5. For unusual size or weight doors, furnish type, size and quantity recommended by the hinge manufacturer.
- D. Locksets and Cylinders
 - 1. Furnish all Lever Handle Locksets and Latches in Sparta Design.
 - 2. Backset: 2-3/4"
 - 3. All Locksets and Latchsets shall be listed with Underwriters Laboratories for A label and lesser class doors.
 - 4. Provide Knurled Lever at all Hazardous Location
 - 5. Provide Curved Lip Strikes with adequate projection to protect door trim.
 - 6. Provide manufacturers standard wrought or plastic strike boxes.

- E. Door Closers
 - 1. Furnish drop plates where required.
 - 2. Furnish cold weather fluid, at exterior & vestibule doors.
 - 3. Provide special closer mounting as required where interference with weatherstrip or sound seals occurs.
 - 4. Furnish Shoulder Thru Bolts for all Wood Doors
- F. Kick & Mop Plates
 - 1. Kick Plates shall be applied to the Push Side of the Door, Mop Plate applied to the Pull Side.
 - 2. Height: Kick Plates 10", Mop Plates 6", Armor Plates 34"
 - 3. All plates shall be furnished with width as required to provide 1/4" clearance at sides of doors and stops.
- G. Stops & Holders
 - 1. Furnish Overhead Stop and Holders sized as recommended by Manufacturer.
 - 2. Furnish Overhead Stop and Holders with Special Shims, Brackets, or Special Template Mounting where required.
 - 3. Coordinate Voltage location requirements for Magnetic Holders with Electrical Contractor.
 - 4. Where wall stops are not applicable, furnish floor stops F8061 or F8063 Series, or Overhead Stops if required.
- H. Thresholds: Furnish all Thresholds with #10 Phillips Head Stainless Steel Machine Screws and Lead Anchors.
- I. Weatherstrip and Smoke Gasketing: Where it occurs weatherstrip shall be applied to both sides of a mullion
 - J. Door Silencers
 - 1. Furnish Rubber Door Silencers for all openings not specified to have Smoke Gasketing or Weatherstrip.
 - 2. Quantity: Furnish three (3) for each single door frame, and four (4) for each pair of door frames.
 - 3. Type W07 for metal frames, and W06 for wood frames.

2.02 KEYING

- A. All Locksets and Cylinders for this project shall be Keyed per the Owner's Instruction.
- B. Provide Construction Cylinders and Keys during the construction period.
- C. The Finish Hardware Supplier shall meet with the Owner to prepare the permanent keying schedule.
- D. The Permanent Cylinders, Change Keys, and Control Keys, prepared according to the approved keying schedule, shall be transmitted directly to the Owner, prior to substantial completion. The General Contractor, shall remove the construction cylinders and install the permanent cylinders. All Construction Cylinders shall be returned to the Finish Hardware Supplier.
- E. All Permanent Cylinders and Keys shall be sent via Registered Mail, Return Receipt Requested, to the Owner.
- F. Stamp all Keys "Do not Duplicate" and with change designation as directed.
- G. Furnish:
 - 1. Six (6) Building Grand Master Keys
 - 2. Six (6) Master Keys per Set
 - 3. Four (4) change keys per Lockset or Cylinder.
 - 4. Four (4) Construction Keys
- 2.03 HARDWARE GROUPS

HW- 1

Door #101, 105, 106, 107, 108, 109, 112, 113, 117, 119, 120, 121, 122A, 122B, 123, 124, 125, 126, 130, 132, 133A, 133B, 134, 135, 136, 137, 139, 141, 142. 3 Each Butts HA BB1279

- 3 Each buils HA BB1279
- 1 Lockset SC D70TD-SPA-626
- 1 Door Closer LCN 4041-cush
- 1 Kick Plate TI B4EKP
- 1 Wall Stop BBW W9
- 1 Gasket Pemko S88D-17'
- * Note: At Doors 113 and 137 keyed side of Lockset shall be facing Corridor 113

HW-2

Doors # 100B, 128B, 129

- 3 Each Butts HA BB1168 5 x 4.5
- 1 Door Closer LCN 4111-SCUSH
- 1 TICE PUSH Pull Set 3347 12" CTC
- 1 Kickplate TI B4EKD
- 1 Wall Stop BBW W9
- 3 Silencers
- *Note: At Door 129 provide 1 Lockset SCD70TD-SPA-626 in lieu of Push Pull set.

HW- 3

Doors # 102, 103, 116, 131, 138

3 Each Butts HA BB1279

- 1 Privacy Lock SC D40S-SPA-626
- 1 Door Closer LCN 4041-RA
- 1 Kick Plate TI B4EKP
- 1 Wall Stop BBW W9
- 1 Gasketting Pemko S88D-17'

HW-4

Doors # 100A, 128A

3 Each Butts HA BB1199 5 x 4.5 x NRP 630

- 1 Lockset Simplex 8146S 26Dx Removable Construction Core
- 1 Cylinder Lock SC B864T
- 1 Door Closer LCN 4111- SCUSH
- 1 Kick Plate TI B4EKP
- 1 Threshold PE 253X3AFGx Pemkote
- 1 Set Weatherstrip PE 45061CP
- 1 Door Bottom PE 345AV
- 1 Rain Drip PE 345A

* **Note:** At Clinic Entry Door 100A and 128A provide "Simplex" 8146 Lock, with removable core cylinder.

HW- 5

Door # 143

- 3 Each Butts HA BB1279
- 1 Lockset SC D70TD-SPA-626
- 1 Kick Plate TI B4EKP
- 1 Wall Stop BBW W9
- 1 Gasket Pemko S88D-17'

HW- 6

Door # 114

- 3 Each Butts HA BB1168 5 x 4.5
- 1 Door Closer LCN 4111- SCUSH
- 1 Armorplate TI 34 x 46 630
- 1 Gasket Pemko S88D-17'
- 4 Silencers

HW- 7

Door # 111

- 3 Each Butts HA BB1199 w / non removable pins
- 1 Lockset SC D50TD-SPA-626
- 1 Cylinder Lock SC B864T
- 1 Door Closer LCN 4111xST2265
- 1 Kick Plate TI B4EKP
- 1 Threshold PE 253X3AFGx Pemkote
- 1 Set Weatherstrip PE 45061CP
- 1 Door Bottom PE 18062CP
- 1 Rain Drip PE 345A
- * Note: At Door 111 provide "Simplex" 8146 Lock, with removable core cylinder.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Provide solid blocking for all wall stops.
- B. Fasteners: Check all conditions and use fastening devices as needed to securely anchor all hardware as per manufacturer's published templates. Self-tapping sheet metal screws are not acceptable. All closers and exit devices on wood doors shall be thru-bolted.

3.02 INSTALLATION

- A. Mounting Heights: Mount units at height recommended in "Recommended Locations for Builders' Hardware" by NBHA except as otherwise indicated.
 - 1. Locate Lever Handles at 38", finish Floor to Center of Lever.
 - 2. Products not specifically cover by the above shall be installed in accordance with the manufacturers templates and instructions.
- B. Install each hardware item in compliance with manufacturer's instructions.
 - 1. Wherever cutting and fitting are required to install hardware surfaces which will be painted or finished at a later time, install each item completely and then remove and store in a secure place. After completion of the finishes, re-install each item.
 - 2. Do not install surface-mounted items until finishes have been completed on the substrate.
 - 3. Furnish Overhead Stop and Holders with maximum degree of opening that project conditions will allow.
 - 4. Locate Floors Stops at maximum degree of opening that project conditions will allow. Do not locate Floor Stops where they create a hazardous condition. Stops should be located no more than 1/3 Door width from the Latch Edge of the Door.
- C. Adjust and check each operating item of hardware and each door to insure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly.

3.03 ADJUSTMENT

- A. Wherever hardware installation is made more than one (1) month prior to acceptance or occupancy, make a final check and adjustment of all hardware items during the week prior to acceptance or occupancy. Clean and lubricate operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- B. Instruct Owner's Personnel in proper adjustment and maintenance of hardware and hardware finishes.

END OF SECTION

SECTION 08800

GLAZING

PART 1 - GENERAL

- 1.01 RELATED DOCUMENTS
 - A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- 1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS
 - A. Section 08111 Steel Doors and Frames
- 1.03 OPTIONS
 - A. Contractor may, at his option, install Hollow Metal Door Glazing in Field or in Factory.
- 1.04 REFERENCED SPECIFICATION
 - A. COMPLY WITH APPLICABLE PORTIONS OF:
 - 1. Glazing Manual published by Flat Glass Marketing Association, hereinafter referred to as FGMA; White Lakes Professional Bldg.; 3310 Harrison; Topeka, Kansas 66611; (913) 266-7013.
 - 2. Insulating Glass manufacturing and installation recommendations of Sealed Insulating Glass Mfrs. Assn, hereinafter referred to as SIGMA; 111 E. Wacker Dr.; Chicago, IL 60610; (312) 644-6610.
 - B. COORDINATION

Coordinate with other Trades affecting or affected by Work of this Section.

C. REGULATORY AGENCY REQUIREMENTS

Comply with Safety Glazing requirements of Building Code, Section 2406.

- D. PRODUCT DELIVERY
 - 1. Schedule to coincide with glazing schedule.
 - 2. Original Labels, showing Manufacturer, quality, and thickness are required for each piece of Glass. Where Labels must be removed for Glass cutting, save Labels for Contracting Officer's review.
 - 3. Deliver other Glazing Materials in Original Containers with Manufacturer's original legible Labels thereon.

E. PRODUCT STORAGE AND HANDLING

- 1. Protect against damage and discoloration.
- 2. Prevent Glass to Glass contact.
- 3. Do not overload Structure with stored Materials.
- 4. Store crated Glass in cool, dry, shady, well ventilated area, which is not subject to Sun, Rain, or other Elements.
- 5. Block Crates 2 to 6 inches above Floor.
- 6. Secure Crates against accidental overturning.
- 7. Cover Crates with Waterproof Plastic or Canvas. Maintain sufficient air circulation under Cover to prevent Condensation within Crates.
- F. ENVIRONMENTAL CONDITIONS
 - 1. Do no glazing when:
 - a) Air Temperature is below 40 °F.
 - b) Sufficient Dust is present that could impair Glazing Compound adhesion.
 - c) During wet Weather except under Cover.

G. FIELD MEASUREMENTS

- 1. Verify prior to fabrication.
- 2. If field measurements differ slightly from Drawing dimensions modify Work as required for accurate fit. If measurements differ substantially, notify Contracting Officer prior to fabrication.
- H. SPECIAL WARRANTY
 - 1. Provide the following extended Warranties:
 - a) Insulating Glass against Edge Seal Failure: 10 years
 - b) Mirrors against De-silvering: 5 years

PART 2 - PRODUCTS

2.01 GLASS

- A. APPROVED GLASS MANUFACTURERS:
 - 1. Cardinal Insulating Glass, hereinafter called CIG
 - 2. Ford Glass, hereinafter called FG
 - 3. Guardian Glass, hereinafter called GG
 - 4. Hordis Bros., hereinafter called HB
 - 5. Libbey, Ownes, Ford, hereinafter called LOF
 - 6. Pittsburgh Plate Glass, hereinafter called PPG.
 - 7. Other Manufacturers may be approved by request in accordance with Division 1.

B. FLOAT GLASS

- 1. Approved Manufacturers: FG, GG, LOF, PPG, SD, or approved.
- 2. Manufacturing Standard: ASTM C-1036
- 3. Quality: Glazing Select
- 4. Thickness: Follow Building Code requirements
- C. TEMPERED GLASS
 - 1. Manufacturing Standard: ASTM C-1048
 - 2. Safety Performance Standard: CPSC 16-CFR-1201-C11
 - 3. Glass Type and Thickness: As shown on the drawings.
- D. INSULATING GLASS
 - 1. Manufacturing Standard: SIGMA CBA
 - 2. Edge Material: Sealant conforming to ASTM E-6-P3
 - 3. Glass Type: Low Emissivity Glass
 - 4. Manufacturer: CIG, FG,GG, PPG, South wall, or approved
 - 5. Color: Clear
 - 6. Glass Thickness: 1/4 inch
 - 7. Suspended Inner Layer: Low E on #2 Face
 - 8. Spacer Color: Natural Aluminum
 - 9. Overall Unit Thickness: 1 inch
- E. SETTING BLOCKS
 - 1. Material: EPDM or Neoprene Rubber, unless otherwise required for compatibility with Glazing Compound and Sealant.
 - 2. Shore A Durometer Hardness: 80-90
 - 3. Width: 1/8 inch wider than Glass Unit to be supported and 1/16 to 1/8 inch narrower than Glazing Pocket
 - 4. Length: Sufficient to support Glass Unit without excessive pressure on Glass edge

F. GLAZING COMPOUND

- 1. Manufacturer: Dow, G.E., Gibson-Homans, 3-M, Sonneborn,
- 2. Material:
 - a) For Insulating Glass: Compatible with Glass Edge Sealant and recommended by Insulating Glass Fabricator for condition of use.
 - b) For Factory-glazed Units: Unit Manufacturer's standard Glazing Compound
 - c) For Other Glass Types: At Aluminum Windows: Closed Cell Type Bedding with Silicone Compound
 - d) At Hollow Steelwork: Closed Cell Type Bedding with Silicone Compound

PART 3 - EXECUTION

3.01 EXISTING CONDITIONS

- A. Verify that Openings to be glazed are accurately sized, shaped and located, and free of Fasteners and other Projections which will interfere with glazing.
- B. Verify that Weep System is open.
- C. Verify that Glazing Surfaces are free of Moisture, Dirt, Grease, Oil, or other Deleterious Material.
- D. Verify that any Steel or Wood Glazing Rabbets and any contacting Dissimilar Materials are painted.
- E. Verify that Surfaces to receive Mirrors are structurally sound and capable of supporting Mirrors.
- F. Prior to starting work, notify General Contractor about defects requiring correction.
- G. Do not start Work until conditions are satisfactory.
- 3.02 PROTECTING WORK OF OTHER SECTIONS
 - A. Protect against damage and discoloration caused by Work of this Section.
- 3.03 PREPARATION WORK
 - A. Prior to Glazing, clean, dry, and remove any Protective Coatings from Glass and from surfaces to be glazed.

3.04 GLASS INSTALLATION

- A. General
 - 1. Follow Referenced Specifications and Manufacturer's instructions
 - 2. Allow for Glass expansion and contraction
 - 3. Do not impact Glass against Framing
 - 4. Install Glass with setting Blocks placed at Sill quarter points
 - 5. Do not set any Glass Flares or Bevels adjacent to Setting Blocks
 - 6. Install any Glass Surface Waves running horizontal
 - 7. Shift Glass with Suction Cups; do not use Pry Bar
 - 8. Remove Identity Labels immediately after installation: save for Contracting Officer's review.
- B. Tempered Glass
 - 1. Take particular care to prevent Glass-edge damage
- C. Insulating Glass
 - 1. Follow Glazing Specification for Sealed Insulating Glass Units, SIGMA No. 70-7-1.

3.05 ADJUSTMENTS

- A. Adjust Moving Parts to operate satisfactorily at time of Project Substantial Completion and during Warranty Period
- 3.06 PRODUCT CLEANING AND REPAIRING
 - A. Remove excess Glazing Compound from Glazing and adjacent Surfaces and do a final cleaning.
 - B. Remove Debris form Project Site upon Work completion, or sooner if directed
 - C. Including Work of other Trades, clean, repair and touch-up, or replace when directed, Products which have been soiled, discolored, or damaged by Work of this Section.
- 3.07 PROTECTING COMPLETED WORK
 - A. Protect installed Glazing against breakage and staining
 - B. Identify Glazed Areas with Streamers hanging from Framing. Do not apply directly to Glass.
 - C. Notify General Contractor to prohibit Material storage close enough to Glass to create sufficient Heat Trap to cause Glass breakage.

3.08 GLAZING SCHEDULE

- A. Provide specified Glass in the following locations:
- B. Rated Glazing: Wire Glass
- C. In Doors & Adjacent to Doors: Tempered Glass
- D. Elsewhere: Insulated Float Glass

END OF SECTION

SECTION 09255

GYPSUM BOARD ASSEMBLIES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Steel framing members for gypsum board assemblies.
 - 2. Steel framing for suspended ceiling assemblies.
 - 3. Gypsum board assemblies attached to steel framing.
 - 4. Cement board for tile backing.
 - 5. W/R Gypsum board assemblies attached to steel framing.
 - 6. Galvanized steel backing plate.
 - 7. Gypsum board finishing.

1.03 DEFINITIONS

- A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA-505 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.
- 1.04 ASSEMBLY PERFORMANCE REQUIREMENTS
 - A. Gypsum wallboard shall be sheetrock fire code "Type X", tapered edge, 5/8" thick.
 - B. Gypsum wallboard indicated as moisture resistant shall be 5/8". Firecode "type X" sheetrock W/R gypsum panels.
 - C. Fire rated cement board shall be provided in place of gypsum wallboard where tiles are going to be applied.

1.05 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of product specified.

1.06 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Where fire-resistance-rated gypsum board assemblies are indicated, provide gypsum board assemblies that comply with the required fire rating for each assembly.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

1.08 PROJECT CONDITIONS

- A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 requirements or gypsum board manufacturer's recommendations, whichever are more stringent.
- B. Room Temperatures: For nonadhesive attachment of gypsum board to framing, maintain not less than 40 deg F (4 deg C).
- C. Ventilation: Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials from drying too rapidly.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Steel Framing and Furring:
 - a. Clark Steel Framing, Inc.
 - b. Consolidated Systems, Inc.
 - c. Dale Industries, Inc.
 - d. Dietrich Industries, Inc.
 - e. Marino/Ware (formerly Marino Industries Corp.).
 - f. National Gypsum Co.; Gold Bond Building Products Division.
 - g. Unimast, Inc.

- 2. Gypsum Board and Related Products:
 - a. Domtar Gypsum.
 - b. Georgia-Pacific Corp.
 - c. National Gypsum Co.; Gold Bond Building Products Division.
 - d. United States Gypsum Co.
- 3. Cement Board:
 - a. Domtar Gypsum.
 - b. Georgia-Pacific Corp.
 - c. National Gypsum Co.; Gold Bond Building Products Division.
- B. Products: Subject to compliance with requirements, provide one of the following products where proprietary gypsum wallboard is indicated:
 - 1. Gyprock Fireguard C Gypsum Board; Domtar Gypsum.
 - 2. Firestop Type C; Georgia-Pacific Corp.
 - 3. Fire-Shield G; National Gypsum Co.; Gold Bond Building Products Division.
 - 4. SHEETROCK Brand Gypsum Panels, FIRECODE C Core; United States Gypsum Co.
 - 5. DomCrete Cementitious Tile Backer Board; Domtar Gypsum
 - 6. Wonderboard Multi+Board; Custom Building Products.
 - 7. DurRock Cement Board; U.S. Gypsum Co.

2.03 STEEL FRAMING

- A. For Walls:
 - 1. Provide Steel Studs and Runners complying with: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch- (5-mm-) wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:
 - a. Thickness: 20 gauge minimum.
 - b. Depth: As indicated.

- 2. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.
- B. Ceiling Suspension Systems:
 - 1. Wire Ties and Hangers: ASTM A 641, Class 1 Zinc Coating, 0.62 inch thick.
 - 2. Channels: Cold Rolled steel, 0.059 inch min thickness of vase metal and 7/17 inch flanges. 2 inch carrying channels, 3/4" furring channels, galvanized.
 - 3. Installation to comply with UBC Standard 25-2 for Seismic Zone 4.

2.04 GYPSUM BOARD PRODUCTS

- A. General: Provide gypsum board of types indicated in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application.
 - 1. Widths: Provide gypsum board in widths of 48 inches (1219 mm).
- B. Gypsum Wallboard: ASTM C 36, Type: 5/8" Type X in all locations.
- C. Provide W/R Gypsum Board in all Toilet Rooms, Janitor Closet, and Adjacent To All Sinks.
- D. Accessories for Interior Installation: Cornerbead, edge trim, and control joints complying with ASTM C 1047.
- 2.05 CEMENT BOARD: 1/2" Cement board in maximum sheet size.
- 2.06 SHEETROCK BRAND W/R SEALANT: Apply to all cut edges and screw heads of special moisture wall board used in high moisture room areas.
- 2.07 DRYWALL JOINT TREATMENT MATERIALS
 - A. General: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.
 - B. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated.
 - C. Setting-Type Joint Compounds for Gypsum Board: Factory-packaged, jobmixed, chemical-hardening powder products formulated for uses indicated.

2.08 MISCELLANEOUS MATERIALS

- A. Steel drill screws complying with ASTM C 1002 for fastening gypsum board and cement board to steel members less than 0.033 inch (0.84 mm) thick. Length to penetrate steel framing 1/2" minimum.
- B. Steel Backing Plate: Provide 16 gauge galvanized steel sheet in 8" minimum width, installed horizontally, for backing in areas indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates to which assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.
- 3.02 INSTALLING STEEL FRAMING, GENERAL
 - A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.
 - B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Co.'s "Gypsum Construction Handbook."

3.03 INSTALLING STEEL FRAMING FOR WALLS AND PARTITIONS

- A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.
- B. Install steel studs and furring in sizes and at 16" o.c. unless otherwise indicated.
- C. Install steel studs so flanges point in the same direction and leading edge or end of each gypsum board panel can be attached to open (unsupported) edges of stud flanges first.
- D. Frame door openings to comply with GA-219, and with applicable published recommendations of gypsum board manufacturer, unless otherwise indicated. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

- E. Install 2 studs at each jamb, unless otherwise indicated.
- F. Frame openings other than door openings to comply with details indicated or, if none indicated, as required for door openings. Install framing below sills of openings to match framing required above door heads.
- G. Brace walls at 48" on center with 3-5/8" x 20 ga. metal framing installed at 45 degrees to vertical, from top of wall to roof structure above on all walls which do not extend to underside of steel decking. Patch spray fireproofing damaged at point of connection to metal decking.

3.04 APPLYING AND FINISHING GYPSUM BOARD

- A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.
- B. Locate both edge or 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. Avoid joints other than control joints at corners of framed openings where possible.
- C. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- D. Attach gypsum panels to framing provided at openings and cutouts.
- E. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.
- F. Space screws a maximum of 12 inches (304.8 mm) o.c. for vertical applications.
- G. Gypsum board in concealed locations: Shall be fire taped as required by specific tested assembly, finish coats and paint are not required.
- H. Follow all requirements of listed fire rated assemblies to insure compliance of finished rated wall construction.

3.05 INSTALLING TRIM ACCESSORIES

- A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.
- B. Install cornerbead at external corners.
- C. Install "L" metal adjacent to dissimilar finish materials and adjacent to casework.

3.06 FINISHING GYPSUM BOARD ASSEMBLIES

- A. General: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.
- B. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.
- C. Apply joint tape over gypsum board joints, except those with trim accessories having flanges not requiring tape.
- D. Apply joint tape over gypsum board joints and to flanges of trim accessories as recommended by trim accessory manufacturer.
- E. Finish existing gypsum to provide a smooth, untextured finish for painting.

3.07 CLEANING AND PROTECTION

- A. Promptly remove any residual joint compound from adjacent surfaces.
- B. Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure gypsum board assemblies are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 09260

DRYWALL SUSPENSION SYSTEM

- PART 1 GENERAL
- 1.01 RELATED WORK
 - A. Related work specified elsewhere:
 - 1. Section 09255 Gypsum Board Assemblies
 - 2. Section 09511 Acoustical Ceilings
- 1.02 SYSTEM DESCRIPTION
 - A. A pre-engineered drywall suspension system consisting of straight main tees along with straight furring cross channels or cross tees, that join together to support screw attached gypsum panels and independently supported light fixtures, and air diffusers, where applicable. Where applicable, installed systems must conform to Underwriters Laboratories, Inc. (UL) Fire Resistance Design No. and other applicable codes.

1.03 QUALITY ASSURANCE

- A. Subcontractor qualification: Installer shall have successful experience installing suspension and drywall systems.
- B. Requirements of regulatory agencies: Codes and regulations of authorities having jurisdiction.
- C. Source quality control: Manufacturer will provide test certification for suspension systems as required to meet performance standards specified by various agencies.

1.04 REFERENCES

- A. ASTM C635, Standard Specifications for Metal Suspension Systems.
- B. ASTM C636, Recommended Practice for Installation of Metal Suspension Systems.
- C. CISCA Ceiling Systems Installation Handbook.
- D. GA 216, Installation & Finish of Gypsum Panels.
- E. ASTM C645, Standard Specification for Non-Load Bearing (Axial) Steel Studs, Runners, (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.
- F. ASTM C754, Specification for Installation of Steel Framing Members to Receive Screw-Attach Gypsum Boards.
- G. ASTM C843, Specification of Application of Gypsum Veneer Plaster.
- H. ASTM C844, Specification of Application of Gypsum Base to Receive Veneer Plaster.
- I. ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials.
- J. Underwriters Laboratories Inc. (UL) Fire Resistance Directory.

1.05 SUBMITTAL

- A. Samples: Submit actual samples and technical data for suspension system main tees and cross tees for review.
- B. Shop Drawings:
 - 1. Reflected ceiling plans: Submit ceiling suspension system layout indicating dimensions, lighting fixture locations, and related mechanical components.
 - 2. Assembly drawings: Indicate installation details, accessory attachments and installation of related lighting fixtures and related mechanical system components.
- C. Manufacturer's Data:
 - 1. System details: Submit manufacturer's catalogue cuts or standard drawing showing details of system with project conditions clearly identified and manufacturer's recommended installation instructions.
- 1.06 DELIVERY, STORAGE AND HANDLING
 - A. Delivery of materials: Deliver materials in original, unopened packages clearly labeled with a manufacturer's name, item description, part number, type and class as applicable.
 - B. Inspection: Promptly inspect delivered materials, file freight claims for damage during shipment, and order replacement of materials as required. Any damaged materials shall be promptly removed from the job site.
 - C. Storage: Store in a manner that will prevent warpage, water damage, or damage of any kind. Prevent interference to/by other trades and any other adverse job conditions due to storage locations or methods.
 - Warning: Store all SHEETROCK Brand Gypsum Panels flat. Panels are heavy and can fall over, causing serious injury or death. Do not move unless authorized.
 - D. Handling: Handle in such a manner to insure against racking, distortion or physical damage of any kind.
- 1.07 PROJECT CONDITIONS
 - A. Existing conditions: (include specific alteration work requirements for the project).
 - B. Environmental requirements:
 - 1. Building Conditions: Building shall be enclosed with all windows and exterior doors in place and glazed and roof watertight before installation of suspension system.

- 2. Interior temperature/humidity in building: Climactic conditions in areas to receive drywall suspension systems shall range from 60 °F (16 °C) to 104 °F (40 °C) and relative humidity of not more than 90 % shall be maintained before installation of components.
- 3. In cold weather during gypsum panel installation and joint finishing and veneer plaster application, temperatures within the building shall be maintained in the range of 55-70 °F (13-21 °C). Heat and ventilation should be evenly provided to facilitate curing and drying.
- C. Coordination with other work:
 - 1. General: Coordinate with other work supported by or penetrating through the ceiling, including mechanical and electrical work and partition systems.
 - 2. Mechanical work: Ductwork above system shall be complete and permanent HVAC systems operating.
 - 3. Electrical Work: Installation of conduit above suspension system shall be complete before installation of suspension system.
- D. Protection:
 - 1. Personnel: Follow good safety and industrial hygiene practices during handling and installing of all products and systems, with personnel to take necessary precautions and wear appropriate personal protective equipment as needed. Read material safety data sheets and related literature for important information on products before installation. Contractor to be solely responsible for all personal safety issues during and subsequent to installation; architect, specifier, owner and manufacturer will rely on contractor's performance in such regard.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. USG Drywall Suspension System.
- B. USG SHEETROCK Brand Gypsum Panels (Regular, FIRECODE, FIRECODE C).
- C. USG SHEETROCK Brand Joint Tape, Joint Compounds, Trim, and Accessories (see USG Gypsum Panels and Accessories SA927-09250 Specification).
- D. USG IMPERIAL Brand Gypsum Base (see USG Veneer Plaster Systems Specification SA920-0920). All manufactured by USG, Chicago, IL USA. Manufactured in accordance with ASTM C635.
- E. Or equal by approval.

2.02 MATERIALS

- A. Commercial quality, cold rolled steel, hot dipped galvanized finish.
- B. USG Flat Drywall Suspensions Systems:
 - Main Tees: Fire-Rated Heavy Duty classification 1-1/2" high x 144" long, integral reversible splice with knurled face. DGLW-26 1-1/2" Face
 - 2. Cross Members: Fire-Rated members with knurled face. Cross Tees: DGLW-424 cross tee 1-1/2" high x 48" long with 1-1/2" wide face. Tees must have quick release cross tee ends to provide positive locking and removability without the need for tools.
 - Accessory Cross Tees: Cross tees must have knurled faces. Cross tees have quick release cross tee ends to provide positive locking and removability without the need for tools.
 DGLW-424 Fire-Rated 1-1/2" high x 48" long with 1-1/2" face
 - 4. Wall moldings: Single web with knurled face. DGWM-24 1"x 1-1/2" x 144" long wall molding. DGCM-25 144" x 1-9/16" x 1" x 1" channel molding.
- C. Accessories
 - 1. Transition Clip DGTC-90
 - 2. Splice Clip DGSC-180
- D. Gypsum Panels
 - 1. Gypsum panels manufactured in accordance with ASTMC36.
 - 2. ¹/₄", 3/8", ¹/₂", 5/8" SHEETROCK Brand Gypsum Panels (Regular, FIRECODE, FIRECODE C) and 1/2" SHEETROCK Brand Interior Gypsum Ceiling Board. (see USG Drywall/Steel Framed Systems Specifications—SA923 09250- USG-3).
- E. USG SHEETROCK Brand Drywall Accessories; Trims, Expansion Joints, Sealants, Joint Compounds Materials. (see USG Gypsum Panels & Accessories Specifications SA927 09250.
- F. FIBEROCK Brand Abuse-Resistant Panels, DUROCK Brand Cement Board, and IMPERIAL® Brand Gypsum Base—Abuse-Resistant.
- 2.03 METAL, PAPER OR PLASTIC TRIM
 - A. Corner Reinforcement: Minimum #26 gauge, zinc alloy with or without paper flanges or plastic bead.
 - B. Casing Reinforcement: Minimum #24 gauge, zinc alloy or plastic with expanded flanges.
 - C. Control Joints: Minimum #26 gauge, zinc alloy, 093, extruded aluminum or plastic with expanded flanges.

2.04 FASTENERS

A. Conventional Gypsum Panel fasteners (ASTM C1002). No. 6 Type-S, HiLo bugle head, self-drilling, self-tapping steel screws.

PART 3 EXECUTION

3.01 INSPECTION

- A. Examine areas to receive materials for conditions which will adversely affect installation. Provide written report of unacceptable surface.
- B. Do not start work until unsatisfactory conditions are corrected.
- C. Work to be concealed: Verify work above ceiling suspension system is complete and installed in manner which will not affect layout and installation of suspension system components.
- D. Beginning of installation shall signify acceptance of conditions in areas to receive ceiling suspension system.
- F. Fire-rating requirements: Construction above fire-rated assembly shall meet requirements as applicable to provide fire-resistance rating specified in Part 2-Products.

3.02 PREPARATION

A. Field dimensions must be verified prior to installation.

3.03 INSTALLATION

- A. Standard reference: Install in accordance with ASTM C636, CISCA installation standards, and other applicable code references.
- B. Manufacturer's reference: Install in accordance with manufacturer's current printed recommendations.
- C. Drawing reference: Install in accordance with approved shop drawings and locate ceiling in accordance with main tee dimensions relative to elevations.
- D. Component and hanger wire installation:
 - 1. Flat Ceilings: Main tees shall be spaced a maximum of 48" on center and supported by hanger wires spaced a maximum 48" on center and as specified by UL Fire Resistance Directory attaching hanger wires directly to structure above. Cross tees shall be spaced per manufacturers' recommendations and as specified by UL Fire Resistance Directory.
 - 2. General hanger wire notes: Hanger wires are required within 12" on both sides of a pivoted splice clip. At least 1 hanger wire is required within 12" of a transition clip.

- 3. Limitations: Do not support wires from mechanical and/or electrical equipment occurring above ceiling.
- E. Accessories: Install accessories as applicable to meet project requirements.

3.04 GYPSUM PANEL INSTALLATION

- A. Apply gypsum panels first to ceiling and then to walls. Position all ends and edges of gypsum panels at framing members. Extend ceiling board to corners and make firm contact with the wall angle, channel or top plate. To minimize end joints, use panels of maximum practical lengths. Fit ends and edges closely, but not forced together.
- B. Cut ends, edges, scribe or make cutouts within the field of panels in a workmanlike manner. Cut gypsum board to size using a knife and straight edge.
- C. Attach Gypsum Panels to the suspension system main runners, cross tees and cross channels with conventional gypsum panel fasteners (No. 6 Type S HiLo bugle head, self-drilling, self-tapping steel screws) spaced 8" o.c. at periphery of gypsum panels and located 3/8" in from panel edges and spaced 12" o.c. in the field. Drive fasteners in field of panels first, working toward ends and edges. Hold panels in firm contact with framing while driving fasteners. Drive fastener heads slightly below surface of gypsum panels without breaking face paper. Install trim at all internal and external angles formed by the intersection of panel surfaces or other dissimilar materials. Apply corner reinforcement to all vertical or horizontal external corners in accordance with manufacturer's directions.

Ceilings note: See Drywall/Steel Framed Systems Specifications SA923 09260 USG-3. Spacing of drywall grid is designed to support only the dead load. Heavy concentrated loads should be independently supported. Lighting fixtures or troffers, air vents and other equipment should be separately supported from the structure; Gypsum Panels will not support these items. To prevent objectionable sag in new gypsum panel ceilings, the weight of overlaid unsupported insulation should not exceed 1.3 psf for 1/2" thick gypsum panels with spacing of 24" o.c.; 2.2 psf for 1/2" thick gypsum panels 16" o.c. framing and 1/2" SHEETROCK Brand Interior Gypsum Ceiling Panels on 24" o.c. framing and 5/8" panels 24" o.c.; 3/8" thick gypsum panels must not be overlaid with unsupported insulation. A vapor retarder should be installed in exterior ceilings, and plenum or attic spaces should be properly vented. During periods of cold or damp weather when a polyethylene vapor retarder is installed on ceilings behind the gypsum panels it is important to install the ceiling insulation before or immediately after installing the gypsum panels. Failure to follow this procedure may result in moisture condensation in the back of the gypsum panels causing sag.

E. Spray-Textured Ceilings: Where water-based texturing materials or any slowdrying surface treatments are used over single-layer panels, maximum frame spacing is 16" o.c. for 1/2" panels applied perpendicular to framing.

SECTION 09311

TILE FLOOR FINISH

PART 1 GENERAL

1.01 DESCRIPTION

- A. Work Included:
 - 1. Tile floor, installed using full bed method, with cementitious 1/8" grouted joints.
 - 2. Tile floor, installed using thinset method, with cementitious 1/8" grouted joints.
- B. Related Work Described Elsewhere:
 - 1. Section 03300 Cast-In-Place Concrete
 - 2. Section 07900 Joint Sealers
 - 3. Section 09312 Tile Wall Finish
- C. References:
 - 1. American National Standards Institute (ANSI) :
 - a) A108.5 Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
 - b) A118.1 Dry-Set Portland Cement Mortar.
 - c) A137.1 Ceramic Tile
 - 2. Ceramic Tile Institute (CTI) : Thin Set Portland Center Mortars
 - 3. Tile Council of America, Inc. (TCA): "2001 Handbook for Ceramic Tile Installation". Use current TCA standards for each job condition.

1.02 QUALITY ASSURANCE

- A. Conform to TCA F122-99 with dry-set portland cement mortar for thinset method.
- B. Conform to TCA F121.01, waterproof membrane at interior floors.
- C. Conform to ANSI A137.1.
- D. Installer shall have been a registered contractor for a minimum of 5 years in the business of installing tile. Furnish, on request, names of 10 successful projects for which he was responsible for installation of tile.

1.03 SUBMITTALS

- A. Submit samples, installation instructions, and product data under provisions of Section 01340.
- B. Submit product data, and specifications for using setting materials and grouts.
- C. Mount tile, adhesive, and grout on 24 in. x 24 in. plywood panel, representative of pattern, color variations, and grout joint size variations.

1.04 MAINTENANCE DATA

- A. Submit maintenance data under provisions of Section 01730.
- B. Include cleaning methods, cleaning solutions recommended, and stain removal methods recommended.
- 1.05 DELIVERY, STORAGE AND HANDLING
 - A. Deliver materials to Site and handle under provisions of Section 01610.
 - B. Store and protect materials under provisions of Section 01620.
 - C. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.06 WARRANTY

- A. Provide warranty under provisions of Section 01740.
- B. Furnish written five year warranty, co-signed by installer and contractor, covering materials and installation against defects and delamination.

1.07 EXTRA STOCK

- A. Furnish extra stock under provisions of Section 01750.
- B. Furnish one full box of each type and color of ceramic tile floor finish supplied.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. General: Following products are for general reference only and are subject to compliance with specified requirements.

- B. Tile Materials: Unpolished Porcelain Mosaic Tile: ANSI A137.1, and as follows:
 - a. Product: Crossville, Inc. Color Blox.
 - b. Size and Shape: 3" x 3"
 - c. Thickness: 1/4"
 - d. Colors: Assume 1 color for bidding purposes.
- C. Cove Base:
 - 1. Approved Manufacturer: Crossville, Inc. Color Blox.
 - 2. Size: 6" x 12"
- D. Tile and Grout colors as selected by Architect from manufacturer's standard colors.
- E. Cultured Marble Thresholds
 - 1. Approved Manufacturer: Thornton Tile & Marble 753-5719 www.thorntontile.com
 - 2. Size: 4" x ³/₄" Double Bevel
 - 3. Color: White
- F. Mortar Mix: Bostik Product: Hydroment 1900 Epoxy Modified Mortar Admixture
- G. Mortar Additive: Bostik Product: Multi-Purpose Acrylic Latex Mortar Admixture and Grout Additive
- H. Grout Mix: Bostik, Inc. Product: Hydroment 1900 Epoxy Modified Mortar Admixture
- I. Grout Additive: Bostik, Inc. Product: Multi-Purpose Acrylic Latex Mortar Admixture and Grout Additive
- J. Substitutions: Under provisions of Section 01630.

2.02 UNDERLAYMENT

- A. All floor tile shall be installed over "Laticrete 9235" Anti-Fracture Membrane. Install per manufactures recommendations.
- B. Conform to TCA F121.01.
- C. At shower locations, conform to TCNA B451-07 Fiber-Reinforced Water-Resistant Gypsum Back Board Installation.

2.03 SETTING MATERIALS

- A. Mortar Mix Materials: ANSI A118.1, premix with acrylic additive.
 - 1. Premix: Sand, cement, chemical mixture compatible with acrylic additive conforming to the following:
 - a. Portland Cement: ASTM C150, Type 1, gray.
 - b. Aggregate: ASTM C144, clean, graded, fine sand.
 - 2. Acrylic additive: ANSI A118.1; CTI-64-1.

2.04 GROUT TYPE

- A. Grout: Cementitious type with acrylic additive.
 - 1. Premix grout: Cement, Sand, and Chemical mixture compatible with acrylic additive.
 - 2. Acrylic Additive: ANSI A118.1; CTI 85-8.
- B. Grout Pigments: Pure mineral pigments, resistant to alkalies, non-fading and weatherproof, colors selected.
- 2.05 MORTAR AND GROUT MIXTURES
 - A. Mix and proportion pre-mix mortar and grout materials in accordance with manufacturer's instructions. Verify compatibility of mixtures and additives. Provide from single manufacturer.
- PART 3 EXECUTION
- 3.01 INSPECTION'
 - A. Examine surfaces scheduled to receive ceramic mosaic tile and setting beds before start of tile installation.
 - 1. Verify surfaces are free from defects and conditions adversely affecting quality and execution of tile installation.
 - 2. Verify surface deviations do not exceed 1/4 in. in 10 ft.
 - 3. Verify that surfaces are firm, dry, clean, and free of oily and waxy films.
 - B. Do not proceed with installation until unsatisfactory conditions have been properly corrected.
- 3.02 INSTALLATION
 - A. Installation per TCNA B431-07. Install "Laticrete 9235", or equal, underlayment at all floor installations.

- B. Install ceramic mosaic tile floor in accordance with ANSI A 108.1, Section A-4.1, and ANSI A108.5, Section A-4.3 as indicated.
- C. Lay tile to pattern indicated. Verify pattern is uninterrupted through openings.
- D. Install stainless steel schluter edging at all interfaces between floor tile and adjoining finishes.
- D. Cut and fit tight to protrusions and vertical interruptions. Form corners neatly.
- E. Work tile joints uniform in width, subject to variance in tolerance allowed in tile size. Joints: Watertight, without voids, cracks, excess mortar, or grout.
- F. Sound tile after setting. Replace hollow sounding units.
- G. Allow tile to set for a minimum of 48 hours prior to grouting.
 - 1. Damp cure installation minimum 72 hours.
- H. Upon completion of curing period immediately seal grout with 2 coats of seal as recommended by tile manufacture.

3.03 PROTECTION

- A. Prohibit traffic from floor finish for 7 days after installation.
- B. Clean unglazed tiles with acid solution only when permitted by tile and grout manufacturer's printed instructions, but not sooner than 14 days after installation.

END OF SECTION

SECTION 09312

TILE WALL FINISH

- PART 1 GENERAL
- 1.01 DESCRIPTION
 - A. Work Included:
 - 1. Ceramic tile walls installed using thinset method, with grouted joints.
 - 2. Backer board and accessories.
 - B. Related Work Described Elsewhere:
 - 1. Section 09255 Gypsum Board Assemblies
 - 2. Section 09311 Tile Floor Finish
 - C. References:
 - 1. American National Standards Institute (ANSI):
 - a. A118.1 Dry-Set Portland Cement Mortar
 - b. A137.1 Recommended Standard Specifications for Ceramic Tile.
 - American Society for Testing and Materials (ASTM):
 a. C144-81 Aggregate for Masonry Mortar.
 - b. C150-84 Portland Cement.
 - 3. Tile Council of America, Inc. (TCA): "Handbook for Ceramic Tile Installation". Use current TCA Standards for each job condition.
- 1.02 QUALITY ASSURANCE
 - A. Conform to ANSI A137.1, Recommend Standard Specifications for Ceramic Tile.
 - B. Installer shall have been a registered Contractor, for a minimum of 5 years, in the business of installing tile. Furnish, on request, names of 10 successful projects for which he was responsible for installation of tile.
- 1.03 SUBMITTALS
 - A. Submit product data, installation instructions, and samples under provision of Section 01340.
 - B. Submit product data and specifications for using setting materials and grouts.
 - C. Submit samples for color selection.
 - D. Mount tile and grout on 24 in. x 24 in. plywood panel, representative of color variations and grout joint size variations.
 - E. Submit manufacturer's certification under provisions of Section 01400.
 - F. Certify that tile materials supplied conform to specified requirements.

1.04 MAINTENANCE DATA

- A. Submit maintenance data under provisions of Section 01730.
- B. Include cleaning methods, cleaning solutions recommended, stain removal methods, and polishes and waxes recommended.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to site and handle under provisions of Section 01610.
- B. Store and protect materials under provisions of Section 01620.
- C. Protect adhesives from freezing or over heating in accordance with manufacturer's instructions.

1.06 WARRANTY

- A. Provide warranty under provisions of Section 01740.
- B. Furnish written five-year warranty, co-signed by Installer and Contractor, covering materials and installation against defects and delamitation.

1.07 EXTRA STOCK

- A. Furnish extra stock under provisions of Section 01750.
- B. Furnish one full box of each type and color of ceramic tile wall finish supplied.
- PART 2 PRODUCTS

2.01 TILE MANUFACTURERS

- A. General: Following products are for general reference only and are subject to compliance with specified requirements.
- B. Tile Materials:
 - 1. Polished Porcelain Mosaic Tile: ANSI A137.1, and as follows:
 - a) Product: Crossville, Inc. Retro Active.
 - b) Size and Shape: 4" x 12"
 - c) Thickness: 5/16"
 - d) Colors: Assume 1 Main color (T1) and 1 accent color (T2).
 - e) Finish: Gloss
 - f) Stainless steel Schluter edging at top of wainscoat.
 - g) Trim: 4" x 12" Single Bullnose

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C.	Top UPCO	Product: Top White Anti-Slip Product: Tile Mate 765
D.	Mortar Additive: Top	Product: Top 400 Acrylic
	UPCO	Mortar Admixture and Grout Additive
E.	Grout Mix:	
	Top UPCO	Product: Sanded Ceramic Tile Grout Product: Hydroment Ceramics Tile Grout
F.	Grout Additive: Top UPCO	Product: Top 200 Grout Strengthener Product: Multi-Purpose Acrylic Latex Mortar Admixture and Grout Additive

G. Substitutions: Under provisions of Section 01630.

2.02 SETTING MATERIALS

- A. Mortar Mix Materials: ANSI A118.1, premix with acrylic additive.
 - 1. Premix: Sand, cement, chemical mixture compatible with acrylic additive conforming to the following:
 - a. Portland Cement: ASTM C150, Type 1, white.
 - b. Aggregate: ASTM C144, clean, graded, fine sand.
 - 2. Acrylic additive: ANSI A118.1; CTI-64-1.
- B. Skim Coat: Plastic acrylic-portland cement mortar, same as above, except increased proportion of sand and coarser sand (No. 30 mesh) to suit condition of use.
- C. Work tile joints uniform in width, subject to variance in tolerance allowed in tile size. Joints: Watertight, without voids, cracks, excess mortar, or grout.
- C. Backer Board: "Dens-sheild"
 - 1. Fasteners: 1 in. buglehead Type S High-Low screws.
 - 2. Joint Tape: As recommended by backer board manufacturer for application.

2.03 GROUT TYPE

- A. Grout: Sanded type with acrylic additive.
 - 1. Premix grout: Cement, Sand, Chemical mixture compatible with acrylic additive.
 - 2. Acrylic Additive: ANSI A118.1; CTI 85-8.

B. Grout Pigments: Pure mineral pigments, resistant to alkalies, non-fading and weatherproof, colors selected.

2.04 MORTAR AND GROUT MIXTURES

- A. Mix and proportion pre-mix setting bed and grout materials in accordance with manufacturer's instructions. Verify compatibility of mixtures and additives. Provide from single manufacturer.
- PART 3 EXECUTION
- 3.01 INSPECTION
 - A. Examine substrates scheduled to receive ceramic wall tile before start of installation.
 - 1. Verify surfaces are firm, dry, clean, and free of defects and conditions adversely affecting quality and execution of tile installation.
 - 2. Verify surface deviations do not exceed 1/8 in. in 10 ft. Skim coat to correct unevenness in CMU.
 - B. Do not proceed with installation until unsatisfactory conditions have been properly corrected.
- 3.02 INSTALLATION
 - A. Backer Board: Install "Dens-shield" over studs in accordance with manufacturer's recommendations; fill and tape joints.
 - B. Installation Methods:
 - 1. At masonry: TCA W202-01 for tile installation with dry-set portland cement mortar.
 - 2. At framed walls with backer boards: TCA W245-01 for tile installation with latex-portland cement mortar.
 - 3. At shower receptors: Fiber-Reinforced Water-Resistant Gypsum Backer Board TCNA Installation B431-07.
 - C. Install ceramic wall tile in accordance with ANSI A 108.5, Section A-4.3.
 - D. Cut and fit tile tight to protrusions and perpendicular interruptions. Form corners neatly. Provide wall tile continuous behind mirrors. Align floor and wall tile joints.
 - E. Form internal angles square and external angles bullnosed.
 - F. Sound tile after setting. Replace hollow sounding units.
- G. Allow tile to set for minimum 48 hours prior to grouting.
- H. Damp cure installation minimum 72 hours.
- I. All CMU walls shall receive a leveling thin set coat to provide straight surface for tile installation.

3.03 PROTECTION

- A. Prohibit activities near wall finish for 7 days after installation.
- B. Clean ceramic tile surfaces free of foreign matter. Buff glazed surfaces to original sheen.

SECTION 09511

ACOUSTICAL CEILINGS

- PART 1 GENERAL
- 1.01 DESCRIPTION
 - A. Work Included:
 - 1. Fire rated suspended metal grid system complete with all trim.
 - 2. Lay-in ceiling panels.
 - B. Related Work Specified Elsewhere:
 - 1. Section 06200 Finish Carpentry
 - 2. Section 09255 Gypsum Board Assemblies
 - 3. Section 10925 Miscellaneous Specialties
 - C. Reference Standards:
 - 1. American Society for Testing and Materials (ASTM) :
 - a) C635-83 Metal Suspension System for Acoustical Tile and Lay-In Panel Ceilings.
 - b) C636-76 (1981) Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
 - c) D1761-77 Mechanical Fasteners in Wood.
 - d) E84-84 Surface Burning Characteristics of Building Materials.
 - Uniform Building Code (UBC) : UBC Standard 47-18, including Part III

 Lateral Design Requirements.

1.02 QUALITY ASSURANCE

- A. Provide acoustical panels and suspension materials bearing UL Classification marking.
- 1.03 SUBMITTALS
 - A Clearly indicated grid layouts and related dimensioning, junctions with other work or ceiling finishes, inter-relation of mechanical and electrical items related to system.
 - 1. Show insert and hanger spacing and fastening details, splicing method for main and cross runners, acoustical unit support at lighting fixtures, and installation details.
 - 2. Include detailed locations of lighting fixtures, sprinkler heads, detectors, ceiling diffusers, air return grilles and air volume control dampers.

- B. Submit manufacturer's information, installation instructions and product data under provisions of Section 01340.
- C. Furnish suspension system manufacturer's lateral loading capacity and displacement or elongation characteristics for proposed systems indicating:
 - 1. Bracing pattern and wire sizes.
 - 2. Tension and compression force capabilities of main runner splices, cross runner or connections and expansion devices.

1.04 ENVIRONMENTAL REQUIREMENTS

- A. Do not install acoustical ceiling until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead mechanical work is completed, tested, and approved.
- B. Permit wet work to dry prior to commencement of installation.
- C. Maintain uniform temperatures of minimum 61 degrees F and humidity of 20 percent to 40 percent prior to, during, and after installation.

1.05 EXTRA STOCK

- A. Furnish extra materials under provisions of Section 01750.
- B. Furnish not less than the percentage of each type acoustical ceiling material supplied as noted below. Furnish fill original, unopened, undamaged cartons only.
 - 1. Acoustical tiles: One percent, minimum.
 - 2. Acoustical panels: Two percent, minimum.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acoustical Panels and Tiles: Armstrong World Industries, Inc.
- B. Suspension System: Armstrong World Industries, Inc.
- C. Substitutions: Under provision of Section 01630.
- 2.02 SUSPENSION SYSTEM FOR ACOUSTICAL PANELS
 - A. Type: Conform to ASTM C635 heavy duty system.
 - B. Grids: Exposed T, 24 x 48 x 15/16 in. all components die cut and interlocking. Donn DX-26, or equal.

- C. Accessories: Stabilizer bars, furring clips, splices, edge molding; compression struts and hold down clips, as required to complete and complement suspended ceiling grid systems.
- D. Materials/Finish: Commercial quality cold rolled steel with galvanized coating; manufacturer's standard white, baked enamel finish on exposed surfaces.
- E. Carrying Channels and Hangers: Galvanized steel; size and type to suite application and to rigidly secure complete acoustical unit ceiling system, with maximum deflection of 1/360.
 - 1. Carrying channels: Minimum 1-1/2 in. cold-rolled steel.
 - 2. Hanger wire: Minimum 12 ga. galvanized, pre-straightened, softannealed, mild steel wire.
 - 3. Attachment devices: Minimum 100 lbs. load carrying capacity, per ASTM D1761. Threaded for screw attachment to underside of wood chord joists where required.
- 2.03 ACOUSTICAL MATERIALS
 - A. Acoustical Panels:
 - 1. Armstrong Fine Fissured Second Look II, Angled Tegular 48 x 24, with the * Antimicrobial Treatment applied.
 - * Antimicrobial shall be only in rooms -114, 119, 120, 121, 122, 132, 133.

PART 3 EXECUTION

- 3.01 INSPECTION
 - A. Verify that existing conditions are ready to receive work.
 - B. Beginning of installation means installer accepts condition of existing substrates.
- 3.02 INSTALLATION SUSPENDED GRID AND LAY-IN PANELS
 - A. Install acoustical ceiling systems in accordance with UBC Standard 47-18, including Lateral Design Requirements, and ASTM C 636 to produce finished ceiling true to lines and levels, and free from warped, soiled, or damaged grid and lay-in panels.
 - B. Install fire rated ceiling systems in accordance with UL requirements, including light fixture protection.
 - C. Install ceiling systems in manner capable of supporting all superimposed loads, with maximum deflection of 1/360 of span, and maximum surface deviation of 1/8 in. in 12 ft.

- D. Install after major above-ceiling work is complete. Coordinate location of hangers with other work. Ensure layer of hangers and carrying channel locations accommodate fittings and units of equipment to be placed after installation of ceiling grid system.
- E. Support main runners from hangers attached directly to structure.
 - 1. When obstructions preclude direct attachment to structure use trapeze suspension for spans exceeding 48 in. Form trapeze from two carrying channels back to back.
 - 2. Provide lateral force bracing in conformance with UBC Standard 47-18, Part III.
 - 3. Anchor hangers with .216 in. diameter shaft screw-eyes attached to bottom chord of wood joists; minimum 2 in. penetration of screw shaft into underside of wood chord where acceptable to Owner's Representative, unless otherwise required for assembly rating.
 - 4. Do not screw into plywood roof deck.
- F. Hang independently of walls, columns, ducts, pipes, and conduit. Where carrying members are spliced avoid visible displacement of longitudinal axis or face plane of adjacent member.
- G. Center ceiling systems on room axis leaving equal border pieces, unless indicated otherwise.
- H. Do not support fixtures from or on main runners or cross runners if weight of fixture exceeds 56 lbs. or causes total dead load to exceed deflection capability, whichever weight is less.
 - 1. Space hanger wire 48 in. o.c. maximum.
 - 2. Install additional hangers at terminal ends of each suspension member, 8 in. from vertical surfaces.
 - 3. Support fluorescent lighting fixture safety chains independent of grid and grid suspension system.
 - 4. Do not splay wires more than 5 in. in 4 ft. vertical drop without countersplaying.
- I. Install edge moldings at intersection of ceiling and vertical surface, using maximum lengths, straight, true to line and level. Miter corners. Provide edge moldings at junctions with other ceiling finishes.
- J. Fit acoustical ceiling materials in place, free from damaged edges and other defects detrimental to appearance and function. Fit border units neatly against abutting surfaces.

K. Install acoustical ceiling materials level, in uniform plane and free from twist, warp and dents.

3.03 ADJUSTMENTS

A. Adjust any sags and twists which develop in ceiling system and replace any part damaged or faulty.

SECTION 09650

RESILIENT FLOORING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Sheet vinyl floor coverings, with integral coved base.
 - 2. Resilient base for carpet in areas without integral coved base.

1.03 SUBMITTALS

- A. Product Data: For each type of product specified.
- B. Shop Drawings: Indicate location of columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutout locations.
 - 1. Show location of seams and edges.
 - 2. Show technique for forming inside and outside corners.
- C. Samples for Initial Selection: Provide no substitutions product identified in Part 2.
- D. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- E. Maintenance Data: For sheet vinyl floor coverings to include in the maintenance manuals specified in Division 1.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an installer who is competent in the technique required by manufacturer for heat-welding seams.
 - 1. Engage installers who are certified by floor covering manufacturer for heat-welded seam installation.
- B. Fire Performance Charateristics: Provide sheet vinyl floor coverings with the following fire performance characteristics as determined by testing products per SASTM text bethod indicated below by Underwriters laboratories, Inc. (UL) or another texting and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Critical Radiant Flux: 0.45 Watts per sq. cm or more per ASTM E648.
 - 2. Smoke Density: Less than 450 per ASTM E 622.

C. Certification by floor covering manufacturer that products supplied for installation comply with local regulations controlling use of volatile organic compounds (VOC's).

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sheet vinyl floor coverings and installation accessories to Project site in manufacturer's original, unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.
- B. Store products in dry spaces protected from the weather, with ambient temperatures maintained between 50 and 90 deg F (10 and 32 deg C).
- C. Store rolls upright.
- D. Move sheet vinyl floor coverings and installation accessories into spaces where they will be installed at least 48 hours before installation, unless longer conditioning periods are recommended in writing by manufacturer.

1.06 PROJECT CONDITIONS

- A. Do not install sheet vinyl floor coverings until they are at the same temperature as the space where they are to be installed.
- B. Close spaces to traffic during sheet vinyl floor covering installation and for time period after installation recommended in writing by manufacturer.
- C. Install sheet vinyl floor coverings and accessories after other finishing operations, including painting, have been completed.

1.07 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet (3 linear m) in roll form for each 500 linear feet or fraction therreof, of each pattern/color/wear surface installed.
 - 2. Deliver extra materials to Owner.

PART 2 – PRODUCTS

- 2.01 PRODUCTS, GENERAL
 - A. Where sheet vinyl are indicated on the drawings, the following sheet vinyl shall be provided without substitutions: Armstrong Medintech®. Color to be selected from manufacturer's full line. All seams shall be welded with color/pattern matched weld rod.

2.02 TYPE II UNBACKED SHEET VINYL FLOOR COVERING PRODUCT DATA SHEET

- A. Type II Unbacked Sheet Vinyl Floor Covering Designation: II-USV-[1]
- B. Wearing Surface: Smooth.
- C. Wear Layer and Overall Thickness: 0.080 inch.
- D. Sheet Width: 6 feet.
- E. Seaming Method: Heat-welded.
- F. Color and Pattern: Two colors as selected by Architect from manufacturer's full range of colors and patterns produced for sheet vinyl floor covering complying with requirements indicated.
- G. Available Products: Armstrong Medintech, Armstrong World Industries, P.O. Box 3001, Lancaster PA, 17604.

2.03 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portlandcement-based formulation provided or approved by floor covering manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit sheet vinyl floor covering and substrate conditions indicated.
- C. Heat-Welding Bead: Solid-strand product of floor covering manufacturer for heat-welding seams.
 - 1. Color: Match field color and pattern mix of sheet vinyl floor covering.
- D. Cove Strip: 1-inch- (25.4-mm-) radius support for integral flash cove base provided or approved by floor covering manufacturer.
- E. Cove-Base Cap Strip: Square metal, vinyl, or rubber cap for integral flash cove base provided or approved by floor covering manufacturer.
- F. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edge of sheet vinyl floor coverings, and in maximum available lengths to minimize running joints.
- G. Concrete Slab Primer: Nonstaining type as recommended by flooring manufacturer.

PART 3 – EXECUTION

- 3.01 EXAMINATION
 - A. Examine substrates, areas, and conditions where installation of sheet vinyl floor coverings will occur, with Installer present, for compliance with manufacturer's requirements. Verify that substrates and conditions are satisfactory for floor covering installation and comply with requirements specified.
 - B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials whose presence would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by floor covering manufacturer.
 - 2. Slab substrates are in compliance with underlayment manufacturer's requirements and otherwise ready to receive underlayment and patching work.
 - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.
 - C. Do not proceed with installation until unsatisfactory conditions have been corrected.
- 3.02 PREPARATION
 - A. General: Comply with sheet vinyl floor covering manufacturer's written installation instructions for preparing substrates indicated to receive sheet vinyl floor coverings.
 - B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
 - C. Use trowelable leveling and patching compounds per floor covering manufacturer's direction to fill cracks, holes, and depressions in substrates. Substrate is expected to require a substantial amount of underlayment patching work where adhesives are removed in the abatement phase of this project. Consolidate underlayment surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and finish surfaces to tolerances of F(F) 20 (floor flatness) and F(L) 17 (floor levelness) measured according to ASTM E1155. Grind smooth any surface defects that would telegraph through applied floor covering system.
 - D. Broom and vacuum clean substrates to be covered immediately before installing sheet vinyl floor coverings. Do not proceed with installation until unsatisfactory conditions have been corrected.

E. Per manufacturer's recommendation, provide APA – The Engineered Wood Association – plywood underlayment. Prep underlayment per manufacturer's directions to receive resilient flooring. Minumum thickness: 1/4".

3.03 INSTALLATION

- A. General: Comply with sheet vinyl floor covering manufacturer's written installation instructions.
- B. Unroll sheet vinyl floor coverings and allow them to stabilize before cutting and fitting, if recommended in writing by manufacturer.
- C. Lay out sheet vinyl floor coverings to comply with the following requirements:
 - 1. See drawings for details of special layout conditions.
 - 2. In typical corridor conditions lay out a 6 foot width centered in the corridor and accent color strip from the center section to the wall on each side.
 - 3. Finish recesses at doors, drinking fountains and similar conditions by extending the accent color per details.
 - 4. At designated building grid lines provide control joints.
 - 5. Maintain uniformity of sheet vinyl floor covering direction.
 - 6. Arrange for a minimum number of seams and place them in inconspicuous and low-traffic areas, and not less than 6 inches (150 mm) away from parallel joints in flooring substrates.
 - 7. Match edges of sheet vinyl floor coverings for color shading and pattern at seams according to manufacturer's written recommendations.
 - 8. Avoid cross seams.
- D. Scribe, cut, and fit sheet vinyl floor coverings to butt neatly and tightly to vertical surfaces and permanent fixtures, including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.
- E. Integral Flash Cove Base: Where indicated, cut sheet vinyl floor coverings to form integral base of height indicated at vertical surfaces.
- F. Extend sheet vinyl floor coverings into toe spaces, door reveals, closets, and similar openings.
- G. 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 chalk or other nonpermanent, nonstaining marking device.

- H. Install sheet vinyl floor coverings on covers for telephone and electrical ducts, and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on covers. Tightly adhere edges to perimeter of floor around covers and to covers.
- I. Adhere sheet vinyl floor coverings to flooring substrates to comply with floor covering manufacturer's written instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.
 - 1. Produce completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
 - 2. Form integral flash cove base by flashing floor covering up vertical surfaces. Support floor covering at horizontal and vertical junction with cove strip. Butt floor covering at top of base against cap strip.
- J. Heat-Welded Seams: Route joints and heat weld with welding bead, permanently fusing sections into a seamless floor covering. Prepare, weld, and finish seams according to manufacturer's written instructions and ASTM F 1516 to produce surfaces flush with adjoining floor covering surfaces.
 - 1. Cut seams at corners and compound corners neatly following recommended procedures.
 - 2. Prevent spread of seaming material beyond actual joint.
- K. Hand roll sheet vinyl floor coverings in both directions from center out to embed floor coverings in adhesive and eliminate trapped air. At walls, door casings, and other locations where access by roller is impractical, press floor coverings firmly in place with flat-bladed instrument.

3.04 CLEANING AND PROTECTING

- A. Perform the following operations immediately after installing sheet vinyl floor coverings:
 - 1. Remove adhesive and other surface blemishes using cleaner recommended by floor covering manufacturer.
 - 2. Sweep or vacuum floor thoroughly.
 - 3. Do not wash floor covering until after time period recommended by floor covering manufacturer.
 - 4. Damp-mop floor to remove marks and soil.

- B. Protect flooring against mars, marks, indentations, and other 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 floor covering manufacturer.
 - 1. Apply protective floor polish to sheet vinyl floor covering surfaces that are free from soil, visible adhesive, and surface blemishes, if recommended in writing by manufacturer.
 - a. Use commercially available product acceptable to floor covering manufacturer.
 - b. Coordinate selection of floor polish with Owner's maintenance service.
 - 2. Cover sheet vinyl floor coverings with undyed, untreated building paper until inspection for Substantial Completion.
 - 3. Do not move heavy and sharp objects directly over sheet vinyl floor coverings. Place plywood or hardboard panels over floor coverings and under objects while they are being moved. Slide or roll objects over panels without moving panels.
- C. Clean sheet vinyl floor coverings not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean floor coverings according to manufacturer's written recommendations.
 - 1. Before cleaning, strip protective floor polish that was applied after completing installation.
 - 2. After cleaning, reapply polish to floor.

3.05 REINSTALLATION OF ACCESSORIES

- A. After installing sheet vinyl floor covering replace all door stops, fin tube heat enclosures and other permanent accessory devides removed during demolition.
 - 1. Replace any fasteners damaged in the course of work with fasteners of the same size, configuration and finish.

SECTION 09651

RESILIENT BASE

PART 1 GENERAL

1.01 DESCRIPTION

- A. Work Included:
 - 1. Preparation of substrate surfaces
 - 2. Application of rubber base.
 - 3. Cleaning of all surfaces and areas of work.
- B. Related Work Described Elsewhere:
 - 1. Section 03300 Cast-In-Place Concrete
 - 2. Section 06200 Finish Carpentry
 - 3. Section 09650 Resilient Flooring
 - 4. Section 09680 Carpeting
- C. References:
 - 1. FF SS-W-40, Wall Base: Rubber and Vinyl Plastic

1.02 SUBMITTALS

- A. Submit samples and product data under provisions of Section 01340.
- B. Include duplicate 2 in. long samples of base selected.

1.03 ENVIRONMENTAL REQUIREMENTS

- A. Maintain minimum 70 degrees F air temperature at installation area for three days prior to, during, and for 48 hours after installation.
- B. Store flooring materials in area of application. Allow three days for material to reach equal temperature as area.

1.04 EXTRA STOCK

A. Provide not less than 5% for fewer than 100 sq. ft. and 3% for over 100 sq. ft. for each type, color, pattern and size installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. BASE: Following products are for general reference only and are subject to compliance with specified requirements.
 - 1. Roppe Product: Rubber Cove Base
 - 2. Johnsonite Product: Rubber Cove Base
 - 3. Flexco Product: Flex-Cove
 - 4. Burke Product: Thermal-Molded Rubber Cove

2.02 BASE MATERIALS

- A. Provide 4" base at locations shown on the drawings.
- B. Rubber Base: Conforming to FS SS-W-40,

2.03 ADHESIVES

A. Primers and Adhesives: Waterproof; of types recommended by manufacturer for specified material.

PART 3 EXECUTION

3.01 PREPARATION

- A. Remove substrate ridges and bumps. Fill low spots, cracks, joints, holes and other defects with filler.
- 3.02 INSTALLATION
 - A. Fit joints tight and vertical. Maintain minimum measurement of 18 in. between joints.
 - B. Miter internal corners. Use premolded sections for exposed ends and external corners, except wrap base around corners of bullnosed CMU.
 - C. Install base on solid backing. Adhere tightly to wall and floor surfaces.
 - D. Scribe and fit to door frames and other obstructions.
 - E. Install straight and level to variation of plus or minus 1/8 in. over 10 ft.
 - F. Install coved base in carpeted areas.

3.03 CLEANING

- A. Remove excess adhesive from base, and wall surfaces without damage.
- B. Clean base surfaces in accordance with manufacturer's instructions.

SECTION 09680

CARPETING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes carpet and installation.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 2 Sections for removing existing flooring.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who is certified by the Floor Covering Installation Board (FCIB) or who can demonstrate compliance with FCIB certification program requirements.
- B. Carpet Fire-Test-Response Characteristics: A no substitutions carpet is specified. Provide product data on specified carpet indicating compliance with Class II rating:
 - 1. Flame Spread: 75 or less per ASTM E 84.
 - 2. Smoke Developed: 450 or less per ASTM E 84.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with the Carpet and Rug Institute's CRI 104, Section 5: "Storage and Handling."
- B. Deliver materials to Project site in original factory wrappings and containers, labeled with identification of manufacturer, brand name, and lot number.
- C. Store materials on-site in original undamaged packages, inside well-ventilated area protected from weather, moisture, soilage, extreme temperatures, and humidity. Lay flat, with continuous blocking off ground.

1.05 PROJECT CONDITIONS

A. General: Comply with CRI 104, Section 6: "Site Conditions.

1.06 WARRANTY

- A. Wear Lifetime ICT Modular Warranty
- B. Static Lifetime Static

1.08 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
 - 1. Carpet: Before installation begins, furnish quantity of full-width units equal to 5 percent of amount installed.

PART 2 - PRODUCTS

2.01 CARPET

- A. Main Carpet Manufacturers:
 - a) Lees: GT044 Form: Modular Quarter Turn
 - b) Bigelow Commercial
 - c) Patcraft & Designweave
 - Or approved equal, per Section 01630.

2.02 CARPET MATERIALS

A. Lees Form: Modular Quarter Turn

Construction -	tufted
Surface Texture -	textured multi-colored loop
Gauge -	1/12 (47.00 rows per 10 cm)
Stitches Per Inch -	11.0 (43.31 per 10 cm)
Finished Pile Thickness -	.157" (3.99 mm)
Dye Method -	yarn dyed
Backing Material -	ICT-RC - Fiberglass Reinforced Thermoplastic Composite Tile with 35% Recycled Content
Face Yarn -	Antron® Legacy nylon 6,6 with DuraTech Soil Protection by Invista
Fiber Technology -	Duracolor® by LEES Stain Resistant System. Passes GSA requirements for permanent stain resistant carpet.
Face Weight -	22.0 oz/yd2 (746 g/m2)
Size/Width -	24" x 24" (60.9 cm x 60.9 cm)
Installation Method -	quarter-turn
IAQ Greenlabel Plus -	4338

Stitches Per Inch Dye Method

Pattern Repeat - Performance	not applicable
Static -	AATCC 134, Under 3.5 KV
Flammability -	Passes DOC-FF-1-70 Pill Test
Flooring Radiant Panel Test -	- Meets NFPA Class 1 when tested under ASTM E-648 glue down
Smoke Density -	ASTM E 662, Less than 450
CRI Green Label Plus Certified -	Y
Construction Materials -	100% man-made materials for superior stability. Specifications are subject to change without notice when such changes do not alter product performance. Slight color variation may occur from dye lot to dye lot.
Warranties	
Wear -	Lifetime ICT Modular Warranty
Static -	Lifetime Static
Adhesive -	Lees warrants that the use of Lees adhesives will bond the carpet to the properly prepared substrate for the life of the carpet. Substrate must meet Lees recommended floor preparation procedures. Should Lees adhesive not be used, Lifetime Adhesive Warranties become null and void.
Stain Resistance -	Lees provides lifetime stain warranty and a 10 year Lightfastness and Atmospheric Contaminant Warranty on all Duracolor carpets. This lifetime stain warranty covers all Duracolor carpets made by Lees. * Under GSA requirements stain resistant carpets must score no less than 8.0 (10.0 is best) on the AATCC Red 40 Stain Scale. Carpet samples must first be exposed to 100 revolutions of the Taber abrader (1,000-gram weight per H-18 wheel) and then the abraded area must be stain tested using AATCC test method 175.
B. Bigelow Commercial	
Style Name Product Type Construction Surface Appearance Nylon Type Gauge Pile Weight Pile Thickness Stitches Per Inch	Florencia Modular Modular Tufted Textured Patterned Loop Colorstrand® Nylon 1/10 (39.37 rows per 10 cm) 22.0 oz. per sq. yd. (746 g/m2) .104" (2.64 mm) 11.0 (43.31 per 10 cm)

Solution Dyed/Space Dyed

Protective Treatment	Sentry Plus
Density	7,615
Weight Density	167,530
Primary Backing	Non Woven Synthetic
Backing Foundation	None
Secondary Backing	UltraSet Modular System
Pattern Repeat	Not Applicable
Size	24" x 24" (.6096 m x .6096 m)
Flammability	ASTM E 648 Class 1 (Glue Down)
Smoke Density	ASTM E 662 Less than 450
Static Propensity	AATCC-134 Under 3.5 KV
AAQ Green Label	10984338
AQ Green Label Plus	1098
CRI Rating	Severe Traffic
Warranties	Lifetime Limited Modular Warranty

2.03 INSTALLATION ACCESSORIES

A. Adhesive recommended by flooring manufacturer.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine condition of existing subfloors with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting performance of carpet. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Verify that subfloors and conditions are satisfactory for carpet installation and comply with requirements specified in this Section and those of the carpet manufacturer.

3.02 PREPARATION

- A. General: Comply with carpet manufacturer's installation recommendations to prepare substrates indicated to receive carpet installation.
- B. Level subfloor within 1/4 inch in 10 feet (6 mm in 3 m), noncumulative, in all directions. Sand or grind protrusions, bumps, and ridges. Patch and repair cracks and rough areas. Fill depressions.
 - 1. Use leveling and patching compounds to fill cracks, holes, and depressions in subfloor as recommended by the carpet manufacturer.
- C. Broom or vacuum clean subfloors to be covered with carpet. Following cleaning, examine subfloors for moisture, alkaline salts, carbonation, or dust.

3.03 INSTALLATION

- A. Direct Glue-Down Installation: Comply with CRI 104, Section 8: "Direct Glue-Down."
- B. Comply with carpet manufacturer's recommendations for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under door in closed position. Do not bridge building expansion joints with continuous carpet.
- C. Cut and fit carpet 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 manufacturer.
- D. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- E. Install pattern in Form: Modular Quarter Turn Installation.
- F. Use vinyl edge strip adjacent to existing corridor vinyl flooring.

3.04 CLEANING

- A. Perform the following operations immediately after completing installation.
 - 1. Remove visible adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
 - 2. Remove protruding yarns from carpet surface.
 - 3. Vacuum carpet using commercial machine with face-beater element.

3.05 PROTECTION

- A. General: Comply with CRI 104, Section 15: "Protection of Indoor Installation."
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure carpet is without damage or deterioration at the time of Substantial Completion.

SECTION 09900

PAINTING

- PART 1 GENERAL
- 1.01 DESCRIPTION
 - A. Work Included:
 - 1. Prepare surfaces to receive finish.
 - 2. Finish surfaces as indicated in schedule at end of this Section.
 - B. Related Work in Other Sections:
 - 1. Section 07900 Joint Sealers
 - 2. Section 15160 Insulation
 - 3. Section 16160 Panel Boards
- 1.02 QUALITY ASSURANCE
 - A. Container labels shall include manufacturer's name, type of paint, stock number, color, label analysis, and where applicable instructions for reducing.
- 1.03 MOCKUP
 - A. Before proceeding with paint application, finish one complete surface of each color scheme required, clearly indicating selected colors, finish texture, materials, and workmanship. For spray application, paint surface not smaller than 100 sq.ft. as Project standard.
 - B. If accepted, sample area will serve as a minimum standard for work throughout Work.
- 1.04 SUBMITTALS
 - A. Submit materials list, product data, samples and manufacturer's instructions under provisions of Section 01340.
 - B. Submit manufacturer's product data on each paint material used on project.
 - C. Prepare 12 in. x 12 in. samples of finishes when requested by Owner. Transparent finishes on solid lumber may be 4 in. x 8 in. When possible, apply finishes on identical type materials to which they will be applied on job.
 - D. Identify each sample as to finish, formula, color name and number, sheen name, and gloss units.
 - E. Colors selected by Owner prior to commencement of work.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver paint materials under provisions of Section 01610 in sealed original labeled container.
- B. Store and protect materials under provisions of Section 01620. Provide adequate storage facilities. Store paint materials at minimum ambient temperatures of 45 °F in well ventilated area.
- C. Take precautionary measure to prevent fire hazards and spontaneous combustion.
- 1.06 ENVIRONMENTAL REQUIREMENTS
 - A. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture contents of surfaces are below following maximums: Refer to Section 01500.
 - 1. Plaster and gypsum wallboard: 12 percent.
 - 2. Concrete and Concrete Masonry Units: 12 percent.
 - 3. Interior Located Wood : 12 percent
 - 4. Exterior Located Wood: 19 percent
 - B. Ensure surface temperatures or the surrounding air temperature is above 45 °F before applying finishes. Minimum application temperatures for latex paints for interior work are 60 °F and 50 °F for exterior work. Minimum application temperature for varnish finishes is 75 °F.
 - 1. Do not paint exterior surfaces after September 30th unless surrounding are temperature is above 45 °F.
 - C. Provide adequate continuous ventilation and sufficient heating facilities to maintain temperatures above 45 °F, and 75 °F, as applicable, for 24 hours before, during and 48 hours after applications of finishes.
 - D. Provide minimum 25 foot candles illumination on surfaces to be finished.

1.07 MAINTENANCE DATA

- A. Submit maintenance data under provisions of Section 01730.
- B. Indicate cleaning methods, cleaning solutions recommended, and stain removal methods recommended.

1.08 EXTRA STOCK

- A. Furnish extra stock under provisions of Section 01750. Leave on premises, where directed by Owner, not less than on gallon each type and color used.
- B. Tightly seal and clearly label containers for identifications.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ICI Paints
- B. Fuller-O'Brien Corporation
- C. Glidden Coatings and Resins
- D. PPG Industries, Inc.
- E. Pratt and Lambert, Inc.
- F. Parker Paints
- G. Clorox Corporation/Olympic
- H. MINWAX
- I. Columbia Paints
- J. Substitutions: Under provisions of Section 01630.
- 2.02 PAINT AND ENAMEL MATERIALS
 - A. Paint and Enamel: Type and brand listed as manufactured by ICI Paints, unless otherwise noted.
 - 1. Owner's review of other acceptable manufacturer's products may include reference to "Architectural Specification Manual" published by Specifications Services and the Washington State Council Painting and Decorating Contractors of America. Provide first line materials.
 - B. Paint Accessory Materials: Linseed oil, shellac, turpentine and other materials not specifically indicated herein but required to achieve the finishes specified shall be of high quality and acceptable manufacturer.
 - C. Paint: Ready-mixed except field catalyzed coatings. Pigments fully ground maintaining a soft paste consistency, readily and uniformly dispersed to complete homogeneous mixture.
 - D. Paint shall have good flowing and brushing properties and dry or cure free of streaks and sags.
- 2.03 FINISHES
 - A. Refer to surface finish schedule at end of this Section.
 - B. Provide finish for all exposed materials factory primed or unfinished, unless specifically stated as not requiring finish.

PAINT SYSTEMS (Based on ICI Paints Reference #'s, unless otherwise noted)

INTERIOR PAINT SYSTEMS

On Gypsum Wallboard (IPS 10)

One Coat ICI No. 1260 Ultra Hide Airless High Build Latex Flat Primer/Finish Two Coats ICI No. 1403 Ultra Eggshell Interior Acrylic Wall and Trim Enamel On Gypsum Wallboard (IPS 20)

One Coat ICI No. 1260 Ultra Hide Airless High Build Latex Flat Primer/Finish Two Coats ICI No. 1407 Ultra Semi-Gloss Interior Acrylic Wall and Trim

On Gypsum Wallboard (IPS 30)

One Coat ICI No. 1260 Ultra Hide Airless High Build Latex Flat Primer/Finish Two Coats ICI No. 1403 Ultra Eggshell Interior Acrylic Wall and Trim Enamel

On Ferrous and Galvanized Metal Surfaces (IPS 40)

One Coat	ICI Devor Coatings No. 4160 Devguard Primer
One Coat	ICI No. 1120 Ultra-Hide Oil/Alkyd Interior Wood Undercoater
Two Coats	ICI Dulux No. 1512 Semi-gloss oil base Enamel

Hardwood Trim (IPS 50)

Two Coats	Clear Gloss MinWax Polyurethane
One Coat	Clear Satin MinWax Polyurethane

Concrete Floors (IPS 60)

Two Coats "Acrylseal" 20% or equal

EXTERIOR PAINT SYSTEMS

Exterior Fascia (EPS 10)

Prime	ICI Ultra-Hide Durus Exterior Primecoat Latex (2010)
One coat	ICI Decra Shield Exterior 100% Acrylic Satin Finish
One coat:	ICI Ultra Hid Durus Exterior Acrylic Satin Finish

Exterior Soffit (EPS 20)

1st Coat:"Olympic" Heavy Bodied Stain2nd Coat:"Olympic" Heavy Bodied Stain

Galvanized and Ferrous Metal Surfaces (EPS 30)

One Coat	ICI Devoe Coatings No. 4160 Devguard Primer
Two Coats	ICI No. 2406 Dulux Professional Exterior Semi-Gloss Finish

Striping (EPS 40)

- 1st Coat: White Traffic Paint
- 1 Coat Blue Traffic Paint @ Handicap parking

PART 3 EXECUTION

- 3.01 INSPECTION
 - A. Thoroughly examine surfaces scheduled to be painted prior to commencement of work. Report in writing to Owner, conditions that may potentially affect proper application. Do not commence until such defects have been properly corrected.
 - B. Properly correct defects and deficiencies in surfaces which may adversely affect work of this Section.
 - C. Beginning of installation means installer accepts existing substrates.

3.02 PROTECTION

- A. Adequately protect other surfaces from paint and damage. Repair damage resulting form inadequate, and unsuitable protection.
- B. Use sufficient drop cloths, shields, and protective equipment to prevent spray and droppings from fouling surfaces not being painted, surfaces within storage and preparation area.
- C. Place cotton waste, cloths, and material which may constitute fire hazards, in closed metal containers and remove daily from site.
- D. Prior to painting operations, remove electrical plates, surface hardware, fittings and fastenings. Carefully store, clean, and replace on completion of work in each area. Do not use solvent to clean hardware with permanent lacquer finish.

3.03 PREPARATION

- A. Remove mildew, by scrubbing with solutions of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry completely.
- B. Remove contamination from gypsum board surfaces and prime to show defects, if any. Paint after defects have been remedied.
- C. Remove surfaces contamination and oils from zinc coated surface and prepare for priming in accordance with metal manufacturer's recommendations.
- D. Remove dirt, loose mortar, scale, powder and other foreign matter from concrete and unit masonry surfaces to be painted. Remove oil and grease with solutions of tri-sodium phosphate; rinse well and allow to thoroughly dry.
- E. Remove grease, rust, scale, dirt, and dust from steel and iron surfaces. Where heavy coatings of scale are evident, remove by wire brushing, sandblasting, or other necessary method. Ensure steel surfaces are satisfactory before painting.

- F. Clean unprimed steel surfaces by washing with solvent. Apply treatment of phosphoric acid solution, ensuring weld joints, bolts and nuts are similarly cleaned. Prime surfaces to indicate defects. Paint after defects have been remedied.
- G. Sand and scrape shop primed steel surfaces to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
- H. Galvanized Metals:
 - 1. Solvent clean with toluol, xylol, or lacquer thinner to remove oils, grease and other contaminants. Don not use paint thinner or turpentine.
 - 2. Use phosphoric acid based, etching type, surface treatment compatible with painting system materials. Follow surface treatment manufacturer's instructions.
 - 3. Where conditions require, use strong acid treatment or sand blasting to prepare galvanized surfaces scheduled to receive paint finish.
- I. Wipe off dust and grit from miscellaneous wood items and millwork prior to priming. Sand wood, scheduled to receive transparent finish, to unblemished condition. Visible sanding scratches are unacceptable. Spot-coat knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried, and sand between coats. Remove factory applied sealers containing wax from glue laminated members finished under this Section by solvent wiping and sanding before coating. Back prime interior and exterior woodwork.
- 3.04 APPLICATIONS
 - A. Apply products in accordance with manufacturer's instructions.
 - B. Apply each coat to uniform finish, at proper consistency.
 - C. Tint each coat of paint slightly darker than preceding coat unless otherwise accepted by Owner's Representative.
 - D. Sand lightly between coats to achieve required finish.
 - E. Do not apply finishes on surfaces not sufficiently dry.
 - F. Allow each coat of finish to dry before applying following coat, unless directed otherwise by manufacturer.
 - G. Where clear finishes are required, tint fillers to match wood. Work fillers well into grain before set. Wipe excess from surfaces.
 - H. Prime top and bottom edges of hollow metal doors with enamel undercoat.
 - I. Prime back surfaces of interior and exterior woodwork with primer paint.

- J. Prime back surfaces of interior wood work scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.
- K. Colors:
 - 1. Anticipate maximum 3 field colors and 4 accent colors for paint and enamel systems.
 - 2. Anticipate maximum 3 field colors and no accent colors for epoxy paint systems. Refer to Section 09650 for gym floor striping.
 - 3. Anticipate maximum 1 field color and no accent colors for each of the other paint and stain systems.
- 3.05 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT
 - A. Remove grilles, covers, and access panels for mechanical and electrical systems for locations and paint separately.
 - B. Finish paint primed equipment to color selected.
 - C. Paint interior surfaces of air ducts, convector and baseboard heating cabinets visible through grilles and louvers with one coat flat black paint, to limit of sight line.
 - 1. Paint dampers exposed immediately behind louvers, grilles, convector and baseboard cabinets to match face panels.
 - D. Paint both sides and edges of plywood backboards for electrical equipment before installing backboards and mounting equipment.
 - E. Paint electrical panel boards and frames. In locations other than electrical/mechanical rooms, paint color to match adjacent wall surfaces.

3.06 CLEANING

- A. As work proceeds and upon completion, promptly remove paint spills, splashes, and spatters.
- B. During progress of work keep premises free from unnecessary accumulation of tools, equipment, surplus materials, and debris.
- C. Upon completion of work leave premises neat and clean.

SECTION 10260 WALL AND CORNER GUARDS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following types of wall surface protection systems:
 - 1. Wall protection systems, including:
 - a) Rigid Vinyl Sheets
 - b) Wall guards
 - c) Corner guards
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Wood blocking and grounds for surface-mounted wall guards, corner guards, and handrails are included in Division 6 Section "General Carpentry."
 - 2. Mop plates, kick plates, and armor plates are included in Division 8 Section "Door Hardware."

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each protection system component and installation accessory required, including installation methods for each type of substrate. Provide written data on each required component including physical characteristics, such as durability, resistance to fading, and flame resistance.
- C. Shop drawings showing locations, extent, and installation details of wall and corner guards, and other protection systems. Show methods of attachment to adjoining construction and any require backing.
- D. Samples for Initial Selection: For initial selection of color, pattern and surface texture, provide the manufacturer's standard color chips consisting of actual sections of each vinyl plastic material required showing the full range of materials, colors, and textures available.

- E. Product test reports from a qualified independent testing laboratory showing compliance of wall surface protection system components with requirements indicated based on tests performed by the laboratory within the past five years.
- F. Maintenance data for wall surface protection system components for inclusion in the Operating and Maintenance Manuals specified in Division 1.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has previously installed wall surface protection systems similar in material, design, and extent to the systems indicated for this Project.
- B. Manufacturer Qualifications: Firm experienced in manufacturing wall surface protection system components that are similar to those required for this Project and that have a record of successful in-service performance.
- C. Fire Performance Characteristics: Provide wall surface protection system components that are identical to those tested in accordance with ASTM E 84 for the fire performance characteristics indicated below. Identify wall surface protection system components with appropriate markings from the testing and inspection organization.
 - 1. Flame Spread: 75 or less.
 - 2. Smoke Developed: 450 or less.
- D. Single Source Responsibility: Obtain each color, grade, finish, and type of wall surface protection system component from a single source with resources to provided products of consistent quality in appearance and physical properties without delaying progress of the Work.
- E. Design Criteria: The drawings indicate the location of wall protection and corner guards. Products selected as a basis for design under Part 2 of this Section set the standard for performance and appearance. Wall surface protection system components by other manufacturers may be considered provided deviations in dimensions and profiles are minor and do not change the design concept as judged by the Contracting Officer. The burden of proof of equality is on the proposer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, quality or grade, and fire hazard classification.
- B. Store wall surface protection materials in original undamaged packages and containers inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

- 1. Maintain room temperature within the storage area at not less than 70 °F (21 °C) during the period plastic materials are stored. Keep sheet material out of direct sunlight to avoid surface distortion.
- 2. Store rigid plastic corner guard covers in a vertical position, and rigid plastic wall guard and handrail covers in a horizontal position for a minimum of 72 hours, or until the plastic material attain the minimum room temperature of 70 °F (21 °C).

1.06 MAINTENANCE

A. Maintenance Instructions: Provide the manufacturer's instructions for maintenance of installed work. Include recommended methods and frequency for maintaining optimum condition under anticipated traffic and use conditions. Include precautions against cleaning materials and methods that may be detrimental to finishes and performance.

PART 2 PRODUCTS

- 2.01 MANUFACTURERS RIGID VINYL SHEET, WALL GUARDS AND CORNER GUARDS
 - A. Design is based on : IPC Door and Wall Protection Systems InPro Corporation, PO Box 406 Muskego, WI 53150 Telephone: 800-222-5556, Fax: 888-715-8407 <u>http://www.inprocorp.com</u>
 - B. Other acceptable manufacturers:
 - 1. American Floor Products Co., Inc.
 - 2. Acrovyn VA Series
 - 3. Pawling Corporation
 - C. Substitutions: Per Section 01630
- 2.02 RIGID VINYL SHEET MANUFACTURER
 - A. Rigid Vinyl Sheet C. Provide all Sanparrel Rigid Vinyl Sheet and wall protection from a single source.
 - Sanparrel, Rigid Vinyl Sheet Options Item # Dimensions Thickness 404 4'x8' (1.22m x 2.44m) .030" = 1/32" (.8mm) Accessories:
 - a) 407 Top Cap; Length: 8' (2.44m) standard, 10' (3.04m)
 - b) 408 Vertical Divider Bar; Length: 8' (2.44m) standard, 10' (3.04m)
 - c) 409 Inside Corner; Length: 8' (2.44m) standard, 10' (3.04m)

- d) 417 Top Cap for .080" sheet;
 Length: 8' (2.44m) standard, 10' (3.04m)
- e) 418 Vertical Divider Bar for .080" sheet;
 - Length: 8' (2.44m) standard, 10' (3.04m)
- f) 419 Inside Corner for .080" sheet; Length: 8' (2.44m) standard, 10' (3.04m)
- g) 168BN Surface mounted bluenose corner guards Size: 2" x 2" x 4", 90°

2.03 MATERIALS

A. Vinyl: Sanparrel shall be manufactured from chemical and stain resistant polyvinyl chloride with the addition of impact modifiers. No plasticizers shall be added (plasticizers may aid in bacterial growth).

2.04 ACCESSORIES

A. Top caps, inside corners, divider bars and outside corners shall be made of extruded PVC.

2.05 FINISHES

- A. Color or pattern of Sanparrel to be selected by the architect from the IPC finish selection. Surface shall have a .04 haircell texture.
- B. Accessories: Top caps, inside corners, divider bars and outside corners shall be of a color matching the Sanparrel.

2.06 WALL GUARDS

A. Wall Guard Profile: 700 Wall Guard, 7-3/4" (197mm) height x 1" (25mm) depth, with continuous aluminum retainer.

2.07 MATERIALS

- A. Vinyl: Snap on cover of .080" (2mm) thickness shall be extruded from chemical and stain resistant polyvinyl chloride with the addition of impact modifiers. No plasticizers shall be added (plasticizers may aid in bacterial growth).
- B. Aluminum: Continuous aluminum retainer of .080" (2mm) thickness shall be fabricated from 6063-T5 aluminum, with a mill finish.

2.08 COMPONENTS

- A. End caps, outside corners, inside corners and brackets shall be made of injection molded thermoplastics.
- B. Fasteners: All mounting system accessories appropriate for substrates indicated on the drawings shall be provided.

2.09 FINISHES

- A. Vinyl Covers: Colors of the wall guard to be selected by the architect from the IPC finish selection. Surface shall have a pebblette texture.
- B. Molded Components: End caps, outside corners, inside corners and brackets shall be of a color matching the wall guards. Surface shall have a pebblette texture.
- 2.10 CORNER GUARDS
 - A. Provide Surface Mount Corner Guards, IPC 160, with 2" wing, for all outside corners, located where Wall Guard System is present, per the Finish Schedule. Color as selected by Owner's Representative, from manufactures standard colors.
- PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions in which wall surface protection components and wall protection systems will be installed.
 - 1. Inspect wall to see that new blocking required by shop drawings is in place and properly finished. Identify areas without blocking/backing required. Do not proceed until all backing is properly in place according to shop drawings.
 - 2. Complete all finishing operations, including painting, before beginning installation of wall surface protection system materials.
- B. Do not proceed with installations until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General: Install wall surface protection units plumb, level, and true to line without distortions.
 - 1. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished work.
- B. Install aluminum retainers, mounting brackets, and other accessories in strict accordance with the manufacturer's instructions.
 - 1. Where splices occur in horizontal runs of over 20 feet, splice aluminum retainer and plastic cover at different locations along the run.

3.03 CLEANING

- A. General: Immediately upon completion of installation, clean plastic covers and accessories using a standard ammonia based household cleaning agent. Clean metal components in accordance with the manufacturer's recommendations.
- B. Remove excess adhesive using methods and materials recommended by manufacturer.
- C. Remove surplus materials, rubbish, and debris resulting from installation upon completion of work and leave areas of installation in neat, clean condition.

SECTION 10400

SIGNS AND SYMBOLS

- PART 1 GENERAL
- 1.01 DESCRIPTION
 - A. Work Included:
 - 1. Interior signs and accessibility symbols.
 - 2. Installation of signs and symbols.
 - 3. Building Identification Sign
 - B. Related Work Described Elsewhere:
 - 1. Section 03300 Cast-In-Place Concrete
 - 2. Section 04230 Reinforced Unit Masonry
 - 3. Section 05500 Metal Fabrications
 - 4. Section 08111 Steel Doors and Frames
 - 5. Section 09900 Painting and Finishing
 - C. References:
 - 1. Symbols of Accessibility: ANSI A117.1 "Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.

1.02 SUBMITTALS

- A. Submit shop drawings, samples and product data under provisions of Section 01340.
- B. Provide listing of sign types, lettering, locations, dimensions, and methods of attachments.
- C. Provide full size sample interior sign, and symbol, of type, style and color specified. Include method of attachment.
- 1.04 DELIVERY, STORAGE AND HANDLING
 - A. Deliver signage under provision of Section 01610.
 - B. Package signs and symbols separately, or in like groups of names, labeled as to names and symbols. Include installation template, hardware or adhesive specified, and installation instruction.

PART 2 PRODUCTS

- 2.01 INTERIOR MANUFACTURER
 - A. InPro Signscape, InproCorp.com
 - B. Substitutions: Under provisions of Section 01630.
- 2.02 INTERIOR SIGNS The total number of room signs shall be no less than 35 signs
 - A. Standard Design: Rounded, placement: upper centered, tactile, Grade 2 braille, font: Helvetica.
 - B. Restroom S320 ADA Regulatory signs: Icon of male and female on restroom signs with ADA symbol and Grade 2 braille. Average of 15 characters per sign. Copy and colors as selected by architect.
 - C. Attachments: Furnish complete with adhesive and attachment devices as indicated, as required for complete installation.
- 2.03 EXTERIOR BUILDING SIGNAGE
 - A. Building Identification: Provide 11" High Plastic Lettering, Helvetica, similar or equal to Minnesota Letters, as manufactured by GEMINI, Inc. 1-800-LETTERS (538-8377), letter as shown on the drawings, stud mounted per manufacturers recommendations, with 3" deep fasteners and silicone.
- PART 3 EXECUTION
- 3.01 INSTALLATION
 - A. Install interior signs in locations, and at heights indicated, level, plumb and in accordance with manufacturer's instructions, reviewed shop drawings and requirements of Contract Documents. Where not shown, install as directed.
 - B. Interior Signs and Symbols: Install with manufacturer's standard silastic adhesive mounting unless otherwise indicated.

SECTION 10520 FIRE EXTINGUISHERS, CABINETS & ACCESSORIES

PART 1 GENERAL

1.01 SHOP DRAWINGS

- A. Show layout, dimensions, details of construction, methods of joining of other work, required clearances, finishes, accessories, and other pertinent items.
- B. Manufacturer's standard printing literature may be substituted, provided required information is included.
- 1.02 PRODUCT DELIVERY, STORAGE AND HANDLING
 - A. Protect against damage and discoloration.
 - B. Deliver in manufacturer's original, unopened, protective wrapping with original, legible label intact.
- 1.03 INSTALLER'S QUALIFICATIONS
 - A. Employed by or acceptable to manufacturer or specialty being installed.

PART 2 PRODUCTS

2.01 FIRE EXTINGUISHER CABINETS

A. Manufacturer:

Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to the following:

- 1. J.L. Industries
- 2. Larsen's
- 3. Modern Metal Products
- 4. Potter-Roemer
- B. Model: J.L Industries Clear Vu #1516.
- C. Size: Accommodate fire extinguishers specified below.
- D. Mounting: Semi-recessed where located in stud wall assembly and flat trimmed elsewhere.
- E. Door and frame Material: Prime-coated steel.
- F. Door glazing: Clear acrylic plastic convex bubble.
- G. Cylinder lock: Not required.
- H. Cabinet interior: Black enamel.
- I. Cabinet exterior: Red enamel.
- J. Extinguisher support: Manufacturer's standard brackets to receive fire extinguishers specified below.
- K. Extent of work: Provide where shown on drawings.
- L. Provide fire FX cabinets where located in fire rated assemblies.
2.02 FIRE EXTINGUISHERS

A. Manufacturer:

Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to the following: JL Industries.

- B. Model: Cosmic 10E or equal.
- C. Type: OSHA-approved and UL-rated for type A, B, and C fires.
- D. Color: Red.
- E. Size: 10 lbs.
- F. Fill and service extinguishers prior to project substantial completion and attached certificate of service, including date, to each extinguisher. Fire extinguishers shall be certified for 12 months, after final inspection date.
- G. Extent of work: Provide extinguishers for each fire extinguisher cabinet specified above.
- PART 3 EXECUTION
- 3.01 EXISTING CONDITIONS
 - A. Verify that blocking, backing, and surfaces to receive specialties are properly prepared, sized, and located.
 - B. Prior to starting work, notify General Contractor about defects requiring correction.
 - C. Do not start work until conditions are satisfactory.
- 3.02 PROTECTING WORK OF OTHER SECTIONS
 - A. Protect against damage and discoloration caused by work of this section.
- 3.03 INSTALLATION
 - A. General:
 - 1. Follow manufacturer's instructions and approved shop drawings.
 - 2. Secure specialties plumb, level, square, and true as possible.
 - B. Fire extinguisher cabinets: Unless otherwise shown on drawings, mount cabinet so that extinguisher top is 48 inches above floor.
 - C. Fire extinguishers: Mount in fire extinguisher cabinets.
- 3.04 ADJUSTMENTS
 - A. Adjust moving parts to operate satisfactorily at time of project substantial completion and during warranty period.
- 3.05 PRODUCT CLEANING AND REPAIRING
 - A. Remove debris from project site upon work completion, or sooner if directed.
 - B. Including work of other trades, clean, repair, and touch-up or replace when directed, products which have been soiled, discolored, or damaged by work of this section.

END OF SECTION

SECTION 10800 TOILET AND BATH ACCESSORIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes toilet and bath accessory items as scheduled.

1.03 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division
 1 Specifications Sections.
- B. Product data for each toilet accessory item specified, including construction details relative to materials, dimensions, gauges, profiles, mounting method, specified options, and finishes.
- C. Samples of each toilet accessory item to verify design, operation, and finish requirements. Acceptable full-size samples will be returned and may be used in the Work.
- D. Schedule indicating types, quantities, sizes, and installation locations (by room) for each toilet accessory item to be provided for project.
- E. Setting drawings where cutouts are required in other works, including templates, substrate preparation instructions, and directions for preparing cutouts and installing anchorage devices.
- F. Maintenance instructions including replaceable parts and service recommendations.

1.04 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise acceptable to Contracting Officer.

1.05 PROJECT CONDITIONS

A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

1.06 WARRANTY

- A. Warranty: Submit a written warranty executed by mirror manufacturer, agreeing to replace any mirrors that develop visible silver spoilage defects within warranty period.
- B. Warranty Period: 15 years from date of Substantial Completion.
- C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide toilet accessories by one of the following:
 - 1. Bobrick Washroom Equipment, Inc. (Bobrick), Referenced Mfgr.
 - 2. American Specialties, Inc. (ASI)
 - 3. Bradley Corporation (Bradley)
 - 4. McKinney/Parker (McK/P)

2.02 MATERIALS, GENERAL

- A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 0.034-inch (22gauge) minimum thickness.
- Brass: Leaded and unleaded, flat products, ASTM B 19; rods, shapes, forgings, and flat products with finished edges, ASTM B 16; Castings, ASTM B 30.
- C. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 0.04-inch (20gauge) minimum. Surface preparation and metal pretreatment as required for applied finish.
- D. Galvanized Steel Sheet: ASTM A 527, G60.
- E. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.
- F. Baked Enamel Finish: Factory-applied, gloss white, baked acrylic enamel coating.
- G. Mirror Glass: Nominal 6.0-mm (0.23-inch) thick, conforming to ASTM C 1036, Type I, Class 1, Quality q2, and with silvering, electro-plated copper coating, and protective organic coating.

- H. Stainless Steel Mirror Surfaces: Not less than 0.04-inch (20-gauge) AISI Type 302/304 stainless steel sheet, stretcher-leveled with No. 8 polished mirror finish. Bond to 1/4-inch minimum hardboard backing.
- I. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.
- J. Fasteners: Screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.

2.03 FABRICATION

- A. General: Only a maximum 1-1/2-inch-diameter, unobtrusive stamped manufacturer logo, as approved by Contracting Officer, is permitted on exposed face of toilet or bath accessory units. On either interior surface not exposed to view or back surface, provide additional identification by either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.
- B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.
- C. Framed Mirror Units, General: Fabricate with mirror glass.
 - 1. Provide galvanized-steel backing sheet, not less than 0.034 inch (22 gauge) and full mirror size, with non-absorptive filler material. Corrugated cardboard is not an acceptable filler material.
- D. Mirror Unit Hangers: Provide system for mounting mirror units that will permit rigid, tamperproof, and theft proof installation, as follows:
 - 1. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
- E. Keys: Provide universal keys for access to toilet accessory units requiring internal access for servicing, re-supply, etc. Provide minimum of six keys to Owner's representative.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install toilet accessory units according to manufacturers' instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.
- B. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, according to manufacturer's instructions for type of substrate involved.
- C. Install grab bars to withstand a downward load of at least 250 lbs, complying with ASTM F 446.

3.02 ADJUSTING AND CLEANING

- A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.
- B. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

3.04 SCHEDULE OF ACCESSORIES

The following identifies accessories for the indicated rooms. This list may not be comprehensive. Some accessories may appear on drawings that are not listed below in which case, also provide those accessories indicated on drawings matching the similar units specified.

- A. Paper Towel Dispenser/Waist Receptacle: Bobrick B-43944
- B. Mirror: Bobrick B-165 2436
- C. Grab Bar: Bobrick B6806x42
- D. Grab Bar: Bobrick B6806x36
- E. Toilet Tissue Dispenser (Surface Mounted): Bobrick B-4288
- F. Toilet Seat Cover Dispensers: Bobrick B-4221
- G. Sanitary Napkin Disposal: Bobrick B-270
- H. Robe / Towel Hooks: Bobrick B-211
- I. Shower Curtain Rod with concealed mounting: Bobrick B-207
- J. Vinyl Shower Curtain: Bobrick B-204-2
- K. Horizontal Surface-Mounted Satin Stainless Steel Finish Baby Changing Station: Bobrick KB110-SSWM

- L. Privacy Curtain and Ceiling Mounted Rack:
 - 1. Shower Curtain: Brite Inc, briteinc.com, 800-791-2946
 - a) Height: 96", Width: 72", Height off the floor: 2"
 - b) Fabric Pattern: Shower Shield
 - c) Fabric Color: Snow
 - 2. Carrier Tracks: Brite Inc, briteinc.com, 800-791-2946
 - a) Model: IFC-98 Track/IFC-100 Carrier Track Kits
 - b) Kit 2: 6'0" straight. Sonsists of one 6'0" straight track, 1 pair of endstops, and 17 IFC-100 carriers. Satin Anodized Finish

END OF SECTION

SECTION 10925

MISCELLANEOUS SPECIALTIES

- PART 1 GENERAL
- 1.01 DESCRIPTION
 - A. Work Included:
 - 1. Items scheduled under PART 2 Products.

1.02 SUBMITTALS

- A. Submit product data, samples, shop drawings and manufacturer's installation instructions under provisions of Section 01340.
- B. Provide above submittals on each item scheduled under Products.
- C. Indicate framing system, sizes and spacing of hangers, braces, and components, loads, bearing and anchor details of ceiling hooks. Submit design calculations signed by professional engineer experienced in structural framing design of metal components.
- 1.03 DELIVERY, STORAGE AND HANDLING
 - A. Deliver products of this Section in individual packages, under provision of Section 01610.
 - B. Protect products of this Section from damage or disfiguration, under provisions of Section 01620.
 - C. Mask off products of this Section to protect from over spray or finishing of adjacent surfaces.
- PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Listed under each scheduled item.
- B. Substitutions: Under provisions of Section 01630.
- 2.02 MATERIALS
 - A. CORNER GUARDS: Equal to 1 ¹/₂" IPC Tape on Vinyl Corner guards; 4 ft. tall on all external corners of all gypsum board wall construction, with the exemption of corners covered by Wall Guard System in Section 10260. Color as selected by Owner's Representative, from manufactures standard colors.

B. JANITOR MOP AND TOOL HOLDERS: Similar and equal to Bobrick Washroom Equipment, Inc. Model B-239; shelf 18 ga. stainless steel, satin finish; 8 in. deep; Rubber mop holders: 44 in. long, 4 holders, 5 hooks; included one unit for each janitor's closet. Secure holders to wall with tamper-proof fasteners. Mount shelf at 6 ft. above floor. Approved Substitutions: Continental Manufacturing

- C. LOUVERS: Provide similar and equal to GREENHECK louvers.
 - Louver Type: Model ESJ-202 TA 14'4" W x 2'1" H, Stationary Louver J Blade.
 Frames shall be heavy gauge 6063T5 extruded aluminum positioned at 37° and 45° angles on approximately 4 in centers. Bird Screen: 0.75 x 0.051 in flattened expanded aluminum in removable frame. Screen mounted at rear (inside). Welded construction with baked enamel finish. Contractor shall submit manufacturer's standard color samples to Architect for selection.
- D. TRASH CONTAINERS: Provide similar and equal to Cascade Engineering Bear Resistant Cascade Carts. Provide two (2) 96 gallon bear resistant with twopoint locking system.
- E. SPECIMEN TURNTABLE PASS BOX:
 - 1. Approved Manufacturer: American Specialties, Inc Babychanger.com 441 Saw Mill River Road Yonkers, NY 10701
 - 2. Model No: 0515
 - 3. Door Size: 6" x 10-1/2"
 - 4. Finish: No. 4 Satin
 - 5. Wall thickness: 3-3/8" to 7"
 - 6. Installation: As per manufacturer
- F. WIRE SHELVING:
 - 1. Approved Manufacturer: Metro, <u>www.metro.com</u>
 - 2. Name: Super Adjustable 2 Super Erecta Shelf
 - 3. Model #:
 - a) A2454BR (Super Erecta Brite)/ A2454NC (Chrome)
 - b) A2436BR (Super Erecta Brite)/ A2436NC (Chrome)
 - c) A2448BR (Super Erecta Brite)/ A2448NC (Chrome)
 - d) Cat. No. Plated: 74P

G. ENTRYWAY MAT:

- 1. Approved Manufacturer: Pedimat, C/S Group Pedisystems® www.pedisystems.com/carpet
- 2. Thickness: 3/8"
- 3. Frame Material: Tapered Aluminum
- 4. Mounting: Surface mounted
- 5. Tread rails: 7/16" deep, vinyl/acrylic with aluminum hinge connectors

- H. STAINLESS STEEL BASE MOLDING:
 - 1. Approved Manufacturer: Diamond Life Gear, <u>www.diamondlifegear.com</u>
 - 2. Material: 22 gauge Stainless Steel
 - 3. Dimensions: 4 ¹/₂" x 16 LF
 - 3. Warranty: 90 days
 - 4. Pre-formed corners: Provide where shown on drawings.
- I. Substitutions: Under provisions of Section 01630.
- PART 3 EXECUTION
- 3.01 INSTALLATION
 - A. Install miscellaneous specialty items plumb and level, conforming to manufacturer's installation requirements, in accordance with reviewed shop drawings.
- 3.02 PROTECTION
 - A. Protect installed items in accordance with Section 01500.

END OF SECTION

SECTION 11452

APPLIANCES

- PART 1 GENERAL
- 1.01 DESCRIPTION
 - A. Work Included:
 - 1. Provide appliances as listed herein.
 - B. Related Work Described Elsewhere:
 - 1. Section 12302 Modular Casework
 - 2. Div 15 Mechanical
 - 3. Div 16 Electrical
 - C. References:
 - 1. Electrical Components: UL Listed and Labeled
 - 2. Install electrical equipment in conformance with UL requirements.

1.02 SUBMITTALS

- A. Submit product data under provisions of Section 01340.
- B. Submit manufacturer's brochures, properly edited for Project, for each item of equipment required. Include catalog cuts and technical specifications.
- C. Show locations of electrical and mechanical connections, anchorage's, finishes, fitting, mounting flanges, studs and gaskets for installation.
- 1.03 DELIVERY, STORAGE AND HANDLING
 - A. Deliver appliances to Project in manufacturers original, unopened protective packaging with attachments and accessories necessary for complete installation. Do not deliver appliances until Project is ready for installation of units.
- 1.04 WARRANTY
 - A. Provide manufacturer's standard warranty, under provisions of Section 01740.
- 1.05 OPERATION AND MAINTENANCE DATA
 - A. Provide manufacturer's standard operation and maintenance data under provisions of Section 01730.

PART 2 PRODUCTS

- 2.01 APPLIANCE LIST
 - A. CLOTHES WASHER/DRYER:
 - GE Profile 4.2 IEC cu Ft Colossal Capacity Frontload Washer

 a) Item#: 294935
 - b) Model: WPDH8800J
 - c) Color selected per architect
 - 2. GE Profile 7.5 Cu. Ft. Colossal Capacity Electric Dryer
 - a) Item#: 294936
 - b) Model: DPVH880EJWW
 - c) Color selected per architect
 - B. RANGE: GE Profile 30" Slide in Electric Range (JS968SKSS)
 - C. HOOD/MICROWAVE: GE Profile Adcantium 120 1.4 Cu. Ft. Above-the-Cooktop Oven

 a) Model: SCA1001KSS
 - a) Model. SCATOUTR
 - D. REFRIGERATORS:
 - 1. Summit Commercially approved under counter refrigerator a) Model: AL750SSTB
 - 2. GE Profile 21.7 Cu. Ft. Top Freezer Refrigerator a) Model: PTS22SHSSS
 - E. DISHWASHER: GE Profile 24 in. Built-In Dishwasher a) Model: PDW9280NSS
 - F. Substitutions: Per substitutions Section 01630.

PART 3 EXECUTION

- 3.01 INSPECTION
 - A. Verify that installation of equipment may be completed in accordance with requirements of Contract Documents and manufacturer's recommendations. Properly correct unsatisfactory conditions and proceed with installation.
- 3.02 INSTALLATION
 - A. Install appliances plumb, level, in alignment and in accordance with manufacturer's recommendations.
 - B. Mount dryer on wall using manufacturer's wall mount installation kit. Exhaust dryer out the left side.
 - C. Connections to services specified in Divisions 15 and 16.

3.03 ADJUST AND CLEAN

- A. Testing: Test each item of residential equipment to verify proper operation. Make necessary adjustments. Demonstrate operation to Owner under provisions of Section 01670.
- B. Accessories: Verify that accessory items required have been furnished.
- C. Cleaning: Remove packing material from residential appliances and leave units in clean condition, ready for operation.

END OF SECTION

SECTION 12302

MODULAR CASEWORK

- PART 1 GENERAL
- 1.01 DESCRIPTION
 - A. Work Included:
 - 1. Shop fabricated, plastic laminate covered wood casework with hardware.
 - 2. Prefinished surfaces.
 - 3. Countertops.
 - 4. Prepared for utilities.
 - 5. Casework installation.
 - B. Related Work Described Elsewhere:
 - 1. Section 06114 Wood Blocking and Curbing
 - 2. Section 06200 Finish Carpentry
 - 3. Section 08700 Door Hardware
 - 4. Section 10925 Miscellaneous Specialties
 - C. References:
 - 1. American National Standards Institute (ANSI): A208.1-1979 Mat-Formed Wood Particleboard.
 - 2. Architectural Woodwork Institute (AWI): Quality Standards 1985 Edition.
 - 3. Commercial Standards (CS): 35 Adhesives.
 - 4. Federal Specifications (FS) :
 - a) MM-L-736 Lumber, Hardwood.
 - b) MMM-A-130 Adhesive, Contact.
 - 5. National Electrical Manufacturer's Association (NEMA) : LD3-1980 High Pressure Decorative Laminates.
 - 6. Voluntary Product Standard (PS) :
 - a) 1 Construction and Industrial Plywood
 - b) 20 American Softwood Lumber Standards
 - c) 51 Hardwood and Decorative Plywood
 - d) 58 Basic Hardboard.
 - 7. American Society for Testing and Materials (ASTM) : A525-83 Steel Sheet, Zinc Coated, (Galvanized) by the Hot-Dip process.

1.02 QUALITY ASSURANCE

- A. Perform work to custom quality in accordance with "Quality Standards" of the Architectural Woodworking Institute (AWI).
 - a) Laminate Clad Cabinets: AWI Section 1600.
 - b) Laminate Clad Tops: AWI Section 1600, Division C.
- B. Furnish all modular casework by one manufacturer.

1.03 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01340.
- B. Include materials, components profiles, fastening methods, assembly methods, joint details, hardware, accessory listings, and schedule of finishes.
- C. Submit color samples under provisions of Section 01340.
- D. Submit samples 6 in. x 6 in. illustrating selected colors, patterns and finishes.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and protect wood materials under provisions of Section 01610 and 01620.
- B. Store indoors, in ventilated areas with constant minimum temperature of 60 °F and maximum relative humidity of 55 percent.

PART 2 PRODUCTS

- 2.01 MANUFACTURERS
 - A. General: All cabinetry and casework illustrated in drawings shall meet the following construction standards. Following products are for general reference only and are subject to compliance with specified requirements.
 - B. Westmark Products: Series: 200 or equal shop built.
 - C. Substitutions:
 - 1. TMI Systems Design Corporation
 - 2. MidMark

2.02 WOOD MATERIALS

- A. Softwood Lumber: PS 20 graded in accordance with AWI. Maximum moisture content 12 percent.
- B. Hardwood Lumber: FS MM-L-736 graded in accordance with AWI. Maximum moisture content 12 content.

2.03 SHEET MATERIALS

- A. Softwood Plywood: PS 1 graded in accordance with AWI, particleboard core.
- B. Wood Particleboard: ANSI A208.1 mat-formed, 3 ply board of balanced construction, minimum Grade 1-M-3; 3/4 in. core (plus overlay thickness); 8 percent maximum moisture content.
 - 1. 45 lb./cu. ft. density particleboard, and face screw holding minimum 300 lb. withdrawal, except for hinged cabinet doors use 50 lb. cu. ft. density or Grade 1-H-3 with face screw holding minimum 350 lb. withdrawal.
 - 2. Optional: Monolithic flakeboard, 3 ply board of balanced construction, outer layers of wood flakes. Provide 45 lb./cu ft density with face screw holding minimum 350 lb. withdrawal, surface hardness of 900 psi.
 - 3. Provide with resin binder, water-soluble glues and binders not acceptable; 8 percent maximum moisture content.
- C. Hardboard: PS 58 or CS 251; pressed wood fiber with resin binder; tempered grade, smooth on non-concealed surfaces. Prefinished, 1/4 in. thick minimum or as otherwise indicated, color matched to interior.
- D. Provide 3/4" Medex core material at all countertops with sinks
- 2.04 LAMINATE MANUFACTURERS
 - A. Wilsonart Laminate
 - B. Formica Corporation
 - C. Nevamar Corporation
- 2.05 LAMINATE MATERIALS
 - A. Plastic Laminate: NEMA LD3, general purpose type, except post forming grade for curved countertops and where forming is required, colors as specified.
 - 1. Horizontal surfaces: GP 50 and PF 43.
 - 2. Vertical surfaces and horizontal non-work surfaces: GP 28.
 - B. Laminate Backing Sheet: NEMA LD3 BK20 backing grade, undecorated plastic laminate.
- 2.06 ACCESSORIES
 - A. Adhesives:
 - 1. Contact Adhesive: FS MMM-A-130, type recommended by accepted laminate manufacturer to suit application.
 - 2. Joint Adhesive: CS 35, Type 1 waterproof.
 - B. Plastic Edge Trim: Heavy duty extruded 2 mm p.v.c., machine applied with waterproof hot-melt adhesive; 1/8 in. radius, all corners. Color as selected by architect.

- C. Fasteners: Size and type to suit application.
- D. Trim, Fillers, Closures, Stands, Supports, Sleeves, Collars, Escutcheons, Ferrules, Brackets, Braces, and Other Miscellaneous Items: Manufacturer's standard of size and type to suit application, and consistent with casework design, except provide specified size and type where indicated.
- E. Vented Base: Modify casework construction and provide accessories as shown.
- F. Galvanized Steel Sheet: ASTM A525, G60 zinc coating, gage of core steel shown.
 - 1. Adhesive for application of galvanized sheet to casework backs and bottom, and to gypsum wallboard: Similar and equal to 3M's Fast-Bond 30.

2.07 HARDWARE

- A. General: Comply with the requirements of ANSI/BHMA A156.9 and A156.11 and the following:
- B. Finish: US26D
 - 1. Concealed Hinges for flush doors. Three hinges required on doors over 48 in. tall.
 - 2. Drawer and door pulls: 5/16 in. diameter stainless steel wire, 3-1/2 in. screw center, 1 in. finger clearance, through-bolted from back side. Optional: Injection molded A.B.S. semi-flush recessed plastic glued in place. Use of option permitted only with subfront panel.
 - 3. Cabinet Locks: Furnished under Section 08700.
 - 4. Catches: Heavy duty, magnetic, 7 lb. pull; BHMA B43172.
 - 5. Drawer Slider: European style bottom mounted drawer slides, coldrolled steel, zinc-plated, sized for minimum 75 lb. loads minimum (for drawers up to 6 in. high) and sized for 150 lb. loads and full extension (for drawers 6 in. high and over) load capacity side mount ball bearing rollers.
 - 6. Adjustable recessed shelf brackets: 16 gauge steel ANO Double-Slot Standard equal to Knapp and Vogt KV85 standard with KV185 support. Screw attach shelving to brackets typical.

2.08 FABRICATION

A. Casework numbers referenced on Drawings refer to Westmark Series 200. Other approved manufacturers shall provide products of equivalent function, complying with Contract Documents.

- B. Construction: AWI flush or reveal overlay or flush inset (without face frame)
 - 1. Provide base cabinets with separate continuous or unit base raised off floor minimum 1/4 in. For unit cabinet construction, provide 1/8 in. thick hardboard continuous across adjacent cabinets, attached to toeboards. Provide special construction as detailed for continuous vented bases where indicated.
 - 2. Cabinet bottom, drawer fronts and doors; body member panels: 3/4 in. minimum thickness. 24 in. maximum width, 60 in. maximum height.
 - 3. Cabinet backs and drawer bottoms: Minimum 1/4 in. hardboard or optional minimum 1/2 in. particleboard.
 - 4. Drawer sides, backs and optional subfronts: 5-ply plywood. Particleboard not acceptable, except 3/4 in. front, subfront, and backs and 1/2 in. particleboard sides may be used in conjunction with European style bottom mount drawer slides.
- C. Field verifies dimensions prior to fabrication.
- D. Assemble casework for delivery to site in units easily handled and permitting passage through building openings. Coordinate fabrication with built-in equipment dimension requirements.
- E. Fabricate adjustable shelves of 3/4 in. thick particleboard for spans up to 36 in., 1 in. thickness for spans up to 48 in. GP28 plastic laminate, polyester or melamine finish on top and bottom surfaces. Leading edge finished with .024 pvc to match interior color.
- F. Door and Drawer Fronts: GP28 plastic laminate cladding on front and back surfaces. Fit shelves, doors, and exposed edges with plastic edging. Use full length, wrap-around pieces only.
- G. When necessary to cut and fit on site, provide materials with amply allowance for cutting. Provide plastic laminate clad trim for scribing and site cutting.
- H. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Make corners and joints hairline.
 - 1. Slightly bevel arises.
 - 2. Locate counter butt joints minimum 24 in. from sink cutouts.
 - 3. Cap exposed plastic laminate edges with plastic edge trim.
- I. Joinery and Fastening of case body members:
 - 1. Fixed case body members (shelves, bottoms, tops, and rails which are fastened to sides, ends and dividers) shall be joined using concealed dado, dowel or screwed construction, or interlocking mechanical fasteners. Where concealed dado and dowel methods are employed, cases shall be assembled utilizing glue and pressure. Dado and dowel methods shall be reinforced with blind nailing or screwing. Screw methods shall utilize #6 x 2 in. deep threaded screws.

- 2. Nails, screws or other fastenings shall not be visible on exposed surfaces. On semi-exposed surfaces, mechanical fasteners may be visible, but they shall be color coordinated.
- 3. Rails, spreaders or top panels shall be provided where case will have a separate top when required to conceal fastening of separate top.
- J. Counter tops: Manufacturer's standard butt splash tops, except rolled and coved splash tops on countertops where indicated. 4 in. splash unless otherwise noted or shown. Provide 3/4 in. radius rolled edge tops where indicated, and square edges tops where indicated.
 - 1. Nominal thickness 3/4 in., excluding rails.
 - 2. Use PF 42 plastic laminate for rolled edged and GP50 plastic laminate for square edged tops. Self edge exposed square edged countertop edges with GP 50 plastic laminate material of same finish and pattern.
 - 3. Tops shall have plastic laminate balancing sheet, minimum .020 in. thickness.
 - 4. Mechanically fasten splashbacks to countertops with screws at maximum 16 in. on center.
 - 5. Back splashes shall have back side laminated with a laminated backing sheet and bottom of splash shall be sealed with and set in a full bed of silicone sanitary sealant as specified in Section 07900.
 - 6. Where indicated provided back splashes with cove at connection to countertop and roll with scribe strip at junction with wall. Provide applied square edged splash returns at side walls coped to fit coved and rolled back splash and laminate finished ends.
 - 7. Edge banding on square edged tops shall be applied after face surfaces.
 - 8. Joints required for continuous runs or corners shall be shop prepared for bolt-type joint fasteners.
- K. Except as otherwise noted, apply laminate backing sheet to reverse side of plastic laminate finished surfaces. Apply in same machine direction in both faces.
 - 1. Interior exposed and semi-exposed surfaces, exterior tops of wall and tall cabinets, and exterior bottoms of wall cabinets: High pressure laminate liner, 60 percent polyester laminate or melamine laminated panels. Vinyl overlays not acceptable. Backs and drawer bottoms may be painted.
 - 2. Exterior concealed surfaces: Balanced and sealed with phenolic overlay, (for polyester), or polymer treated kraft paper (for high pressure liner).

- 3. Interior concealed surfaces shall be finished with a balancing sheet.
- 4. Laminated components edges: Minimum 2mm thick extruded PVC, color throughout, bonded with waterproof hot melt adhesive; for doors, drawers and end panels. Subtops, bottoms and shelves shall be edged with .024 PVC.
- L. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures and fittings. Verify locations of cutouts from on-site dimensions. Seal contact surfaces of cut edges.
- M. Unless otherwise indicated, mechanically fasten splashbacks to countertops with screws at maximum 16 in. o.c.
- O. All cabinets except sink bases to have full subtops, or optional 3/4 in. x 4 in. plywood spreaders front and back.
- PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and openings are ready to receive work and field measurements are as shown on shop drawings. Verify adequacy of backing and support framing.
- B. Verify mechanical, electrical and building items are in place and ready to receive work of this Section.
- C. Beginning of installation means installer accepts conditions of existing substrates.

3.02 INSTALLATION

- A. Install work in accordance with AWI custom quality standards. Set and secure casework in place rigid, plumb and level.
- B. Use purpose-designed fixture attachments at concealed locations for wall mounted components.
- C. Use threaded steel concealed joint fasteners to align and secure adjoining cabinet units and countertops.
- D. Carefully scribe casework which is against other building materials, leaving gaps of 1/16 in. maximum. Do not use additional overlay trim for this purpose.
- E. Secure cabinet and counter bases to floor using appropriate angles and anchorages.
- F. Counter-sink anchorage devices at exposed locations used to wall-mount components, and conceal with solid plugs to match surrounding wood. Finish flush with surrounding surfaces.

- G. Secure cabinet to walls with screws at both top and bottom as required to prevent fillers and scribes from opening should settling or other substrate movement occur.
- H. Install continuous 1/8 in. thick hardboard kickboard cover on base of casework units built on unit principle, closely fitted to underside of casework bottoms and not more than 5/16 in. above substrate for floor covering.
 - 1. Located joints over solid backing.
 - 2. Set nails flush and leave ready to receive scheduled base specified in Division 9.
- I. Provide all trim, fillers, closures, stands, supports, sleeves, collars, escutcheons, ferrules, brackets, braces, and other miscellaneous items as indicated, and as required for complete installation.

3.03 ADJUSTING AND CLEANING

- A. Adjust doors, drawers, hardware, fixtures and other moving or operating parts to function smoothly and correctly.
- B. Clean casework, counters, shelves, hardware, fittings and fixtures. Thoroughly vacuum clean interiors of drawers and cabinets. Clean, lubricate and adjust hardware.
- C. Provide protection and maintain conditions in manner to ensure casework is without damage or deterioration at time of Substantial Completion.

3.4 TOLERANCES

- A. Variation from True Position: 1/16 in.
- B. Offset from True Alignment with Abutting Materials: 1/32 in.

END OF SECTION

SECTION 12500

WINDOW BLINDS

PART 1 GENERAL

1.01 CONTRACT CONDITIONS

A. Work of this section is bound by the contract conditions and Division 1, bound herein, in addition to this specification and accompanying drawing.

1.02 EXTENT OF WORK

- A. Provide each blind as complete unit produced by one manufacturer, including all necessary hardware, mounting devices, accessory items, and fasteners.
- B. Provide Blinds at all exterior and interior windows except at arctic entries. Mounting: Inside of jambs.

1.03 REFERENCED SPECIFICATIONS

- A. Fabricate blinds in compliance with Commercial Item Description Document 1029 published by American Window Covering Manufacturers Association.
- B. Copies of documents can be obtained from Association at 355 Lexington Ave.; New York, NY 10017; (212) 661-5300.

1.04 COORDINATION

A. Coordinate with other trades affecting or affected by work of this section.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect against damage and discoloration.
- B. Deliver in manufacturer's original, unopened, undamaged packages with legible labels intact.
- C. Identify manufacturer, brand name, finish, color, and installation location on each package.

1.06 FIELD MEASUREMENTS

- A. Verify prior to fabrication.
- B. If field measurements differ slightly from drawing dimensions modify work as required for accurate fit. If measurements differ substantially, notify Contracting Officer prior to fabrication.

PART 2 PRODUCTS

2.01 HORIZONTAL SLAT VENETIAN BLINDS

A. Manufacturer & Model: Levolor Riviera, or approved. Similar units by Bali-Graber & Hunter-Douglas are approved.

B. Slats

- 1. Typical Slats:
 - a) Material: Spring tempered aluminum: Sheerview (perforated).
 - b) Width: 1 inch.
 - c) Finish: Manufacturer's standard.
 - d) Color: Selected by Architect from manufacturer's standard choices.
- 2. Slats in the following rooms: 109, 130, 138, and 142.
 - a) Material: Spring tempered aluminum.
 - b) Width: 1 inch.
 - c) Finish: Manufacturer's standard.
 - d) Color: Selected by Architect from manufacturer's standard choices.
- C. Head Rail:
 - 1. Material: Steel.
 - 2. Shape: manufacturer's standard with sufficient front depth to conceal mechanism when viewed from standing eye level.
 - 3. Finish: Manufacturer's standard.
 - 4. Color: Match slat interior face.
 - 5. Required Accessories: Tilting mechanism, top brace, end braces, top cradle, and others required for complete installation.
- D. Bottom Rail:
 - 1. Material: Steel reinforced to prevent twist or sag.
 - 2. Weight: Sufficient to lower blind evenly and in alignment.
 - 3. Shape: Manufacturer's standard.
 - 4. End Caps: Manufacturer's standard metal or plastic.
 - 5. Finish & Color: Match slat interior faces.
- E. Tapes:
 - 1. Type: Braided ladder.
 - 2. Color: match head rail.

- F. Tilter:
 - 1. Type: Manufacturer's standard, disengaging, enclosed, lubricated mechanism to provide full 180 degree operation, and hold blinds in any set angle.
 - 2. Operation: Wand-type, length to suit installation.
- G. Cords:
 - 1. Type: Manufacturer's standard; fit with self-aligning position equalizers and tassels secured to cord ends.
 - 2. Color: Match slat interior face.
 - 3. Minimum Breaking Strength: 200 lbs.
 - 4. Cords replaceable without removing tilter.
- H. Cord Locks:
 - 1. Type: Manufacturer's standard; automatically capable of holding blind in any vertical position.

2.02 FABRICATION

- A. Fabricate units to completely fill opening from jamb to jamb and head to sill.
- B. Align any intermediate unit ends with vertical window mullions or jambs.
- C. Space supporting tapes no less than 3 1/2 inches not more than 7 inches from slat ends, and no more than 36 inches apart between.
- D. Overlap slats when fully closed to exclude light.
- E. Locate controls for each operation. Notify Contracting Officer before fabrication if indicated locations can be improved.

2.03 FASTENERS

A. Oval-head, non-corrosive screws.

PART 3 EXECUTION

3.01 EXISTING CONDITIONS

- A. Verify that work surfaces are accurately located and secure.
- B. Prior to starting work, notify general contractor about defects requiring correction.
- C. Do not start work until conditions are satisfactory.

3.02 PROTECTING WORK OF OTHER SECTIONS

A. Protect against damage and discoloration caused by work of this section.

3.03 INSTALLATION

- A. Follow manufacturer's instructions.
- B. Do necessary cutting, tapping, and drilling.
- C. Protect metal parts in contact with dissimilar materials against galvanic corrosion.
- D. Securely attach units plumb, square, and true with brackets, clips, and fasteners.

3.04 ADJUSTMENTS

- A. Adjust units to provide correct clearances and overlaps.
- B. Adjust moving parts to operate satisfactorily at time of Project Substantial Completion and during Warranty Period.

3.05 PRODUCT CLEANING AND REPAIRING

- A. Including work of other trades, clean, repair and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by work of this section.
- B. Remove debris from project site upon work completion, or sooner if directed.

END OF SECTION

DIVISION 15 - MECHANICAL

- 15010 Basic Mechanical Requirements
- 15060 Hangers and Supports
- 15075 Mechanical Identification
- 15080 Mechanical Insulation
- 15120 Piping Specialties
- 15130 Pumps
- 15140 Domestic Water Piping
- 15150 Sanitary Waste and Vent Piping
- 15180 Hydronic Piping
- 15190 Fuel Piping
- 15300 Fire Suppression Materials and Methods
- 15350 Wet Pipe Fire Suppression Systems
- 15410 Plumbing Fixtures
- 15485 Domestic Hot Water Generators
- 15510 Heating Boilers and Accessories
- 15550 Breeching, Chimneys and Stacks
- 15760 Terminal Heating Units
- 15810 Ducts
- 15830 Fans
- 15850 Air Outlets and Inlets
- 15905 Instrumentation and Control Elements
- 15950 Testing, Adjusting and Balancing

SECTION 15010 BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes basic mechanical requirements, basic mechanical methods, restricted materials, motors for mechanical equipment, vibration isolation, seismic restraint, painting of mechanical systems and mechanical systems testing.
- B. Related Sections:
 - 1. Division 1: All sections of Division 1 as they pertain to general contract requirements.
 - 2. Division 9 Painting: Painting of mechanical systems.
 - 3. Division 16: Electrical requirements for mechanical equipment.

1.02 SUBMITALS

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

1.03 SHOP DRAWINGS

A. Seismic Restraint Shop Drawings: Contractor shall submit structurally engineered shop drawings for seismic restraint of all mechanical equipment required by the International Building Code – 2006 Edition, Chapter 16. Shop drawings shall be stamped by a professional engineer registered in the State of Alaska. Structural design shall be based on Seismic Use Category II and Seismic Design Category D.

1.04 CLOSEOUT SUBMITTALS

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

1.05 RECORD DOCUMENTS

- A. Record Drawings: In addition to record drawing requirements as outlined under Division 1, mechanical record drawings shall include the following:
 - 1. Any and all changes made in the field with respect to original design drawings.
 - 2. Actual valve locations and valve tag identification.
- B. Shop Drawings: Control system, radiant tubing layout and other specialty system shop drawings shall be provided to the Owner. Record shop drawings shall be produced utilizing AutoCad version 2007 or more current release and provided in digital format on CD-ROM.
- C. Operation & Maintenance Manuals: In addition to Operation & Maintenance Manual requirements as outlined under Division 1, mechanical O&M manuals shall include the following:
 - 1. Product data for each piece of equipment including local supplier and local manufacturer's representative including address, phone number and fax number
 - 2. Manufacturers operation & maintenance instructions for each piece of equipment.
 - 3. Identification numbers for all parts and nearest source for obtaining parts.

- 4. Verbal description of each system.
- 5. Summary of maintenance instructions to Owner.
- 6. Periodic maintenance form.
- 7. Testing reports.
- 8. Equipment startup reports.
- 9. Final balance report.
- 10. Reduced scale record drawings.
- 11. Reduced scale shop drawings.

1.06 OPERATIONS AND MAINTENANCE INSTRUCTION

- A. Notification: The Contractor shall notify the Owner's Representative in a timely manner to schedule O&M instruction such that facility personnel may be present for such instruction.
- B. Instruction: The Contractor shall provide detailed instruction on the operation and maintenance requirements for all mechanical systems. Instruction shall include class time with maintenance personnel and thorough on-site observations and review of each mechanical system and applicable equipment.

1.07 SUBSTITUTIONS

- A. Substitution Requirements: In addition to substitution requirements as outlined under Division 1, mechanical material and equipment substitutions shall meet the following minimum requirements:
 - 1. Size: Proposed substitutions shall be of equivalent size and fit within available space with adequate service access as recommended by the equipment manufacturer.
 - 2. Performance: Proposed substitutions shall have equal or superior performance to specified equipment.
 - 3. Quality: Proposed substitutions shall be of equal or greater quality to specified equipment.
 - 4. Weight: Proposed substitutions shall be of equal weight to specified equipment or Contractor shall be responsible for modifications to structure as required for increased weight.

- 5. Accessories and Options: Proposed substitutions shall be provided with appropriate accessories and options as required for a complete and operational system.
- 6. System Modifications: The Contractor shall be responsible for modifications to mechanical systems, electrical systems and building structure and finishes as required for implementing proposed substitute products.
- 1.08 REGULATORY REQUIREMENTS
 - A. Conform to applicable local codes and amendments including but not limited to the following.
 - 1. International Building Code (IBC) 2006 Edition
 - 2. Uniform Plumbing Code (UPC) 2006 Edition
 - 3. International Mechanical Code (IMC) 2006 Edition
 - 4. International Fuel Gas Code (IFGC) 2006 Edition
 - 5. International Fire Code (IFC) 2006 Edition
 - 6. National Electric Code 2005 Edition
 - B. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., as suitable for the purpose specified and indicated.

1.09 DELIVERY, STORAGE AND HANDLING

- A. Materials shall be delivered, stored and handled at the project site to prevent damage and facilitate inspection.
- B. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering.

1.10 RESTRICTED MATERIALS

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

1.11 BASIC MECHANICAL METHODS

- A. Installation Instructions: Comply with manufacturer's published instructions for delivery, storage, protection, installation and materials.
- B. Operation of Equipment during Construction: When equipment is operable and it is to the advantage of the Contractor to operate the equipment during construction, such equipment may be operated provided that the operation is properly supervised and the Contractor retains full responsibility for the equipment operated. Regardless of whether or not the equipment has or has not been operated, the Contractor shall properly clean the equipment, install new filter media, make all required adjustments and complete all punch list items before final acceptance by the Owner's Representative.
- C. Service Access: Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing.
- D. Access Doors: Where mechanical equipment requiring access (including valves) is located above GWB ceilings, within wall assemblies, or other non-readily accessible locations; access doors shall be provided. Access doors within areas of public occupancy shall be lockable type.
- E. Mounting Heights: Where mounting heights are not detailed or dimensioned, install mechanical services and overhead equipment to provide the maximum headroom possible.
- F. Exposed Systems: Items exposed (in areas without ceilings) shall be installed in a neat, orderly manner. Elements shall be perpendicular and parallel to building lines. Items exposed in normally occupied areas (not including mechanical rooms) shall be finished in accordance with specifications. In those conditions where ductwork is exposed in finished areas, careful craftsmanship and only the highest standards of installation will be acceptable. All routing of exposed ducts, pipes, conduits, shall be approved in advance by the Owner's Representative prior to installation.
- G. Drawings and Specifications:
 - 1. The Drawings indicate the general arrangement of systems and are to be followed insofar as possible. If substantial deviations from the layout are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted in writing to the Owner's Representative, for approval before proceeding with the work.
 - 2. This Contractor shall make all measurements in the field and shall be responsible for correct fitting. Contractor shall coordinate this work with all other trades in such a manner as to cause a minimum of conflict or delay.

- 3. Where any work is placed as to cause or contribute to a conflict it shall be readjusted at the expense of the Contractor. The Owner's Representative's decision shall be final in regard to the arrangement of ducts, piping, etc, where conflict arises.
- 4. Where offsets in systems are required to complete the installation, or for the proper operation of the system, these shall be deemed to be included in the Contract.
- 5. Significant deviations from Drawings must be approved by the Owner's Representative.
- H. Location of Mechanical Systems:
 - 1. Mechanical layouts indicated on drawings are diagrammatical. Exact locations of ducts, pipes and equipment may vary because of conflicts with work of other trades.
 - 2. Locate equipment requiring periodic servicing so that it is readily accessible. Do not back up service sides to walls, nor place it too close to other equipment to make service impractical.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Materials and equipment shall be new, unused and delivered to site in manufacturer's original packaging.
- B. Equipment shall be regularly cataloged items of the manufacturer and shall be supplied as a complete unit in accordance with the manufacturer's standard specifications. Optional items shall be provided as required for proper installation unless noted otherwise. Manufacturer's identification shall be maintained for all equipment.

2.02 MOTORS

- A. Motors: Motors for mechanical equipment shall be furnished by the equipment manufacturer, for the specific application and duty applied and as required to deliver rated horsepower without exceeding temperature ratings when operated on power systems with a combined variation in voltage and frequency not more than plus or minus 10% of rated voltage. Motors for pumps and fans shall be selected for non-overloading.
- B. Motors controlled by variable frequency drives shall be designed for variable frequency duty and meet NEMA Standard MG 1, part 31.
- C. Electrical Characteristics: The Contractor shall verify from the drawings and specifications available electrical power characteristics and furnish equipment that will perform satisfactorily under the conditions as shown and specified.

- D. Service Factor: Motors shall be sized for 1.15 service factor and not to exceed 40 degrees C. temperature rise above ambient.
- E. Motors on belt driven equipment shall have slide rails with adjusting screws for belt tension adjustment. Motors exposed to the weather shall be weather-protected.
- F. Fractional horsepower motors shall have self-resetting thermal overload switches.
- G. Motor sound power levels shall not be greater than recommended in NEMA MG 1-12.49.
- H. Provide motors with drive shafts long enough to extend completely through belt sheaves when sheaves are properly aligned or balanced.

2.03 VIBRATION ISOLATION

- A. General: Rotating equipment shall be provided with vibration isolation with the exception of small in-line circulating pumps. Where mechanical equipment is provided with internal vibration isolation, external vibration isolation is not required unless specifically indicated on drawings.
- B. Internal Vibration Isolation: Internal vibration isolation equipment shall be sized by the equipment manufacturer to provide appropriate isolation with respect to equipment rotating characteristics. Earthquake snubbers shall be provided where required.
- C. External Vibration Isolation: External vibration isolation shall be provided where indicated on drawings. Vibration isolation equipment shall be sized by the manufacturer based equipment rotating characteristics to provide appropriate isolation. Earthquake snubbers shall be provided where required.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required and ready to receive work.
- B. Report in writing to Owner's Representative prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.
- C. By beginning work, the Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.02 INSTALLATION - GENERAL

A. Install in accordance with manufacturer's instructions.

3.03 INSTALLATION - MOTORS

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

3.04 SEISMIC RESTRAINT OF MECHANICAL EQUIPMENT

A. Seismically restrain equipment in accordance with the International Building Code – 2006 Edition, Chapter 16. Seismic restraint assemblies shall be premanufactured, or field fabricated, secured to building structural components.

3.05 SEISMIC RESTRAINT OF PIPING AND DUCTWORK SYSTEMS

- A. Seismically restrain all piping and ductwork systems in accordance with the SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
- B. Seismic restraint shall be in accordance with Seismic Hazard Level (SHL) A of the SMACNA Seismic Restraint Manual.
- C. General Requirements for Ductwork:
 - Brace rectangular ducts with cross sectional areas of 6 square feet and larger. Brace flat oval ducts in the same manner as rectangular ducts. Brace round ducts with diameters of 28 inch and larger. Brace flat oval ducts the same as rectangular ducts of the same nominal size. Exception: No bracing is required if the duct is suspended by hangers 12 inches or less in length, as measured from the top of the duct to the bottom of the support where the hanger is attached. Hangers must be positively attached to the duct within 2 inches of the top of the duct with a minimum of two #10 sheet metal screws.
 - 2. Transverse bracing shall occur at the interval specified in the tables in Chapters 5, 6 and 7 of SMACNA manual or at both ends if the duct run is less than the specified interval. Transverse bracing shall be installed at each duct turn and at each end of the duct run, with a minimum of one brace at each end.

- 3. Longitudinal bracing shall occur at the interval specified in the tables in Chapters 5, 6 and 7 of SMACNA manual with at least one brace per duct run. Transverse bracing for one duct section connected perpendicular to it if the bracing is installed within four feet of the intersection of the ducts and if the bracing is sized for the larger duct. Duct joints shall conform to SMACNA duct construction standards.
- 4. A group of ducts may be combined in a larger frame so that the combined weights and dimensions of the ducts are less than or equal to the maximum weight and dimensions of the duct for which bracing details are selected.
- 5. Walls, including gypsum board nonbearing partitions, which have ducts running through them may replace a typical transverse brace. Provide solid blocking around duct penetrations at stud wall construction.
- 6. Unbraced ducts shall be installed with a 6 inch minimum clearance to vertical ceiling hanger wires.
- D. General Requirements for Piping:
 - 1. Bracing details, schedules and notes of SMACNA manual apply to all types of pipe, conduit and all types of joints. Exception: Piping suspended by individual hangers 12 inches or less in length, as measured from the top of the pipe to the bottom of the support where the hanger is attached, need not be braced.
 - 2. Brace all fuel oil piping, gas piping, such as gas fuel, medical gas piping and compressed air piping that is 1 inch nominal diameter or larger.
 - 3. Brace all piping located in boiler room, mechanical equipment rooms and refrigeration mechanical rooms that is 1-1/4 inches nominal diameter and larger.
 - 4. Brace all pipes 2-1/2 inch minimal diameter and larger.
 - 5. Transverse bracing shall be at 40 feet maximum except where a lessor spacing is indicated in the tables for bracing of pipes.
 - 6. Longitudinal bracing shall be at 80 feet maximum except where a lesser spacing is indicated in the tables of SMACNA manual. In pipes where thermal expansion is a consideration, an anchor point may be used as the specified longitudinal brace provided that it has a capacity equal to or greater than a longitudinal brace. The longitudinal braces and connections must be capable of resisting the additional force induced by expansion and contraction.
 - 7. For fuel oil and all gas piping, the bracing details, schedules and notes of SMACNA manual may be used, except that transverse bracing shall be at 20 feet maximum and longitudinal bracing shall be 40 feet maximum

- 8. Transverse bracing for one pipe section may also act as longitudinal bracing for a pipe section of the same size connected perpendicular to it if the bracing is installed within 24 inches of the elbow or tee.
- 9. Seismic braces for pipes on trapeze hangers may be used.
- 10. Provide flexibility in joints where pipes pass through building seismic joints or expansion joints where rigidly supported pipes connect to equipment with vibration isolators. For threaded piping, the flexibility may be provided by the installation of swing joints. For piping with manufactured ball joints, select the length of piping offset using seismic drift in place of the expansion given in the joint manufacturer's selection table. Seismic drift = 0.015 feet per foot of height above the base where seismic separation occurs.
- 11. Branch lines may not be used to brace main lines.
- 12. A rigid piping system shall not be braced to dissimilar parts of the building or to two dissimilar building systems that may respond differently during an earthquake.
- 13. Cast iron pipe of all types, glass pipe and any other pipe joined with a shield and clamp assembly, where the top of the pipe is 12 inches or more from the supporting structure, shall be braced on each side of a change in direction of 90° or more. Riser joints shall be braced or stabilized between floors.
- 14. Vertical risers shall be laterally supported with a riser clamp at each floor. For buildings greater than six stories high, all risers shall be engineered individually.
- 15. Restrain risers in hubless piping systems where the riser joints are unsupported between floors.

3.06 PAINTING

- A. Coordinate with Division 9.
- B. Paint all piping, ductwork, mechanical equipment, hangers and associated appurtenances exposed within finished spaces (except chrome plated or stainless steel). Insulated piping, ductwork and equipment shall also apply. Furnished spaces shall include all spaces except the mechanical room, spaces above ceilings and attic spaces.
- C. Paint mechanical equipment delivered to the site with prime coat.
- D. Paint mechanical equipment supplied with factory finish where indicated within the contract documents to be field finished.
- E. Wall mounted air registers, grilles and diffusers to be factory painted to match adjacent wall color.

- F. GWB ceiling mounted air registers, grilles and diffusers to be factory painted to match adjacent ceiling color.
- G. Paint access doors to match adjacent wall or ceiling color; or as directed by the Owner's Representative.
- H. Paint piping and appurtenances exposed within casework; except chrome plated or stainless steel.
- I. Paint fabricated mechanical support systems, other than galvanized.
- J. Paint or touch-up, as directed by Owner's Representative, factory painted equipment damaged during shipment or installation.
- K. Colors as directed by Owner's Representative.

3.07 TESTING

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

3.08 SYSTEMS ADJUSTMENT

A. Systems shall be adjusted as necessary to ensure proper function of all controls, proper air distribution, elimination of drafts, noise and vibration. All systems shall be fully adjusted and in operating condition at final completion.
3.09 SYSTEMS DEMONSTRATION

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

END OF SECTION

SECTION 15060 HANGERS AND SUPPORTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes piping, ductwork and equipment supports, hangers, anchors, bases sleeves and the sealing of work to adjacent construction.
- B. Related Sections:
 - 1. Division 3 Cast-In-Place Concrete: Execution requirements for placement of concrete housekeeping pads specified by this section.
 - 2. Section 15080 Mechanical Insulation: Interface between insulation and support systems.
 - 3. Section 15140 Domestic Water Piping: Support of domestic water piping systems.
 - 4. Section 15150 Sanitary Waste and Vent Piping: Support of sanitary and vent piping systems.
 - 5. Section 15180 Hydronic Piping: Support of hydronic piping systems.
 - 6. Section 15190 Fuel Piping: Support of fuel piping systems.
 - 7. Section 15810 Ducts, support of duct systems.

1.02 REFERENCES

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

1.03 SUBMITTALS

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

1.04 QUALIFICATIONS

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

1.05 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 - PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

- A. Manufacturers:
 - 1. Grinnell.
 - 2. Michigan Hanger Co.
 - 3. Unistrut.
 - 4. Approved Equal.
- B. Plumbing Piping DWV:
 - 1. Conform to ASME B31.9.
 - 2. Hangers for Pipe Sizes $\frac{1}{2}$ to 1-1/2 inch: Malleable iron or Carbon steel, adjustable swivel, split ring.
 - 3. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.

- 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- 5. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.
- 6. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.
- 7. Vertical Support: Steel riser clamp.
- 8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange and concrete pier or steel support.
- 9. Copper Pipe Support: Copper-plated, carbon-steel adjustable, ring.
- C. Plumbing Piping Water, Gas:
 - 1. Conform to ASME B31.9.
 - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron or Carbon steel, adjustable swivel, split ring.
 - 3. Hangers for Cold Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.
 - 4. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.
 - 5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - 6. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 inches and Larger: Steel channels with welded spacers and hanger rods, cast iron roll.
 - 7. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.
 - 8. Vertical Support: Steel riser clamp.
 - 9. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 - 10. Floor Support for Hot Pipe Sizes 4 inches and Smaller: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 - 11. Copper Pipe Support: Copper-plated, Carbon-steel ring.
- D. Hydronic Piping:
 - 1. Conform to ASME B31.9.

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

2.02 ACCESSORIES

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

2.03 INSERTS

A. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.04 FLASHING

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

2.05 SLEEVES

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

PART 3 - EXECUTION

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

3.02 PIPE HANGERS AND SUPPORTS

- A. Install pipe hangers and supports in accordance with ASME B31.9.
- B. Support pipe hangers from building structural components.
- C. Support horizontal piping as scheduled.
- D. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
- E. Place hangers within 12 inches of each horizontal elbow.
- F. Use hangers with 1-1/2 inch minimum vertical adjustment.
- G. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
- H. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
- I. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

- J. Support riser piping independently of connected horizontal piping.
- K. Provide copper plated hangers and supports for non-insulated copper piping.
- L. Design hangers for pipe movement without disengagement of supported pipe.
- M. Prime coat exposed steel hangers and supports. Hangers and supports located in pipe shafts and suspended ceiling spaces are not considered exposed.

3.03 DUCTWORK HANGERS AND SUPPORTS

A. Support ductwork systems in accordance with SMACNA requirements.

3.04 EQUIPMENT BASES AND SUPPORTS

- A. Provide housekeeping pads of concrete, minimum 3-1/2 inches thick and extending 6 inches beyond supported equipment. Refer to Division 3.
- B. Provide templates, anchor bolts and accessories for mounting and anchoring equipment.
- C. Construct supports of steel members or steel pipe and fittings. Brace and fasten with flanges bolted to structure.
- D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.05 FLASHING

- A. Provide flexible flashing and metal counter-flashing where piping and ductwork penetrate weather or waterproofed walls, floors and roofs.
- B. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked 1 inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counter-flash and seal.
- C. Seal floor drains watertight to adjacent materials.
- D. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms for sound control.
- E. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.06 SLEEVES

- A. Set sleeves in position in forms. Provide reinforcing around sleeves.
- B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- C. Extend sleeves through floors one inch above finished floor level. Caulk sleeves.
- D. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and caulk. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- E. Install chrome plated steel escutcheons at finished surfaces.

3.07 EXPANSION LOOPS AND ANCHORS

- A. Provide expansion loops as indicated on drawings.
- B. Rigidly anchor pipe to building structure where necessary. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.
- C. Provide support and equipment required for controlling expansion and contraction of piping. Provide loops, pipe offsets and swing joints, or expansion joints where indicated.

3.08 SCHEDULES

<u>PIPE SIZE</u> (Inches)	MAX. HANGER SPACING (Feet)	DIAMETER (Inches)
1 ¹ / ₂ to 1-1/4 1-1/2 to 2 2-1/2 to 3 4 to 6 C.I. Bell and Spigot (or No-Hub) And at Joints	6.5 10 10 10 5.0	3/8 3/8 5/8 5/8 5/8

END OF SECTION

SECTION 15075 MECHANICAL IDENTIFICATION

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

1.02 REFERENCES

A. ASME A13.1 (American Society of Mechanical Engineers) - Scheme for the Identification of Piping Systems.

1.03 SUBMITTALS

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

1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- 1.06 FIELD MEASUREMENTS
 - A. Verify field measurements prior to fabrication.

PART 2 - PRODUCTS

- 2.01 MANUFACTURERS
 - A. Manufacturers:
 - 1. Craftmark Identification Systems.
 - 2. Safety Sign Co.
 - 3. Seton Identification Products.
 - 4. Approved Equal.

2.02 NAMEPLATES

A. Product Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.

2.03 TAGS

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

2.04 STENCILS

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

2.05 PIPE MARKERS

- A. Color and Lettering: Conform to ASME A13.1.
- B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Division 9 for stencil painting.

3.02 INSTALLATION

- A. Apply stencil painting in accordance with Division 9.
- B. Install identifying devices after completion of coverings and painting.
- C. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.
- D. Install tags using corrosion resistant chain. Number tags consecutively by location.
- E. Identify air handling units, pumps and tanks with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- F. Identify control panels and major control components outside panels with plastic nameplates.
- G. Identify valves in main and branch piping with tags.
- H. Tag automatic controls, instruments and relays. Key to control schematic.
- I. Identify piping located in the boiler room with plastic pipe markers. Identify service, flow direction and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at side of penetration of structure or enclosure and at each obstruction.
- J. Identify piping, concealed or exposed, with plastic pipe markers or stenciled painting. Identify service, flow direction and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure and at each obstruction.

END OF SECTION

SECTION 15080 MECHANICAL INSULATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes ductwork insulation, duct liner, insulation jackets, equipment insulation, covering, thermal insulation for piping systems including vapor retarders, jackets and accessories.
- B. Related Sections:
 - 1. Division 9 Paints and Coatings: Execution requirements for painting insulation jackets and covering specified by this section.
 - 2. Section 15060 Hangers and Supports: Execution requirements for inserts for placement by this section.
 - 3. Section 15075 Mechanical Identification: Product requirements for mechanical identification for placement by this section.

1.02 REFERENCES

- A. ASTM A167 Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
- B. ASTM C177 Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus.
- C. ASTM C195 Standard Specification for Mineral Fiber Thermal Insulating Cement.
- D. ASTM C449/C449M Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
- E. ASTM C518 Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- F. ASTM C533 Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
- G. ASTM C534 Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
- H. ASTM C547 Standard Specification for Mineral Fiber Preformed Pipe Insulation.

- I. ASTM C553 Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- J. ASTM C592 Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type).
- K. ASTM C612 Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- L. ASTM C1071 Standard Specification for Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material).
- M. ASTM C1126- Standard Specification for Preformed Closed Cell Phenolic Foam Pipe and Board Insulation.
- N. ASTM C1136 Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
- O. ASTM D1784 Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
- P. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- Q. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.
- R. ASTM E162 Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.
- S. ASTM G21 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- T. NAIMA (North American Insulation Manufacturers Association) National Insulation Standards.
- U. SMACNA (Sheet Metal and Air Conditioning Contractors' National Association) - HVAC Duct Construction Standards - Metal and Flexible.

1.03 SUBMITTALS

- A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
 - 1. Product Data: Provide product description, thermal characteristics and list of materials and thickness for each service and locations.
 - 2. Manufacturer's Installation Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.04 QUALIFICATIONS

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

1.05 DELIVERY, STORAGE AND HANDLING

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical and mechanical damage, by storing in original wrapping.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not install insulation outside ambient conditions required by manufacturer of each product.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

1.07 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers:
 - 1. Owens Corning.
 - 2. Certain Teed.
 - 3. Knauf.
 - 4. Armstrong.
 - 5. Johns Manville.
 - 6. Approved Equal.

2.02 MINERAL FIBER PIPE INSULATION

- A. Insulation: ASTM C547 Mineral Fiber Pipe Insulation, Type I 850(454).
- B. Vapor Retarder Jacket:
 - 1. White Kraft paper with glass fiber yarn, bonded to aluminized film.
 - 2. Moisture vapor transmission: ASTM E96; 0.02 perm-inches.
- C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- D. Vapor Retarder Lap Adhesive: Compatible with insulation.
- E. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
- F. Insulating Cement: ASTM C449/C449M.
- 2.03 ELASTOMERIC CELLULAR FOAM PIPE INSULATION
 - A. Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular form: ASTM C534; Type I, Tubular form.
 - B. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.
- 2.04 MINERAL FIBER, FLEXIBLE (INSULATION FOR THE EXTERIOR OF SHEET METAL DUCTS)
 - A. Insulation: ASTM C553 Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications, Type II.
 - B. Vapor Retarder Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture vapor transmission: ASTM E96; 0.02 perm.
 - 3. Secure with pressure sensitive tape.
 - C. Vapor Retarder Tape: Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
 - D. Tie Wire: Annealed steel, 16 gage.
- 2.05 MINERAL FIBER, RIGID (INSULATION FOR THE EXTERIOR OF SHEET METAL DUCTS)
 - A. Insulation: ASTM C612 Mineral Fiber Block and Board Insulation, Type IA
 - B. Indoor Vapor Retarder Finish: Canvas Jacket with vapor retardant finish.

2.06 INSULATION JACKETS

- A. Pipe Fitting Jacket: ASTM D1784, One piece molded type fitting covers, offwhite color.
 - 1. Connections: Pressure sensitive color matching vinyl tape.
- B. Canvas Jacket: UL listed.
 - 1. Fabric: 6 oz/sq yd, plain weave cotton.
 - 2. Fire retardant lagging adhesive. Composite of insulation, jacket and lagging adhesive shall have a flame spread index not greater than 25 and a smoke developed index not greater than 50 per ASTM E84.
 - 3. Lagging Adhesive: Compatible with insulation.

PART 3 - EXECUTION

- 3.01 EXAMINATION
 - A. Division 1 Administrative Requirements: Coordination and project conditions.
 - B. Verify that piping, equipment and ductwork has been tested before applying insulation materials.
 - C. Verify that surfaces are clean and dry, with foreign material removed.
- 3.02 INSTALLATION GENERAL
 - A. Install in accordance with NAIMA National Insulation Standards.

3.03 INSTALLATION - PIPING

- A. Exposed Piping: Locate insulation and cover seams in least visible locations.
- B. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges and strainers.
- C. Mineral fiber insulated pipes conveying fluids below ambient temperature:
 - 1. Provide factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal all staple penetrations with vapor retarder mastic.
 - 2. Insulate fittings, joints and valves with molded insulation of like material and thickness as adjacent pipe. Finish with PVC fitting covers.

- D. For hot piping conveying fluids over 140°F, insulate flanges and unions at equipment.
- E. Mineral fiber insulated pipes conveying fluids above ambient temperature:
 - 1. Provide factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or the pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
 - 2. Insulate fittings, joints and valves with insulation of like material and thickness as adjoining pipe. Finish with PVC fitting covers.
- F. Inserts and Shields:
 - 1. Application: Piping or Equipment 1-1/2 inches diameter or larger.
 - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 - 3. Insert location: Between support shield and piping and under the finish jacket.
 - 4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 - 5. Insert material: Compression resistant insulating material suitable for the planned temperature range and service.
- G. Continue insulation through penetrations of building assemblies or portions of assemblies having a fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions and interruptions. Division 7 for penetrations of assemblies with a fire resistance rating greater than one hour.
- H. Pipe Exposed in Mechanical Equipment Rooms: Finish with canvas jacket.

3.04 INSTALLATION – EQUIPMENT

- A. Factory Insulated Equipment: Do not insulate.
- B. Exposed Equipment: Locate insulation and cover seams in least visible locations.
- C. Apply insulation close to equipment by grooving, scoring and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
- D. Seal all ends of pipe insulation to encapsulate and smooth the insulation.
- E. Fill joints, cracks, seams and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.

- F. Insulated equipment that contains fluids below ambient temperature: Insulate entire system.
- G. Mineral fiber insulated equipment that contains fluids below ambient temperature: Provide vapor retarder jackets, factory-applied or field-applied. Finish with glass-cloth and vapor barrier adhesive.
- H. For hot equipment that contains fluids over 140°F, insulate flanges and unions with removable sections and jackets.
- I. Mineral fiber insulated equipment that contains fluids above ambient temperature: Provide standard jackets, with or without vapor retarder, factory-applied or field-applied. Finish with glass cloth and adhesive.
- J. Finish insulation at supports, protrusions and interruptions.
- K. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.
- L. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation so it can be easily removed and replaced without damage.

3.05 INSTALLATION – DUCTWORK

- A. Insulated ductwork conveying air below ambient temperature:
 - 1. Provide insulation with vapor retarder jackets.
 - 2. Finish with tape and vapor retarder jacket.
 - 3. Continue insulation through walls, sleeves, hangers and other duct penetrations.
 - 4. Insulate entire system including fittings, joints and flanges.
- B. Insulated ductwork conveying air above ambient temperature:
 - 1. Provide with or without standard vapor retarder jacket.
 - 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- C. Ductwork Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with canvas jacket.
- D. External Duct Insulation Application:
 - 1. Secure insulation with vapor retarder with wires and seal jacket joints with vapor retarder adhesive or tape to match jacket.
 - 2. Secure insulation without vapor retarder with staples, tape, or wires.

- 3. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.
- 4. Seal vapor retarder penetrations by mechanical fasteners with vapor retarder adhesive.
- 5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
- E. Duct Liner Application:
 - 1. Adhere insulation with adhesive for 100 percent coverage.
 - 2. Secure insulation with mechanical liner fasteners. SMACNA Standards for spacing.
 - 3. Seal and smooth joints. Seal and coat transverse joints.
 - 4. Seal liner surface penetrations with adhesive.
 - 5. Duct dimensions indicated are net inside dimensions required for airflow. Increase duct size to allow for insulation thickness.

3.06 PIPING INSULATION SCHEDULE

A. Glass Fiber Insulation Schedule:

Piping Systems	Pipe Size	Thickness	
Domestic Hot Water Supply	All	1"	
Domestic Hot Water Recirculating	All	1"	
Domestic Cold Water	All	1"	
Heating Water/Glycol Supply	All	1"	
Heating Water/Glycol Return	All	1"	

B. Cellular Foam Insulation Schedule

Piping Systems	Pipe Size	<u>Thickness</u>
Buried Domestic Cold Water	All	1/2"
Vent Through Roof Assemblies	All	1"

3.07 DUCTWORK INSULATION SCHEDULE

A. Flexible Glass Fiber Duct Wrap Insulation Schedule:

Ductwork	Thickness	Finish
Supply Ducts	1-1/2"	Aluminized Film
Round Exhaust Ducts	1-1/2"	Aluminized Film

B. Rigid Glass Fiber Duct Insulation Schedule:

Ductwork	Thickne	<u>ss Finish</u>
Outside Air Ductwork	2"	Aluminized Film
Combustion Air Ductwork	2"	Aluminized Film
Exhaust Ducts	2"	Aluminized Film

END OF SECTION

SECTION 15120 PIPING SPECIALTIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes positive displacement meters, pressure gauges and pressure gauge taps, thermometers and thermometer wells, expansion tanks, air vents, air separators, strainers, balance valves, glycol specialties and flexible expansion loops.
- B. Related Sections:
 - 1. Section 15180 Hydronic Piping.

1.02 REFERENCES

- A. ASME (American Society of Mechanical Engineers) Boiler and Pressure Vessel Codes, SEC VIII-D Rules for Construction of Pressure Vessels.
- B. ASME B40.1 (American Society of Mechanical Engineers) Gauges Pressure Indicating Dial Type Elastic Element.
- C. ASTM E1 Standard Specification for ASTM Thermometers.
- D. ASTM E77 Standard Test Method for Inspection and Verification of Thermometers.
- E. AWWA C700 (American Water Works Association) Cold-Water Meters Displacement Type, Bronze Main Case.
- F. AWWA M6 (American Water Works Association) Water Meters Selection, Installation, Testing and Maintenance.

1.03 SUBMITTALS

- A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
 - 1. Manufacturer's data indicating use, operating range, total range, accuracy and location for manufactured components.
 - 2. Submit product description, model, dimensions, component sizes, rough-in requirements, service sizes and finishes.
 - 3. Submit schedule indicating manufacturer, model number, size, location, rated capacity, load served and features for each specialty.

- 4. Submit electrical characteristics and connection requirements.
- B. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures, application, selection and hookup configuration. Include pipe and accessory elevations.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.04 CLOSEOUT SUBMITTALS

- A. Division 1 Closeout Submittals.
- B. Project Record Documents: Record actual locations of actual locations of components and instrumentation.
- C. Operation and Maintenance Data: Submit instructions for calibrating instruments, installation instructions, assembly views, servicing requirements, lubrication instruction and replacement parts list.

1.05 QUALIFICATIONS

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

1.06 DELIVERY, STORAGE AND HANDLING

- A. Accept values on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Protect systems from entry of foreign materials by temporary covers, caps and closures, completing sections of the work and isolating parts of completed system until installation.
- D. Do not install instruments when areas are under construction, except for required rough in, taps, supports and test plugs.

1.07 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.
- 1.08 WARRANTY

- A. Division 1 Closeout Submittals.
- B. Provide one year manufacturer warranty for piping specialties.

PART 2 - PRODUCTS

2.01 PRESSURE GAUGES

- A. Manufacturers:
 - 1. Trerice.
 - 2. Marshaltown.
 - 3. Ashcroft.
 - 4. Approved Equal.
- B. Gauge: ASME B40.1, with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.
 - 1. Case: Cast aluminum.
 - 2. Bourdon Tube: Phosphor bronze.
 - 3. Dial Size: 3-1/2 inch diameter.
 - 4. Mid-Scale Accuracy: One percent.
 - 5. Scale: Psi.

2.02 PRESSURE GAUGE TAPS

- A. Needle Valve: Brass, ¹/₄ inch NPT for minimum 300 psi.
- B. Ball Valve: Brass for 250 psi.
- C. Pulsation Damper: Pressure snubber, brass with 1/4 inch NPT connections.

2.03 STEM TYPE THERMOMETERS

- A. Manufacturers:
 - 1. Trerice.
 - 2. Marshaltown.
 - 3. Ashcroft.

- 4. Approved Equal.
- B. Thermometer: ASTM E1, adjustable angle, red appearing mercury, lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device.
 - 1. Size: 9 inch scale.
 - 2. Window: Clear Lexan.
 - 3. Stem: Extended brass, ³/₄ inch NPT.
 - 4. Accuracy: ASTM E77, 2 percent.
 - 5. Calibration: Both°F and degrees C.

2.04 THERMOMETERS SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required and with cap and chain.

2.05 DIAPHRAGM TYPE EXPANSION TANKS

- A. Manufacturers:
 - 1. Amtrol.
 - 2. Taco.
 - 3. Armstrong.
 - 4. Approved Equal.
- B. Construction: Welded steel, rated for working pressure of 125 psig, with flexible EPDM diaphragm sealed into tank and steel support legs or saddles. If required by the drawings schedules: tested and stamped in accordance with ASME SEC 8-D; supplied with National Board Form U-1
- C. Accessories: Pressure gauge and air-charging fitting, tank drain; pre-charge to 12 psig.

2.06 AIR VENTS

- A. Manufacturers:
 - 1. Hoffman.
 - 2. Armstrong.

- 3. Bell & Gossett.
- 4. Approved Equal.
- B. Manual Type: Disk type vent with built-in check valve for manual or automatic operation, discs replaceable without draining system, 1/8 inch shank, rated at 50 psi, Hoffman No. 500 or equal; provide with air chamber, brass construction, 6 cubic inch volume, Hoffman No. 550 or equal.
- C. Float Type: Brass or semi-steel body, copper float, stainless steel valve and valve seat; 1/8 inch NPT connection to atmosphere with drain piping suitable for system operating temperature and pressure; with isolating valve. Hoffman No. 79 or equal.
- D. High Capacity Automatic Air Vent: Cast iron body, stainless steel and brass trim, EPDM diaphragm, rated for 300°F, 350 PSIG, ³/₄ inch system connection, 1/2 inch NPT connection to atmosphere with drain piping. Provide with isolation valve and strainer upstream of vent. Hoffman 792 or equal.

2.07 AIR SEPARATORS

- A. Manufacturers:
 - 1. Spirotherm.
 - 2. Approved Equal.
- B. Combination Air Separators and Dirt Separators:
 - 1. Steel, 150 psig operating pressure, copper core tube bundle with continuous wound copper medium permanently affixed to the core, internal full port float actuated brass vent, valved side tap to flush floating dirt, bottom valved tap to flush separated dirt.

2.08 BALANCE VALVES

- A. Manufacturers:
 - 1. Bell & Gossett.
 - 2. Taco.
 - 3. Approved Equal.
- B. Calibrated, ball or plug type balance valve with precision machined orifice, readout valves equipped with integral check valves and gasketed caps, calibrated nameplate and indicating pointer. Threaded connections.
- 2.09 RELIEF VALVES

- A. Manufacturers:
 - 1. Watts.
 - 2. Taco.
 - 3. Bell & Gossett.
 - 4. Approved Equal.
- B. Bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated capacities ASME certified and labeled.

2.10 GLYCOL CHARGING

- A. Manufacturers:
 - 1. Axiom
 - 2. Wessels.
 - 3. Approved Equal.
- B. Prefabricated automatic glycol make-up tank. Complete with pump, magnetic starter, pressure tank, pressure control, strainer, priming valve, adjustable pressure reducing valve set at 12 psig, shut off valve, pressures gauge.
- C. Factory automatic controls: Maintains fill pressure of glycol system, low level or excess pressure shall cut-off pump, audible low-level or excessive pressure alarm with silence switch, low-level or excessive pressure visible alarm, signal for remote alarm
- D. Construction: 6 gallon translucent polyethylene tank with lid. Lid shall be capable of accommodating system relief piping. Pumping assembly shall be mounted on steel frame with legs. Tank shall be mounted on steel frame above pumping assembly.

2.11 GLYCOL SOLUTION

- A. Manufacturers:
 - 1. Dowfrost/HD.
 - 2. Approved Equal.
- B. Solution: Inhibited propylene glycol and water solution, pre-mixed 50 percent glycol 50 percent water, suitable for operating temperatures down to -30°F.

3.01 INSTALLATION

- A. Install positive displacement meters in accordance with AWWA M6, with isolating valves on inlet and outlet. Provide full line size bypass with ball valve for liquid service meters.
- B. Install one pressure gauge per pump, with taps on suction and discharge of pump; pipe to gauge.
- C. Install gauge taps in piping.
- D. Install pressure gauges with pulsation dampers. Provide needle valve or ball valve to isolate each gauge. Extend nipples to allow clearance from insulation.
- E. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
- F. Install thermometer sockets adjacent to controls systems thermostat, transmitter, or sensor sockets. Where thermometers are provided on local panels, or pipe mounted thermometers are not required.
- G. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- H. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- I. Adjust gauges and thermometers to final angle, clean windows and lenses and calibrate to zero.
- J. Where large air quantities can accumulate, provide enlarged air collection standpipes.
- K. Provide manual air vents at system high points and as indicated.
- L. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.
- M. Provide air separator on suction side of system circulation pump and connect to expansion tank.
- N. Provide drain and hose connection with valve on strainer blow down connection.
- O. Provide balancing valves on water outlet from terminal heating units such as radiation, unit heaters and heating coils units.
- P. Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.

- Q. Pipe relief valve outlet to nearest floor drain.
- R. Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.
- S. Feed glycol solution to system through make-up line with pressure regulator, venting system high points. Set to fill at 12 psig. Pressure system cold at 5 psig.
- 3.02 FIELD QUALITY CONTROL
 - A. Division 1 Quality Requirements.
 - B. Test for strength of glycol and water solution and submit written test results.

3.03 CLEANING

- A. Division 1 Closeout Submittals.
- B. Clean and flush glycol system before adding glycol solution. Refer to Section 15180 Hydronic Piping.

3.04 PROTECTION OF INSTALLED CONSTRUCTION

A. Do not install hydronic gauges until after systems are cleaned.

3.05 AIR VENT APPLICATION SCHEDULE

Location	Type
Terminal heating units, mains below	Manual
Terminal heating units, mains above	None
Heating mains, at high points in system	Automatic
Air separators	High capacity
As Indicated on Drawings	Per Drawings

Note: For terminal heating units, mains above unit, install branch piping connections at bottom of mains or 45° from bottom to allow air migration to mains.

END OF SECTION

SECTION 15130 PUMPS

PART 1 - GENERAL

- 1.01 SUMMARY
 - A. Section includes in-line circulators.
 - B. Related Sections:
 - 1. Section 15180 Hydronic Piping: Execution requirements for connection to pumps specified by this section.
 - 2. Division 16 Wiring Connections: Execution requirements for electrical connections to pumps specified by this section.
 - 3. Division 16 Motors: Product requirements for motors for placement by this section.

1.02 REFERENCES

- A. ASME (American Society of Mechanical Engineers) Boiler and Pressure Vessel Codes, SEC VIII-D Rules for Construction of Pressure Vessels.
- B. UL 778 (Underwriters Laboratories, Inc.) Motor Operated Water Pumps.
- 1.03 PERFORMANCE REQUIREMENTS
 - A. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation and operate within 25 percent of midpoint of published maximum efficiency curve.

1.04 SUBMITTALS

- A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
 - 1. Product Data: Submit certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements. Submit also, manufacturer model number, dimensions, service sizes and finishes.
 - 2. Manufacturer's Installation Instructions: Submit application, selection and hookup configuration with pipe and accessory elevations. Submit hanging and support requirements and recommendations.

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

1.05 CLOSEOUT SUBMITTALS

- A. Division 1 Closeout Submittals.
- B. Operation and Maintenance Data: Submit installation instructions, servicing requirements, assembly views, lubrication instructions and replacement parts list.

1.06 QUALIFICATIONS

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

1.07 DELIVERY, STORAGE AND HANDLING

A. Protect systems from entry of foreign materials by temporary covers, completing sections of the work and isolating parts of completed system.

1.08 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.09 WARRANTY

- A. Division 1 Closeout Submittals.
- B. Provide one year manufacturer warranty for pumps.

1.10 EXTRA MATERIALS

A. Supply one set of mechanical seals for each pump.

PART 2 - PRODUCTS

- 2.01 SYSTEM LUBRICATED CIRCULATORS
 - A. Manufacturers:
 - 1. Grundfos

- 2. No substitution.
- B. Type: Horizontal shaft, single stage, direct connected with multiple speed (where scheduled), wet rotor motor for in-line mounting, for 140 psig maximum working pressure, 230°F maximum water temperature.
- C. Casing: Cast iron or Bronze (where scheduled) with flanged pump connections.
- D. Impeller, Shaft, Rotor: Stainless Steel.
- E. Bearings: Metal Impregnated carbon (graphite) and ceramic.
- F. Motor: Impedance protected.

PART 3 - EXECUTION

- 3.01 INSTALLATION
 - A. Install long radius reducing elbows or reducers between pump and piping. Support piping adjacent to pump such that no weight is carried on pump casings.
 - B. Provide line sized shut-off valve and strainer on pump suction and line sized spring actuated, soft seat check valve and balancing valve on pump discharge.
 - C. Lubricate pumps before start-up.

3.02 FIELD QUALITY CONTROL

- A. Division 1 Quality Requirements: Testing and Inspection Services.
- B. Section 15950 Testing, Adjusting and Balancing.
- C. Inspect for alignment of base mounted pumps.

END OF SECTION

SECTION 15140 DOMESTIC WATER PIPING

PART 1 - GENERAL

- 1.01 SUMMARY
 - A. Section includes domestic water piping, valves, fittings and accessories.
 - B. Related Sections:
 - 1. Section 15060 Hangers and Supports.
 - 2. Section 15080 Mechanical Insulation.
 - 3. Section 15410 Plumbing Fixtures.

1.02 REFERENCES

- A. ASME B16.18 (American Society of Mechanical Engineers) Cast Copper Alloy Solder Joint Pressure Fittings.
- B. ASME B16.22 (American Society of Mechanical Engineers) Wrought Copper and Bronze Solder Joint Pressure Fittings.
- C. ASME B16.26 (American Society of Mechanical Engineers) Cast Bronze Fittings for Flared Copper Tubes.
- D. ASME B31.9 (American Society of Mechanical Engineers) Building Service Piping.
- E. ASTM B32 Solder Metal.
- F. ASTM B88 Seamless Copper Water Tube.
- G. AWWA C651 (American Water Works Association) Disinfecting Water Mains.
- H. MSS SP-71 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Cast Iron Swing Check Valves, Flanged and Threaded Ends.
- I. MSS SP-80 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Bronze Gate, Globe, Angle and Check Valves.
- J. MSS SP-110 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.
- K. ASME A1126.1 (American Society of Mechanical Engineers) Water Hammer Arrestors.

- L. ASSE 1013 (American Society of Sanitary Engineering) Backflow Preventers, Reduced Pressure Principle.
- M. ASSE 1019 (American Society of Sanitary Engineering) Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types.
- N. AWWA C506 (American Water Works Association) Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valve Types.
- O. PDI WH-201 (Plumbing and Drainage Institute) Water Hammer Arrestors.

1.03 SUBMITTALS

- A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
 - 1. Product Data: Submit data on pipe materials; pipe fittings, valves and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
 - 2. Manufacturer's Installation Instructions: Submit installation instructions for pumps, valves and accessories.

1.04 CLOSEOUT SUBMITTALS

- A. Division 1 Closeout Submittals.
- B. Project Record Documents: Record actual locations of valves and equipment.
- C. Operation and Maintenance Data: Submit spare parts list, exploded assembly views and recommended maintenance intervals.

1.05 QUALIFICATIONS

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

1.06 DELIVERY, STORAGE AND HANDLING

- A. Accept valves and equipment on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work and isolating parts of completed system.

1.07 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.08 WARRANTY

- A. Division 1 Closeout Submittals.
- B. Provide one year manufacturers warranty for well tanks and water softeners.

1.09 EXTRA MATERIALS

A. Supply two loose keys for outside hose bibs.

PART 2 - PRODUCTS

- 2.01 WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING
 - A. Copper Tubing: ASTM B88, Type K annealed.
 - 1. Fittings: ASME B16.18, cast bronze or ASTM B16.22 wrought copper and bronze.
 - 2. Joints: AWS A5.8, BCuP silver braze.
 - B. Ductile Iron Pipe: AWWA C151.
 - 1. Fittings: AWWA C110, ductile or gray iron, standard thickness.
 - 2. Joints: AWWA C111, rubber gasket with ³/₄ inch diameter rods.

2.02 WATER PIPING, ABOVE GRADE

- A. Copper Tubing: ASTM B88, Type L, hard drawn.
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - 2. Joints: ASTM B32, solder, Grade 95TA lead free.

2.03 PLASTIC WATER PIPING

- A. Polyethylene Pipe: ASTM F877, oxygen barrier, cross-linked polyethylene, 100 psig operating pressure at 180 °F.
- B. Fittings: Brass and copper.
- C. Joints:
 - 1. Below grade: Not Allowed.
 - 2. Above grade: Mechanical compression fittings.

2.04 FLANGES, UNIONS AND COUPLINGS

- A. Pipe Size 2 inches and Under:
 - 1. Copper tube and pipe: C lass 150 bronze unions with soldered joints.
- B. Pipe Size Over 2 inch:
 - 1. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.05 BALL VALVES

- A. Manufacturers:
 - 1. Nibco.
 - 2. Crane.
 - 3. Hammond.
 - 4. Approved Equal.
- B. Construction, 4 inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle, solder or threaded ends.

2.06 SWING CHECK VALVES

- A. Manufacturers:
 - 1. Nibco.
 - 2. Crane.

- 3. Hammond.
- 4. Approved Equal.
- B. Up To and Including 3 inches:
 - 1. MSS SP-80, Class 125, bronze body and cap, bronze swing disc with rubber seat, solder or threaded ends.
- 2.07 BACKFLOW PREVENTERS
 - A. Manufacturers:
 - 1. Watts.
 - 2. Hersey.
 - 3. Febco.
 - 4. Approved Equal.
 - B. Reduced Pressure Backflow Preventers: ANSI/ASSE 1013.
 - 1. Bronze body, with bronze internal parts and stainless steel springs.
 - 2. Two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, brass strainer and four test cocks.

2.08 WATER HAMMER ARRESTORS

- A. Manufacturers:
 - 1. J.R. Smith.
 - 2. Zurn.
 - 3. Josam.
 - 4. Approved Equal.
- B. ANSI A1126.1; stainless steel construction, bellows type sized in accordance with PDI WH-201.
- C. Pre-charged suitable for operation in temperature range -100 to 300°F and maximum 250 psi working pressure.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry and not over-excavate

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.

3.03 CERTIFICATION

A. Provide Owner with copy of reduced pressure backflow preventer certification.

3.04 INSTALLATION

- A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- C. Install piping to maintain headroom and neither interfere with use of space nor take more space than necessary.
- D. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 15060.
- G. Provide access where valves and fittings are not expose. Coordinate size and location of access doors with Division 8.
- H. Establish elevations of buried piping outside the building to ensure not less than 10 ft of cover.
- I. Do not install underground piping when bedding is wet or frozen.
- J. Where pipe support members are welded to structural building framing, scrape, brush clean and apply one coat of zinc rich primer to welding.
- K. Prepare exposed, unfinished pipe, fittings, supports and accessories ready for finish painting. Refer to Section 09900.

- L. Excavate and backfill in accordance with Division 2.
- M. Install valves with stems upright or horizontal, not inverted.
- N. Install water piping to ASME B31.9.
- O. Install potable water protection devices on plumbing lines where contamination of domestic water may occur.
- P. Pipe relief from valves, back-flow preventers and drains to nearest floor drain.
- Q. Install water hammer arrestors complete with accessible isolation valve.
- R. Where water hammer arrestors are not indicated on the drawings install air chambers on hot and cold water supply piping to each fixture. Fabricate same size as supply pipe or ³/₄-inch minimum and minimum 18 inches long.

3.05 INTERFACE WITH OTHER PRODUCTS

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- C. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Install ball valves for throttling, bypass, or manual flow control services.
- E. Provide spring loaded check valves on discharge of water pumps.
- F. Provide balancing valves in water circulating systems where indicated.
- G. Slope water piping minimum 0.25 percent and arrange to drain at low points.

3.06 CLEANING

- A. Division 1 Closeout Submittals.
- B. Prior to starting work, verify system is complete, flushed and clean.
- C. Ensure pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- D. Inject disinfectant, free chlorine in liquid, powder and tablet or gas form, throughout system to obtain a residual from 50 to 80 mg/L.
- E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

- F. Maintain disinfectant in system for 24 hours.
- G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry and analyze in accordance with AWWA C651. Provide the Owner with a copy of the disinfection report.

END OF SECTION

SECTION 15150 SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes pipe, pipe fittings, connections and equipment for sanitary sewer piping systems. This section also includes cleanouts.
- B. Related Sections:
 - 1. Section 15060 Hangers and Supports.
 - 2. Section 15075 Mechanical Identification: Product requirements for pipe identification for placement by this section.
 - 3. Section 15410 Plumbing Fixtures.

1.02 REFERENCES

- A. ASME B123 (American Society of Mechanical Engineers) Cast Copper Alloy Solder Joint Drainage Fittings DWV.
- B. ASME B129 (American Society of Mechanical Engineers) Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
- C. ASTM A74 Cast Iron Soil Pipe and Fittings.
- D. ASTM B32 Solder Metal.
- E. ASTM B306 Copper Drainage Tube (DWV).
- F. ASTM C564 Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- G. CISPI 301 (Cast Iron Soil Pipe Institute) Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.
- H. CISPI 310 (Cast Iron Soil Pipe Institute) Joints for Hubless Cast Iron Sanitary Systems.
- I. ASTM D1785 Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- J. ASTM D2235 Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
- K. ASTM D2241 Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

- L. ASTM D2466 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- M. ASTM D2564 Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
- N. ASTM D2661 Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings.
- O. ASTM D2665 Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
- P. ASTM D2729 Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- Q. ASTM D2751 Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
- R. ASTM D2855 Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
- S. ASTM F679 Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
- T. ASTM F708 Standard Practice for Design and Installation of Rigid Pipe Hangers.

1.03 SUBMITTALS

- A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
 - 1. Product Data: Submit data on pipe materials, fittings and accessories. Provide manufacturers catalog information. Provide component sizes, rough-in requirements, service sizes and finishes.
 - 2. Manufacturer's Installation Instructions: Submit installation instructions for all material and equipment.

1.04 CLOSEOUT SUBMITTALS

- A. Division 1 Closeout Submittals.
- B. Project Record Documents: Record actual locations of equipment and cleanouts.
- C. Operation and Maintenance Data: Submit frequency of treatment required for interceptors.

1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.
- 1.06 DELIVERY, STORAGE AND HANDLING
 - A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work and isolating parts of completed system.

1.07 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.08 WARRANTY

A. Division 1 – Closeout Submittals.

PART 2 - PRODUCTS

2.01 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Cast Iron Pipe: ASTM A74 service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: ASTM C564, neoprene gasket system or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hub-less.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

2.02 SANITARY SEWER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hub-less, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-andshield assemblies.

- B. Copper Tube: ASTM B306, DWV.
 - 1. Fittings: ASME B123, cast bronze, or ASME B129, wrought copper.
 - 2. Joints: ASTM B32, solder, Grade 50B.

2.03 CLEANOUTS

- A. Manufacturers:
 - 1. J.R. Smith.
 - 2. Josam.
 - 3. Zurn.
 - 4. Approved Equal.
- B. Exterior Surfaced Areas: Round cast nickel bronze access frame and non-skid cover.
- C. Interior Finished Floor Areas: Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly and round scored cover with gasket in service areas and round depressed cover with gasket to accept floor finish (vinyl or tile) in finished floor areas. Provide adjustable carpet clamping frame at carpeted areas.
- D. Interior Finished Wall Areas: Line type with lacquered cast iron body and round epoxy coated cover with gasket and round stainless steel access cover secured with machine screw.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry and not over-excavated.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

- A. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for snaking drainage system.
- B. Encase exterior cleanouts in concrete flush with grade.
- C. Install floor cleanouts at elevation to accommodate finished floor.
- D. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- E. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- F. Do not install plastic piping in return air plenums.
- G. Install piping to maintain headroom. Do not spread piping, conserving space.
- H. Group piping whenever practical at common elevations.
- I. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- J. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 15080.
- K. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08310.
- L. Do not install underground piping when bedding is wet or frozen.
- M. Establish elevations of buried piping outside the building to ensure adequate cover.
- N. Install piping penetrating roofed areas to maintain integrity of roof assembly.
- O. Where pipe support members are welded to structural building framing, scrape, brush clean and apply one coat of zinc rich primer to welding.
- P. Prepare exposed, unfinished pipe, fittings, supports and accessories ready for finish painting. Refer to Division 9.
- Q. Excavate and backfill in accordance with Division 2.
- R. Establish invert elevations, slopes for drainage to 1/4 inch per foot minimum. Maintain gradients.

END OF SECTION

SECTION 15180 HYDRONIC PIPING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes systems, accessories, valves, pipe and pipe fittings for glycol heating, water heating.
- B. Related Sections:
 - 1. Division 8 Access Doors: Product requirements for access doors for placement by this section.
 - 2. Division 9 Paints and Coatings: Product requirements painting for placement by this section.
 - 3. Section 15080 Mechanical Insulation: Product requirements for Piping Insulation for placement by this section.
 - 4. Divison 16 Wiring Connections: Execution requirements for electric connections specified by this section.

1.02 REFERENCES

- A. ASME (American Society of Mechanical Engineers) Boiler and Pressure Vessel Codes, SEC IX - Qualification Standard for Welding and Brazing Procedures, Welders, Brazers and Welding and Brazing Operators.
- B. ASME B31.9 (American Society of Mechanical Engineers) Building Services Piping.
- C. ASME B16.18 (American Society of Mechanical Engineers) Cast Copper Alloy Solder Joint Pressure Fittings.
- D. ASME B16.22 (American Society of Mechanical Engineers) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- E. ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- F. ASTM A234 Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- G. ASTM B32 Solder Metal.
- H. ASTM B88 Seamless Copper Water Tube.

1.03 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union and couplings for servicing are consistently provided.
- B. Use unions, flanges and couplings downstream of valves and at equipment or apparatus connections. Use non-conducting dielectric nipple or flange connections or bronze union whenever jointing dissimilar metals in systems. Do not use direct welded or threaded connections to valves, equipment or other apparatus.
- C. Use ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Use ball valves for throttling or bypass services.
- E. Use ³/₄-inch ball valves with hose connection end and cap for drains at main shut-off valves, low points of piping, bases of vertical risers and at equipment.
- F. Valve seat materials shall be compatible with glycol solutions applicable to this project.

1.04 SUBMITTALS

- A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
 - 1. Product Data: Submit data on pipe materials, pipe fittings, valves and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.
 - 2. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures and isolation.

1.05 CLOSEOUT SUBMITTALS

- A. Division 1 Closeout Submittals.
- B. Project Record Documents: Record actual locations of valves.
- C. Operation and Maintenance Data: Submit instructions for installation and changing components, spare parts lists, exploded assembly views.

1.06 QUALIFICATIONS

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

B. Fabricator or Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Accept values on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work and isolating parts of completed system Protect.

1.08 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.09 WARRANTY

- A. Division 1 Closeout Submittals.
- B. Provide one year manufacturer warranty for valves excluding packing.

PART 2 - PRODUCTS

- 2.01 GLYCOL AND WATER HEATING PIPING, ABOVE GROUND
 - A. Copper Tubing, under 3": ASTM B88, Type L, hard drawn.
 - 1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
 - 2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535°F.
 - B. Copper Tubing, 3" and larger: ASTM B88, Type L, hard drawn.
 - 1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
 - 2. Joints: AWS A5.8, BCuP silver braze, silver/phosphorus/copper alloy with melting range 1190 1480 °F
- 2.02 EQUIPMENT DRAINS AND OVERFLOWS

- A. Copper Tubing: ASTM B88, Type L, hard drawn.
 - 1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
 - 2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535°F.
- 2.03 UNIONS, FLANGES AND COUPLINGS
 - A. Unions for Pipe 2 inches and Under:
 - 1. Ferrous Piping: 150 psig malleable iron, threaded.
 - 2. Copper Pipe: Bronze, soldered joints.
 - B. Flanges for Pipe Over 2 inches:
 - 1. Ferrous Piping: 150 psig forged steel, slip-on.
 - 2. Copper Piping: Bronze.
 - 3. Gaskets: 1/16 inch thick preformed neoprene.
 - C. Dielectric Connections: Non-conducting dielectric nipple or flange connections or bronze union whenever jointing dissimilar metals in systems.

2.04 BALL VALVES

- A. Manufacturers:
 - 1. Nibco.
 - 2. Crane.
 - 3. Milwaukee.
 - 4. Approved Equal.
- B. Up To and Including 2 inches: Bronze two piece body, chrome plated brass or stainless steel ball, teflon seats and stuffing box ring, lever handle, solder or threaded ends.
- C. Over 2 inches: Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle, flanged.
- 2.05 GATE VALVES AND BUTTERFLY VALVES
 - A. Not allowed.

2.06 SWING CHECK VALVES

- A. Manufacturers:
 - 1. Nibco.
 - 2. Crane.
 - 3. Milwaukee.
 - 4. Approved Equal.
- B. Up to and Including 2 inches: Bronze body and trim, bronze rotating swing disc, with composition disc, solder or threaded ends.
- C. Over 2 inches: Iron body, bronze trim, bronze or bronze faced rotating swing disc, renewable disc and seat, flanged ends.

2.07 SYSTEM CLEANER

A. Product Description: Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products: sodium tri-poly phosphate.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
- E. Operate, fill, start and vent systems prior to cleaning. Use the water meter to record capacity in each system. Place terminal control valves in open during cleaning.

3.02 CLEANING

- A. Concentration:
 - 1. As recommended by manufacturer.
- B. Hot Water Heating Systems:

- 1. Apply heat while circulating, slowly raising temperature to 195°F and maintain for 12 hours minimum.
- 2. Remove heat and circulate to 100°F or less; drain systems as quickly as possible and refill with clean water.
- 3. Circulate for 6 hours at design temperatures, then drain.
- 4. Refill with clean water and repeat until system cleaner is removed.
- 5. Remove, clean and replace strainer screens.
- 6. Inspect, remove sludge and flush low points with clean water after cleaning process is completed. Include disassembly of components as required.

3.03 INSTALLATION

- A. Install glycol and water heating piping in conformance with ASME B31.9.
- B. Route piping parallel to building structure and maintain gradient.
- C. Install piping to conserve building space and not interfere with use of space.
- D. Group piping whenever practical at common elevations.
- E. Sleeve pipe passing through partitions, walls and floors.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints or connected equipment. Refer to Section 15060 and 15120.
- G. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Division 8.
- H. Slope piping and arrange systems to drain at low points.
- I. Prepare unfinished pipe, fittings, supports and accessories, ready for finish painting. Refer to Division 9.
- J. Install valves with stems upright or horizontal, not inverted.
- K. Insulate piping; refer to Section 15080.

END OF SECTION

SECTION 15190 FUEL PIPING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes piping, fittings, valves and tanks for fuel piping systems.
- B. Related Sections:
 - 1. Section 09900 Paints and Coatings: Product requirements for painting for placement by this section.
 - 2. Section 15075 Mechanical Identification: Product requirements for valve and pipe identification for placement by this section.

1.02 REFERENCE

- A. API 650 (American Petroleum Institute) Welded Steel Tanks for Oil Storage.
- B. API 2000 (American Petroleum Institute) Venting Atmospheric and Low Pressure Storage Tanks.
- C. ASME SEC IX (American Society of Mechanical Engineers) Welding and Brazing Qualifications.
- D. ASME B16.3 (American Society of Mechanical Engineers) Malleable Iron Threaded Fittings.
- E. ASME B16.18 (American Society of Mechanical Engineers) Cast Copper Alloy Solder-Joint Pressure Fittings.
- F. ASME B16.22 (American Society of Mechanical Engineers) Wrought Copper and Bronze Solder-Joint Pressure Fittings
- G. ASME B16.26 (American Society of Mechanical Engineers) Cast Bronze Fittings for Flared Copper Tubes.
- H. ASME B31.1 Power Piping.
- I. ASME B31.9 Building Services Piping.
- J. ASME B36.10 (American Society of Mechanical Engineers) Welded and Seamless Wrought Steel Pipe.
- K. ASTM A53 Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.

- L. ASTM A234/A234M Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
- M. AWS A5.8 (American Welding Society) Brazing Filler Metal.
- N. AWWA C105 (American Water Works Association) Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.
- O. NFPA 30 (National Fire Protection Association) Flammable and Combustible Liquids Code.
- P. NFPA 31 (National Fire Protection Association) Installation of Oil Burning Equipment.
- Q. UL 80 (Underwriters Laboratories, Inc.) Steel Inside Tanks Oil-Burner Fuel.
- R. UL 142 (Underwriters Laboratories, Inc.) Steel Aboveground Tanks for Flammable and Combustible Liquids.
- S. UL 1479 (Underwriters Laboratories, Inc.) Fire Tests of Through-Penetration Firestops.

1.03 SUBMITTALS

- A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
 - 1. Shop Drawings: Indicate tanks, system layout, pipe sizes, location and elevations. For fuel oil tanks, indicate dimensions and accessories including manholes and hold down straps.
 - 2. Product Data: Submit data on pipe materials, pipe fittings, valves and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
 - 3. Manufacturer's Installation Instructions: Submit oil pump data.
 - 4. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.04 CLOSEOUT SUBMITTALS

- A. Division 1 Contract Closeout.
- B. Operation and Maintenance Data: Submit installation instructions, spare parts lists.
- 1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with ASME SEC IX and NFPA 31 standard.
- B. Maintain one copy of each document on site.
- C. Perform Work in accordance with NFPA 54.

1.06 QUALIFICATIONS

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

1.07 DELIVERY, STORAGE AND HANDLING

- A. Division 1 Product, Storage and Handling.
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- C. Protect piping and fittings from soil and debris with temporary end caps and closures. Maintain in place until installation. Provide temporary protective coating on cast iron and steel valves.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Division 1 Product Requirements and Substitutions.
- B. Do not install underground piping when bedding is wet or frozen.

1.09 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 - PRODUCTS

- 2.01 ABOVE GROUND OIL PIPING
 - A. Copper Tubing: ASTM B88, Type L, hard drawn.
 - 1. Fittings: ASME B16.18 cast copper alloy or ASTM B16.22 wrought copper and bronze.
 - 2. Joints: AWS A5.8 Classification BCuP-3 or BCuP-4 silver braze or ASTM B32, solder, Grade 95TA.

- B. Copper Tubing: ASTM B88, Type L, annealed.
 - 1. Fittings: ASME B16.26 cast bronze.
 - 2. Joints: Flared.
- C. Steel Pipe: ASTM A53, Schedule 40 black.
 - 1. Fittings: ASTM A234/A234M, wrought carbon steel and alloy steel welding type.
 - 2. Joints: ASME B31.1 welded.
 - 3. Jacket: AWWA C105 polyethylene or double layer, half-lapped 10 mil polyethylene tape.

2.02 FLANGES, UNIONS AND COUPLINGS

- A. Pipe Size 2 inches and Under:
 - 1. Ferrous pipe: 150-psi malleable iron threaded unions.
 - 2. Copper tube: 150-psi bronze unions with brazed joints.
- B. Pipe Size Over 2 inches:
 - 1. Ferrous pipe: 150 psi forged steel slip-on flanges; 1/16 inch thick preformed neoprene gaskets.
 - 2. Copper tube: 150 psi slip-on bronze flanges; 1/16 inch thick preformed neoprene gaskets.

2.03 GATE VALVES

1. Not allowed.

2.04 BALL VALVES

- A. Manufacturers:
 - 1. Nibco.
 - 2. Crane.
 - 3. Milwaukee.
 - 4. Substitutions: Section 01610 Product Requirements and Substitutions.

B. MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle, threaded ends.

2.05 SWING CHECK VALVES

- A. Manufacturers:
 - 1. Nibco.
 - 2. Crane.
 - 3. Milwaukee.
 - 4. Approved Equal.
- B. Up to 2 inches: MSS SP-80, Class 125, bronze body and cap, bronze swing disc, solder or threaded ends.
- C. 2 inches and Larger: MSS SP-71, Class 125, iron body, bronze swing disc, renewable disc seal and seat, or flanged ends.

2.06 ABOVEGROUND FUEL STORAGE TANKS

- A. Manufacturers:
 - 1. Ace Tank.
 - 2. Anchorage Tank.
 - 3. Approved Equal.
- B. Tank: UL 80, welded steel, double wall, taps for accessories, threaded connections. Factory applied epoxy paint.
- C. Accessories: Tank fill, gauge, vent and outlet connections.
- D. Gauge: Remote reading, electronic, for two wire, 24 volt power, with wall mounted direct reading gauge.

PART 3 - EXECUTION

- 3.01 EXAMINATION
 - A. Division 1 Project Management and Coordination.
 - B. Verify that excavations are to required grade, dry and not over-excavated.

DIVISION 15

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MECHANICAL SECTION 15190 FUEL PIPING

KLUGE & ASSOCIATES, ARCHITECTS

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Excavate and Backfill in accordance with Division 2.

3.03 INSTALLATION

- A. Provide non-conducting dielectric connections wherever jointing dissimilar metals. Install to NACE RP-01-69.
- B. Route piping in orderly manner and maintain gradient.
- C. Install piping to conserve building space and not interfere with use of space.
- D. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Provide clearance for installation of insulation and access to valves and fittings.
- G. Provide access where valves and fittings are not exposed.
- H. Where pipe support members are welded to structural building framing, scrape, brush clean, weld and apply one coat of zinc rich primer.
- I. Provide support for utility meters in accordance with requirements of utility companies.
- J. Prepare pipe, fittings, supports and accessories not pre-finished, ready for finish painting. Refer to Section 09900.
- K. Identify piping systems including underground piping. Refer to Section 15075.
- L. Install valves with stems upright or horizontal, not inverted.
- M. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work and isolating parts of completed system.

3.04 FUEL TANK INSTALLATION

A. Clean and flush aboveground tanks after installation. Seal until pipe connections are made.

- B. Provide piping connections to tanks with unions and swing joints. Provide venting to API 2000.
- C. Clean and flush day tank after installation. Seal until pipe connections are made.
- D. Fill tanks at Project turnover with appropriate fuel.

END OF SECTION

SECTION 15300 BASIC FIRE SUPPRESSION MATERIALS AND METHODS

PART 1 - GENERAL

- 1.01 SUMMARY
 - A. Section includes pipe, fittings, valves and connections for sprinkler systems.
 - B. Related Sections:
 - 1. Section 15350 Wet-Pipe Fire Suppression Sprinkler Systems
 - 2. Section 15075 Mechanical Identification: Product requirements for pipe and valve identification for placement by this section.

1.02 REFERENCES

- A. ASME B16.9 (American Society of Mechanical Engineers) Factory-made Wrought Steel Butt welding Fittings.
- B. ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless.
- C. ASTM A795 Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.
- D. AWS D1.1 (American Welding Society) Structural Welding Code
- E. NFPA 13D (National Fire Protection Association) Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes.

1.03 SUBMITTALS

- A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
 - 1. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details and piping connections.
 - 2. Product Data: Submit manufacturers catalogue information. Indicate valve data and ratings.
 - 3. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.04 CLOSEOUT SUBMITTALS

- A. Contract Closeout Requirements: In addition to contract closeout requirements as outlined under Division 1, mechanical contract closeout requirements shall include the following:
 - 1. Project Record Documents: Record actual locations of components and tag numbering.
 - 2. Operation and Maintenance Data: Submit spare parts lists.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with NFPA 13D.

1.06 QUALIFICATIONS

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

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store valves in shipping containers, with labeling in place.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation fabrication.

1.08 WARRANTY

- A. Division 1.
- B. Provide one year manufacturer warranty for basic fire suppression materials and methods.

PART 2 - PRODUCTS

2.01 VALVES

- A. Manufacturers:
 - 1. Grinnell.
 - 2. Nibco.

- 3. Crane.
- 4. Milwaukee.
- 5. Approved Equal.
- B. General Valve Requirements:
 - 1. All fire protection control valves shall be supervised with switches compatible with the fire alarm system.
 - 2. Valves shall be UL listed for fire protection service.
- C. Ball Valves:
 - 1. Bronze two piece body, brass, chrome plated bronze, or stainless steel ball, teflon seats and stuffing box ring, lever handle, threaded ends.
- D. Check Valves:
 - 1. Bronze body and swing disc, rubber seat, threaded ends.
- E. Drain Valves:
 - 1. Compression Stop: Bronze with hose thread nipple and cap.
 - 2. Ball Valve: Brass with cap and chain, 3/4 hose thread.

2.02 ABOVE GROUND WET PIPING

- A. CPVC Pipe: ASTM F442, SDR 13.5.
 - 1. Fittings: ASTM F438 schedule 40 or ASTM F439 schedule 80, CPVC.
 - 2. Joints: ASTM F439, solvent weld.

2.03 PIPE HANGERS AND SUPPORTS

A. Conform to NFPA 13D.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Ream pipe ends. Remove burrs.
- B. Remove scale and foreign material, from inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

- A. Install piping in accordance with NFPA 13D requirements.
- B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- C. Install piping to conserve building space, to not interfere with use of space and other work.
- D. Sleeve pipes passing through partitions, walls and floors.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Pipe Hangers and Supports: Install in accordance with NFPA 13D.
- G. Slope piping and arrange systems to drain at low points.
- H. Do not penetrate building structural members unless indicated.
- I. Provide sleeves when penetrating floors and walls. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.

3.03 CLEANING

- A. Division 1.
- B. Clean entire system after all other construction is complete.

END OF SECTION

SECTION 15350 WET PIPE FIRE SUPPRESSION SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes wet-pipe sprinkler system, system design, installation and certification.
- B. Related Sections:
 - 1. Section 15300 Basic Fire Suppression Materials.
 - 2. Section 15075 Mechanical Identification: Product requirements for valve and piping identification for placement by this section.
 - 3. Division 16: Requirements for electric connections to equipment specified by this section.

1.02 REFERENCES

A. NFPA 13D (National Fire Protection Association) - Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes.

1.03 SYSTEM DESCRIPTION

- A. System to provide coverage for one sleeping room labeled Patient Holding/Sleeping #130 on the plans.
- B. Provide hydraulically designed system to NFPA 13D requirements.
- C. Water Supply: The Contractor shall coordinate with the local water utility and/or perform flow tests to determine available water supply with respect to system hydraulic calculations. The Contractor shall be responsible for determination of water supply flow data as required by NFPA 13D and the Authority Having Jurisdiction.

1.04 REVIEWS, APPROVALS AND PERMITS

- A. The Contractor shall obtain written review and/or approval of the entire fire protection system design and arrangement from the following authorities:
 - 1. Owner's Representative Review
 - 2. State of Alaska Fire Marshal Approval

- B. The Contractor shall comply with all review comments, revising the system design as required and resubmitting in a timely manner, so as not to delay the construction schedule.
- C. The Contractor shall obtain and pay for all required permits, inspections, tests and approvals as required by the authorities having jurisdiction.

1.05 SUBMITTALS

- A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
 - 1. Product Data: Submit data on water storage tank, pump, sprinklers, valves and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements and piping connections.
 - 2. Submit a copy of designer's NICET certification and resume' or Alaska P.E. license number, as well as designated project mechanical administrator.
 - 3. Submit adequate number shop drawings, product data and calculations to the Authority Having Jurisdiction and the Owner's insurance underwriter for approval.
 - 4. Submit adequate number of State Fire Marshal approved sets of shop drawings and hydraulic calculations to the Architect/Engineer for their review. Owner's Representative will retain 1 set of "stamped approved" shop drawings. These sets must include the NICET certification or stamp of a licensed professional engineer as described above.
 - 5. Shop Drawings: Indicate layout of finished ceiling areas indicating sprinkler locations coordinated with ceiling installation. Indicate detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.
 - 6. Design Data: Submit design calculations.

1.06 CLOSEOUT SUBMITTALS

- A. Contract Closeout Requirements: In addition to contract closeout requirements as outlined under Division 1, mechanical contract closeout requirements shall include the following:
 - 1. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.
 - 2. Operation and Maintenance Data: Submit components of system, servicing requirements, record drawings, inspection data, replacement

part numbers and availability and location and numbers of service depot.

1.07 QUALITY ASSURANCE

- A. Perform work in accordance with NFPA 13D.
- B. Equipment and components: Bear the "UL" label or the "FM" approval marking.

1.08 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum three years documented experience.
- C. Designer: The system shall be designed and stamped by a licensed professional engineer or by a Level III or IV Fire Sprinkler Designer, certified by the National Institute For Certification In Engineering Technologies (NICET) in Fire Protection Engineering Technology Automatic Fire Sprinkler System Layout.

1.09 COORDINATION

A. The Contractor shall coordinate work with that of other trades and existing systems to ensure that adequate space is provided for all work, including requirements for serviceability and accessibility. Locate sprinkler heads to avoid conflict with light fixture and other installed equipment.

1.10 DELIVERY, STORAGE AND HANDLING

A. Store products in shipping containers until installation. Provide and maintain temporary inlet and outlet caps until installation.

1.11 WARRANTY

A. Division 1 – Closeout Submittals.

PART 2 - PRODUCTS

2.01 SPRINKLERS

A. Manufacturers:

- 1. Grinnell.
- 2. Reliable.
- 3. Tyco.
- 4. Approved Equal.
- B. Ceiling Type:
 - 1. Type: Quick response, residential recessed pendant type listed for NFPA 13D systems with matching screw on escutcheon plate.
 - 2. Finish: Chrome plated.
 - 3. Escutcheon Plate Finish: Chrome plated.
 - 4. Fusible Link: Frangible bulb type designed for use in residential occupancies and temperature rated for specific area hazard .

2.02 WATER STORAGE TANK/PRESSURE PUMP SYSTEM (IF REQUIRED)

- A. Manufacturers:
 - 1. Home Fire Sales Inc.: The D System.
 - 2. Talco Fire Systems.
 - 3. Approved Equal.
- B. Provide all tanks, pumps, controls, valves, switches, backflow preventers, gauges and fittings to ensure complete and operable system.
- C. Tank:
 - 1. Molded polyethylene, one piece construction, built-in hand grips, bulkhead fittings and access lid.
 - 2. Size per NFPA 13D requirements.
- D. Pump:
 - 1. Single-stage centrifugal type.
 - 2. Stainless steel construction.
 - 3. UL listed motor with built-in overload and automatic reset.
 - 4. Built to the Hydraulic Institute Standards and complying with NFPA 20 specifications.

E. Controls:

- 1. NEMA 1 steel enclosure.
- 2. Factory assembled and tested.
- 3. Minium run timer with built-in circuit breaker.
- 4. UL listed for NFPA 13D applications.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install in accordance with NFPA 13D and manufacturer's instructions.
- B. Locate water tank and pump assembly in location as indicated on plans.
- C. Place pipe runs to minimize obstruction to other work.
- D. Place piping in concealed spaces above finished ceilings, within thermal envelope of building.
- E. Hydrostatically test entire system per manufacturer's instructions.
- F. Coordinate with electrical to ensure proper installation of wiring, in accordance with the manufacturer's instructions.

3.02 CLEANING

A. Flush entire piping system of foreign matter.

3.03 PROTECTION OF INSTALLED CONSTRUCTION

A. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

END OF SECTION

SECTION 15410 PLUMBING FIXTURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes water closets, lavatories, sinks, service sinks, mop sinks, drinking fountains, showers, bathtubs, emergency eye washes, hose bibbs and floor drains.
- B. Related Sections:
 - 1. Section 15140 Domestic Water Piping.
 - 2. Section 15150 Sanitary Waste and Vent Piping.
 - 3. Division 7 Joint Sealers: Product requirements for calking between fixtures and building components for placement by this section.
 - 4. Division 16 Wiring Connections: Execution requirements for electric connections to sensor valves and faucets specified by this section.

1.02 REFERENCES

- A. ASME A112.6.1 (American Society of Mechanical Engineers) Supports for Offthe-Floor Plumbing Fixtures for Public Use.
- B. ANSI Z124.2 Gel-Coated Glass-Fiber Reinforced Polyester Resin Shower Receptor and Shower Stall Units.
- C. ASME A112.18.1 (American Society of Mechanical Engineers) Finished and Rough Brass Plumbing Fixture Fittings.
- D. ASME A112.19.2 (American Society of Mechanical Engineers) Vitreous China Plumbing Fixtures.
- E. ASME A112.19.3 (American Society of Mechanical Engineers) Stainless Steel Plumbing Fixtures.
- F. ASSE 1011 (American Society of Sanitary Engineering) Hose Connection Vacuum Breakers.
- G. ASME A1121.1 (American Society of Mechanical Engineers) Floor Drains.

1.03 SUBMITTALS

A. Section 01300 – Administrative Requirements.

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- B. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
 - 1. Product Data: Submit catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim and finishes.
 - 2. Manufacturer's Installation Instructions: Submit installation methods and procedures.
 - 3. Lead Free Certification: Submit lead free certification from manufacturer for all fixtures and trim.

1.04 CLOSEOUT SUBMITTALS

- A. Section 01780 Closeout Submittals.
- B. Contract Closeout Requirements: In addition to contract closeout requirements as outlined under Division 1, mechanical contract closeout requirements shall include the following:
 - 1. Operation and Maintenance Data: Submit fixture, trim, exploded view and replacement parts lists.

1.05 QUALITY ASSURANCE

- A. Ensure that products requiring electrical connections are listed and classified by Underwriters Laboratories Inc.
- B. Lead Free: All fixtures and trim shall be lead free and certified as lead free by the manufacturer.

1.06 QUALIFICATIONS

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

1.07 DELIVERY, STORAGE AND HANDLING

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.
- 1.08 WARRANTY

- A. Section 01780 Closeout Submittals.
- B. Provide one-year manufacturer warranty for plumbing fixtures.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers China Fixtures:
 - 1. Kohler.
 - 2. American Standard.
 - 3. Eljer.
- B. Manufacturers Stainless Steel Sinks:
 - 1. Elkay.
 - 2. Just.
- C. Manufacturers Mop Sinks:
 - 1. Fiat.
- D. Manufacturers Sink and Lavatory Trim:
 - 1. Delta.
 - 2. Sloan.
 - 3. Chicago.
 - 4. Moen.
- E. Manufacturers Water Closet and Urinal Trim:
 - 1. Sloan.
 - 2. Zurn.
 - 3. Delaney.
- F. Manufacturers Bathtubs and Shower Trim:
 - 1. Delta.
 - 2. Moen.
- G. Manufacturers Drinking Fountains:

- 1. Haws.
- 2. Elkay.
- H. Manufacturers Emergency Combination Units and Face and Eye Wash:
 - 1. Haws.
 - 2. Guardian Equipment.
 - 3. Bradley.
- I. Manufacturers Hose Bibbs:
 - 1. Woodford.
 - 2. J.R. Smith.
 - 3. Zurn.
- J. Manufacturers Floor Drains, Floor Sinks and Trench Drains:
 - 1. J.R. Smith.
 - 2. Josam.
 - 3. Zurn.
- K. Approved Equal.
- 2.02 PRESSURE ASSIST FLUSH TANK WATER CLOSETS ADA (WC-1)
 - A. Bowl: ASME A112.19.2; floor mounted, pressure assist, siphon jet, vitreous china, 17-1/8 inches high close-coupled closet combination with elongated rim, vitreous china closet tank with fittings, tank locks and lever flushing valve, tank cover locks, bolt caps.
 - B. Seat: Solid white plastic, open front, extended back, self-sustaining hinge and brass bolts, and cover.
- 2.03 LAVATORIES (LV-1)
 - A. Vitreous China Wall Hung Basin: ASME A112.19.2; vitreous china wall hung lavatory 21" x 18" minimum, with 5 inch high back, drillings on 4 inch centers, rectangular basin with splash lip, front overflow.
 - B. Faucet: ASME A112.18.1; chrome plated combination supply fitting, offset open grid strainer, water economy aerator with maximum 2.0 gpm flow, single lever handle.

- C. Wall Mounted Carrier: ASME A112.6.1; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, concealed arm supports, bearing plate and studs.
- D. Accessories: Chrome plated 17-gauge brass P-trap and arm with escutcheon, screwdriver stops and flexible braided stainless steel supplies.
- E. Pipe Insulation: ADA compliant undersink protective covers for drain piping, hot water piping, cold water piping and angle stops. Molded closed cell vinyl with antimicrobial surface, white color, hinged snap lock lids at angle stops. Truebro or equal.
- 2.04 EXAM SINK (SK-1)
 - A. Accessories: Chrome plated 17gauge brass P-trap and arm with escutcheon, screwdriver stop and flexible braided stainless steel supplies.
- 2.05 SPECIALTY PROCEDURE SINK (SK-2)
 - A. Accessories: Chrome plated 17gauge brass P-trap and arm with escutcheon, screwdriver stop and flexible braided stainless steel supplies.
- 2.06 BAR SINKS (SK-3)
 - A. Single Compartment Bowl: 16" x 17" x 7-1/2" deep outside dimensions, 18 gauge thick, Type 304 stainless steel. Self-rimming and undercoated, with 3-1/2 inch crumb cup and tailpiece, ledge back drilled for trim.
 - B. Trim: ASME A112.18.1M; cast brass body, chrome plated supply fitting, adjustable centers, grid strainer, water economy laminar flow outlet with maximum 2.2 gpm flow, heavy duty 11" high rigid gooseneck, vandal resistant 4" wrist blade handles with vandal resistant screws and red/blue color indicators.
 - C. Accessories: Chrome plated 17gauge brass P-trap and arm with escutcheon, screwdriver stop and flexible braided stainless steel supplies.
- 2.07 KITCHEN SINK (SK-4)
 - A. Single Compartment Bowl: 16" x 17" x 10" deep outside dimensions, 18 gauge thick, Type 304 stainless steel. Self-rimming and undercoated, with 3-1/2 inch crumb cup and tailpiece, ledge back drilled for trim.
 - B. Trim: ASME A112.18.1M; cast brass body, chrome plated supply fitting, adjustable centers, grid strainer, water economy laminar flow outlet with maximum 2.2 gpm flow, heavy duty 11" high rigid gooseneck, vandal resistant 4" wrist blade handles with vandal resistant screws and red/blue color indicators.

- C. Accessories: Chrome plated 17gauge brass P-trap and arm with escutcheon, screwdriver stop and flexible braided stainless steel supplies.
- 2.08 LAB SINK (SK-5)
 - A. Double Compartment Bowl: 18" x 29" x 7-1/2" deep outside dimensions, 18 gauge thick, Type 304 stainless steel. Self-rimming and undercoated, with 3-1/2 inch crumb cup and tailpiece, ledge back drilled for trim.
 - B. Trim: ASME A112.18.1; cast brass body, chrome plated supply fitting, adjustable centers, grid strainer, vandal resistant water economy aerator with maximum 2.2 gpm flow, heavy duty 11" high rigid/swivel gooseneck, install gooseneck in rigid position, vandal resistant 6" elbow handle with red/blue color indicators.
 - C. Emergency Eye/Face Wash: ANSI Z358.1, chrome plated brass, single action swing down to activate, twin ABS soft flow 2.5 gpm spray heads, integral flip top dust covers, universal emergency eyewash sign.
 - D. Accessories: Chrome plated 17gauge brass P-trap and arm with escutcheon, screwdriver stop, flexible braided stainless steel supplies.
- 2.09 SINK (SK-6)
 - A. Accessories: Chrome plated 17gauge brass P-trap and arm with escutcheon, screwdriver stop and flexible braided stainless steel supplies.
- 2.10 LAUNDRY SINK (SK-7)
 - A. Floor Mounted Basin: 20" x 17" x 13" high, molded stone, floor mounted laundry sink, with 1-1/4 inch high back, drillings on 4 inch centers, 35 inch height from floor, rectangular basin.
 - B. Trim: ASME A112.18.1; cast brass body, chrome plated supply fitting, 4" centers, rear deck mount, and swivel serving spout.
 - C. Accessories: Chrome plated 17-gauge brass P-trap and arm with escutcheon, screwdriver stops and flexible braided stainless steel supplies.
- 2.11 SERVICE SINKS (SK-8)
 - A. Bowl: 24" x 24" x 10" high, white, molded stone, floor mounted, with one-inch wide shoulders, vinyl bumper guard, stainless steel strainer.
 - B. Trim: ASME A112.18.1 exposed wall type supply with lever handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges.
- C. Accessories: 5 feet of ½ inch diameter plain end reinforced rubber hose, hose hanger, bumper guard and mop hanger.\
- 2.12 SHOWER VALVE- ADA (SV-1)
 - A. ASME A112.18.1; ADA compliant, flush mounted shower assembly with lever handle, pressure balanced control valve, shower head, flexible hose shower head with vacuum breaker, wall supply elbow and wall bar.
- 2.13 SHOWER ADA (SH-1)
 - A. Cabinet: ANSI Z124.2 continuous cast acrylic reinforced with a fiberglass strand/polyester resin mix, 44" x 39" x 84" high, with integral receptor, soap dish, integral seat, removable chrome plated strainer, tailpiece, white color.
 - B. Trim: ASME A112.18.1; ADA compliant, flush mounted shower assembly with lever handle, pressure balanced control valve, shower head, flexible hose shower head with vacuum breaker, wall supply elbow and wall bar. One 16" x 27-3/4" x 1-1/2" diameter stainless steel wrap around grab bar secured to two walls. One 16" x 1-1/2" diameter stainless steel vertical grab bar. Vinyl curtain and stainless steel curtain rod.
- 2.14 SINGLE DRINKING FOUNTAIN (DF-1)
 - A. Exposed Fountain: ADA compliant, wall mounted, 18 gauge Type 304 stainless steel polished to satin finish, lead free waterway system, with elevated anti-squirt vandal resistant bubblers with flexible stream guard, in-line flow regulator, in-line strainer, vandal resistant front push button operation, bottom cover plate, wall plate, mounting plate, support carrier and screwdriver stop.
- 2.15 WASHING MACHINE VALVE BOX (WB-1)
 - A. 20 gauge steel rough-in box, white enamel finish, water tight construction with sloped bottom, with brass valves with single wheel handle, socket for 2 inch waste.
- 2.16 FLOOR DRAIN (FD-1 AND FD-2)
 - A. Floor Drain (FD-1): ANSI A1121.1; lacquered cast iron body, adjustable iron strainer head and grate, for wood floor installations and round, nickel bronze tractor grate. Provide trap primer connection.
 - B. Floor Drain (FD-2): ANSI A1121.1; lacquered cast iron body with 4" wide drainage flange, secondary flashing flange, weep holes and round, nickel bronze tractor grate. Provide trap primer connection.

2.17 HOSE BIBBS (HB-1)

A. Exterior: ANSI/ASSE 1019-B; IAPMO listed, exposed, non-freeze, chrome exterior finish, polished brass exterior finish, self-draining type, flush wall mounted, hardened stainless steel operating stem, one-piece valve plunger, hose thread spout, removable key and integral vacuum breaker.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.
- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide flexible supplies to fixtures with screwdriver stops, reducers and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall carriers and bolts.
- E. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07900, color to match fixture.
- F. Install fixtures penetrating roofed areas to maintain integrity of roof assembly.

3.04 INTERFACE WITH OTHER PRODUCTS

A. Review millwork shop-drawings. Confirm location and size of fixtures and openings before rough in and installation.

3.05 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.
- 3.06 CLEANING
 - A. Section 01780 Closeout Submittals.
 - B. Clean plumbing fixtures and equipment.
- 3.07 PROTECTION OF INSTALLED CONSTRUCTION
 - A. Do not permit use of fixtures before final acceptance.

SECTION 15485 HOT WATER GENERATORS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes commercial hot water generators.
- B. Related Sections:
 - 1. Division 16 Wiring Connections: Execution requirements for electric connections specified by this section.

1.02 SUBMITTALS

- A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
 - 1. Product Data: Submit dimensioned drawings of hot water generators indicating components and connections to other equipment and piping. Provide electrical characteristics and connection.
 - 2. Manufacturer's Installation Instructions: Submit mounting and support requirements.

1.03 CLOSEOUT SUBMITTALS

- A. Coordinate with Division 1.
- B. Operation and Maintenance Data: Submit replacement part numbers and availability.

1.04 QUALIFICATIONS

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

1.05 DELIVERY, STORAGE AND HANDLING

- A. Coordinate with Division 1.
- B. Accept hot water generators on site in original labeled cartons. Inspect for damage.

1.06 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.07 WARRANTY

- A. Coordinate with Division 1.
- B. Provide one year manufacturer warranty for hot water generator.

PART 2 - PRODUCTS

2.01 HOT WATER GENERATORS

- A. Manufacturers:
 - 1. Amtrol.
 - 2. SuperStor.
 - 3. Weil McLain.
 - 4. Approved Equal.
- B. Type: Indirect using boiler heating fluid, vertical storage.
- C. Storage Tank: Vertical tank, polyethylene or stainless steel water reservoir, thermally insulated with minimum of 1 inch polyurethane.
- D. Heat Exchanger: Double wall vented tube removable copper tube bundle.
- E. Accessories: Union at connections, ASME rated temperature and pressure relief valve, pressure gauge, temperature gauge.
- F. Controls: Closed well aquastat. Electronic control capable of selecting desired hot water temperature, digital readout of temperature.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install hot water generators in accordance with the manufacturer's requirements.
- B. Coordinate with plumbing piping, hydronic piping and electrical work to achieve operating system.

C. Seismically restrain units in accordance with International Building Code requirements.

SECTION 15510 HEATING BOILERS AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes boilers, controls and boiler trim, hot water connections, fuel burning system and connections and chimney connections.
- B. Related Sections:
 - 1. Section 15180 Hydronic Piping: Execution requirements for hot water and steam piping for piping connections to boilers specified by this section.
 - 2. Section 15190 Fuel Piping: Execution requirements for oil and gas piping connections to boilers specified by this section.
 - 3. Division 3 –Cast-In-Place: Execution requirements for concrete housekeeping pads specified by this section.
 - 4. Division 16 Wiring Connections: Execution requirements for electric connections to boilers specified by this section.

1.02 REFERENCES

- A. ASME SEC IV (American Society of Mechanical Engineers) Boiler and Pressure Vessels Code - Rules for Construction of Heating Boilers.
- B. HI (Hydronics Institute) Testing and Rating Standard for Cast Iron and Steel Heating Boilers.
- C. NEMA 250 (National Electrical Manufacturers Association) Enclosures for Electrical Equipment (1000 Volts Maximum).

1.03 SUBMITTALS

- A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
 - 1. Product Data: Submit general layout and dimensions. Include size and location of water, fuel, electric and vent connections, electrical characteristics, weight and mounting loads.
 - 2. Test Reports: Indicate specified performance and efficiency is met or exceeded. Provide combustion test that includes boiler firing rate, over fire draft, gas flow rate, heat input, burner manifold gas pressure, percent carbon monoxide (CO), percent oxygen (O), percent excess air,

flue gas temperature at outlet, ambient temperature, net stack temperature, percent stack loss, percent combustion efficiency and heat output.

- 3. Manufacturer's Installation Instructions: Submit assembly, support details, connection requirements and include start-up instructions.
- 4. Manufacturers Field Reports: Indicate condition of equipment after start-up including control settings and performance chart of control system.

1.04 CLOSEOUT SUBMITTALS

- A. Division 1 Closeout Submittals.
- B. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, cleaning procedures, replacement parts list and maintenance and repair data.

1.05 QUALITY ASSURANCE

- A. Conform to ASME SEC IV for construction of boilers. The boiler shall be registered with the National Board Of Boiler And Pressure Vessel Inspectors
- B. Conform to applicable code for internal wiring of factory wired equipment.
- C. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc.

1.06 QUALIFICATIONS

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

1.07 DELIVERY, STORAGE AND HANDLING

- A. Accept boilers and accessories on site in factory shipping packaging. Inspect for damage.
- B. Protect boilers from damage by leaving packing in place until installation.

1.08 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.09 WARRANTY

- A. Division 1 Closeout Submittals.
- B. Provide three year manufacturers limited warranty for boilers.

PART 2 - PRODUCTS

2.01 BOILERS

- A. Manufacturers:
 - 1. Energy Kinetics.
 - 2. Approved substitutions.
- B. Hot Water Boilers: Natural draft with insulated jacket, energy converter, oil burning system, controls and boiler trim.

2.02 HOT WATER BOILER TRIM

- A. Pre-piped system including ASME pressure relief valve, T&P gauge, low water cut-off with manual reset, high limit temperature controller with manual reset, cold start aquastat and reverse acting aquastat for protection against condensation.
- B. ASME rated pressure relief valve, 30 psig.
- C. Combination water pressure and temperature gage. Scale on pressure gage shall be graduated from 11/2 to 3 times the pressure relief valve set pressure
- D. Low water cut-off shall be automatic reset. One low water cut-off shall be manual reset.
- E. Operating temperature controller to maintain boiler water temperature.
- F. High limit temperature controller with manual reset for burner to prevent boiler water temperature from exceeding safe system temperature. Honeywell Model L4006E.

2.03 CAST IRON BOILER FUEL BURNING SYSTEM

- A. Burner Manufacturers:
 - 1. Carlin.
 - 2. Riello.
 - 3. Approved equal.

- B. Burner Operation: Adjustable firing rates.
- C. Oil Burner: PSC burner motor, primary with interrupted ignition, oil valve with primary pre-purge.
- D. Oil Burner Safety Controls: Energize burner motor and electric ignition, limit time for establishment of main flame, monitor flame continuously during burner operation and stop burner on flame failure with manual reset necessary, solenoid oil delay valve opens after burner motor energized and closes when de-energized
- E. Combustion Air Intake: Provide combustion air intake box.
- F. Controls: Pre-wired, factory assembled electronic controls in control cabinet with flame scanner or detector, programming control, relays and switches. Provide manual switch to allow standard boiler operating control of burner modulation.

2.04 BOILER PERFORMANCE

A. Performance rating shall be in accordance with HI - Testing and Rating Standard for Cast Iron and Steel Heating Boilers.

PART 3 - EXECUTION

3.01 INSTALLLATION

- A. Install in accordance with NFPA 31.
- B. Install boiler on stand or base, minimum 16 inches high and 6 inches larger on each side than boiler base.
- C. Provide connection of fuel oil piping in accordance with NFPA 31.
- D. Provide piping connections and accessories as indicated; refer to Sections 15120, 15140, 15180 and 15190.
- E. Pipe relief valves to glycol tank.
- F. Provide combustion air piping per manufacturer's requirements. Pipe combustion air from intake box to exterior with 3" PVC pipe up to 20 feet in length with up to (5) 90-degree elbows. Do not locate piping in front of the tank, air inlet piping must be disconnected to allow door to swing down.
- G. Provide for connection to electrical service. Refer to Division 16.

3.02 DEMONSTRATION AND TRAINING

A. Demonstrate operation and maintenance procedures.

SECTION 15550 BREECHING, CHIMNEYS AND STACKS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes manufactured double wall chimneys for fuel fired equipment.
- B. Related Sections:
 - 1. Section 15060 Hangers and Supports: Product requirements for hangers and supports for placement by this section.
 - 2. Section 15510 Heating Boiler and Accessories: Positive pressure chimney for forced draft boilers.

1.02 REFERENCES

- A. ASTM A167 Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
- B. NFPA 54 (ANSI Z223.1) (National Fire Protection Association) The National Fuel Gas Code.
- C. NFPA 211 (National Fire Protection Association) Standard for Chimneys, Fireplaces, Vents and Solid Fuel-Burning Appliances.
- D. UL 103 (Underwriters Laboratories, Inc.) Standard for Factory Built Low Heat Chimneys.
- E. UL 441 (Underwriters Laboratories, Inc.) Standard for Gas Vents.

1.03 DESIGN REQUIREMENTS

- A. Factory built vents and chimneys used for venting natural draft appliances shall comply with NFPA 211 and be UL listed and labeled.
- B. Design premanufactured metal chimneys for wind loading of 110 mph and seismic loads for Zone 4.

1.04 SUBMITTALS

A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:

- 1. Shop Drawings: Indicate general construction, dimensions, weights, sizes, support and layout of chimney systems. Submit layout drawings indicating plan view and elevations.
- 2. Manufacturer's Calculations: Submit manufacturer's calculations for chimney system sizing based on proposed system layout.
- 3. Product Data: Submit data indicating factory built chimneys, including dimensional details of components and flue caps, dimensions and weights, electrical characteristics and connection requirements
- 4. Manufacturer's Installation Instructions: Submit assembly, support details and connection requirements.

1.05 QUALIFICATIONS

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

1.06 ENVIRONMENTAL REQUIREMENTS

A. Maintain water integrity of roof during and after installation of chimney or vent.

1.07 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.08 WARRANTY

- A. Division 1 Closeout Submittals.
- B. Provide one year manufacturer warranty for all manufactured units.

PART 2 - PRODUCTS

- 2.01 POSITIVE PRESSURE CHIMNEY SYSTEM BOILERS
 - A. Manufacturers:
 - 1. Metalbestos.
 - 2. Ampco.
 - 3. Van Packer.

- 4. Approved Equal.
- B. Provide double wall metal stacks, tested to UL 103 and UL listed, for use with building heating equipment, in compliance with NFPA 211.
- C. Fabricate with 1-inch minimum, insulated space between walls. Construct inner jacket of 20 gauge ASTM A167 Type 304 stainless steel. Construct outer jacket of Type 304 stainless steel 24 gauge for sizes 10 inches to 24 inches and 20 gauge for sizes 28 inches to 48 inches.
- D. Accessories, UL labeled:
 - 1. Drain Tee: Provide drain tee with valved drain connection.
 - 2. Ventilated Roof Thimble: Consists of roof penetration assembly, support assembly, vent flashing with spacers and storm collar.
 - 3. Stack Cap: Consists of conical rain shield with inverted cone for partial rain protection with low flow resistance.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install venting and chimneys with minimum of joints. Align accurately at connections, with internal surfaces smooth.
- C. Support venting and chimneys from building structure, rigidly with suitable ties, braces, hangers and anchors to hold to shape and prevent buckling.
- D. Pitch venting and chimneys with positive slope up from fuel-fired equipment.
- E. Maintain UL listed minimum clearances from combustibles. Assemble pipe and accessories as required for complete installation.
- F. Clean vents and chimneys during installation, removing dust and debris.
- G. At appliances, provide slip joints permitting removal of appliances without removal or dismantling of venting and chimneys.
- H. Provide venting and chimney systems with drain tee with valved drain connection.
- I. Provide positive pressure chimney systems continuously from breeching collar connections.
- J. Venting and chimney systems with drain tee with valved drain connection.

K. Provide positive pressure chimney systems continuously from breeching collar connections.

SECTION 15760 TERMINAL HEATING UNITS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section baseboard, unit heaters and cabinet unit heaters.
- B. Related Sections:
 - 1. Section 15180 Hydronic Piping: Execution requirements for piping fittings and drains lines specified by this section.
 - 2. Division 16 Wiring Connections: Execution requirements for electric connection to units specified by this section.

1.02 REFERENCES

- A. ARI 410 (Air-Conditioning and Refrigeration Institute) Forced-Circulation Air-Cooling and Air-Heating Coils.
- B. SMACNA (Sheet Metal Air Conditioning Contractors' National Association) -HVAC Duct Construction Standards, Metal and Flexible.

1.03 SUBMITTALS

- A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
 - 1. Shop Drawings: Indicate cross sections of cabinets, grilles, bracing and reinforcing and typical elevations. Indicate schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers
 - 2. Product Data: Submit equipment data including performance, construction and electrical requirements.
 - 3. Manufacturer's Installation Instructions: Submit.

1.04 CLOSEOUT SUBMITTALS

- A. Division 1 Closeout Submittals.
- B. Project Record Documents: Record actual locations of components and locations of access doors in radiation cabinets required for access to valves.

C. Operation and Maintenance Data: Submit manufacturers descriptive literature, operating instructions, installation instructions, maintenance and repair data and parts listings.

1.05 QUALIFICATIONS

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

1.06 DELIVERY, STORAGE AND HANDLING

- A. Accept units on site in factory packing. Inspect for damage. Store under roof.
- B. Protect coil fins from crushing and bending by leaving in shipping cases until installation and by storing indoors. Protect coils from entry of dirt and debris with pipe caps or plugs.

1.07 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.08 WARRANTY

- A. Division 1 Closeout Submittals.
- B. Provide one year manufacturer's warranty for terminal heating units.

PART 2 - PRODUCTS

2.01 BASEBOARD RADIATION (BB-1)

- A. Manufacturers:
 - 1. Sterling.
 - 2. Embassy Industries
 - 3. Trane.
 - 4. Approved Equal.
- B. Heating Elements: 3/4 inch ID copper tubing mechanically expanded into flanged collars of evenly spaced aluminum fins, one tube end belled.

- C. Enclosure: Minimum 0.020 inch steel with 14inch high back and top of one piece; front panel, end panel, end caps, corners and joiner pieces to snap together, with front panel easily removable. Provide full-length damper.
- D. Finish: Factory applied baked enamel, color as selected by Architect.
- E. Element Brackets: 0.0516 inch galvanized steel to support from panel and noise free element cradle.
- F. Capacity: As scheduled, based on 65°F entering air temperature, 170°F average water temperature.

2.02 UNIT HEATERS

- A. Manufacturers:
 - 1. Modine.
 - 2. Trane.
 - 3. Sterling.
 - 4. Approved Equal.
- B. Coils: Seamless copper tubing, silver brazed to steel headers and with evenly spaced aluminum fins mechanically bonded to tubing.
- C. Casing: 0.0478-inch thick steel with threaded pipe connections for hanger rods.
- D. Finish: Factory applied baked enamel of color as selected by Architect.
- E. Fan: Direct drive propeller type, statically and dynamically balanced, with fan guard; horizontal models with permanently lubricated sleeve bearings.
- F. Air Outlet: Adjustable two-way louvers on horizontal throw models.
- G. Motor: Permanently lubricated sleeve bearings on horizontal models, grease lubricated ball bearings on vertical models.
- H. Control: Local disconnect switch.
- I. Capacity: As scheduled.

2.03 CABINET UNIT HEATERS

- A. Manufacturers:
 - 1. Modine.

- 2. Trane.
- 3. Embassy Industries.
- 4. Approved Equal.
- B. Coils: Evenly spaced aluminum fins mechanically bonded to copper tubes, designed for 100 psi and 220°F.
- C. Cabinet: 0.0598 inch thick steel with exposed corners and edges rounded, easily removed panels, glass fiber insulation and integral air outlet and inlet grilles.
- D. Finish: Factory applied baked enamel of color as selected by Architect on visible surfaces of enclosure or cabinet.
- E. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.
- F. Motor: Tap wound multiple speed permanent split capacitor with sleeve bearings, resiliently mounted.
- G. Control: Multiple speed switch, factory wired, located in cabinet.
- H. Filter: Easily removed 1 inch thick glass fiber throw-away type, located to filter air before coil.
- I. Capacity: As Scheduled.

PART 3 - EXECUTION

- 3.01 EXAMINATION
 - A. Division 1 Administrative Requirements.
 - B. Verify wall construction and ductwork are ready for installation.
 - C. Verify concealed blocking and supports are in place and connections are correctly located.

3.02 INSTALLATION

- A. Install equipment exposed to finished areas after walls and ceilings are finished and painted. Avoid damage.
- B. Protection: Provide finished cabinet units with protective covers during balance of construction.
- C. Baseboard Radiation: Locate on outside walls and run cover continuously wall-to-wall unless otherwise indicated. Center elements under windows.

Where multiple windows occur over units, divide element into equal segments centered under each window. Install end trim where units butt against walls.

- D. Unit Heaters: Hang from building structure, with pipe hangers anchored to building, not from piping. Seismically restrain units. Mount as high as possible to maintain greatest headroom unless otherwise indicated.
- E. Cabinet Unit Heaters: Install as indicated. Seismically restrain units. Coordinate to assure correct recess size for recessed units.

3.03 CLEANING

- A. Division 1 Closeout Submittals.
- B. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.
- C. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.
- D. Install new filters.

SECTION 15810 DUCTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes low pressure metal ductwork and duct accessoriers.
- B. Related Sections:
 - 1. Division 9 Painting: Execution requirements for Weld priming, paint or coating specified by this section.
 - 2. Section 15060 Hangers and Supports: Product requirements for hangers, supports and sleeves for placement by this section.

1.02 REFERENCES

- A. ASTM A36 Structural Steel.
- B. ASTM A90 Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.
- C. ASTM A525 General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
- D. ASTM A527 Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock Forming Quality.
- E. NFPA 90A (National Fire Protection Association) Installation of Air Conditioning and Ventilating Systems.
- F. SMACNA (Sheet Metal Air Conditioning Contractors' National Association) -HVAC Air Duct Leakage Test Manual.
- G. SMACNA (Sheet Metal Air Conditioning Contractors' National Association) -HVAC Duct Construction Standards - Metal and Flexible.
- H. UL 181 (Underwriters Laboratories, Inc.) Factory-Made Air Ducts and Connectors.
- I. NFPA 90A (National Fire Protection Association) Installation of Air Conditioning and Ventilating Systems.
- J. UL 33 (Underwriters Laboratories, Inc.) Heat Responsive Links for Fire-Protection Service.
- K. UL 555 (Underwriters Laboratories, Inc.) Fire Dampers and Ceiling Dampers.

1.03 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes other than those of equivalent or lower loss coefficient is permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.04 SUBMITTALS

- A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
 - 1. Shop Drawings: Indicate duct fittings, gages, sizes, welds and configuration for medium pressure vehicle exhaust systems.
 - 2. Product Data: Submit data for duct materials, duct connectors, flexible duct.

1.05 CLOSEOUT SUBMITTALS

- A. Division 1 Closeout Submittals.
- B. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with SMACNA HVAC Duct Construction Standards Metal and flexible.
- B. Construct ductwork to NFPA 90A standards.

1.07 QUALIFICATIONS

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

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Do not install duct sealant when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures during and after installation of duct sealant.

1.09 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 - PRODUCTS

2.01 DUCT MATERIALS

- A. Galvanized Steel Ducts: ASTM A525 and ASTM A527 galvanized steel sheet, lock-forming quality, having zinc coating of in conformance with ASTM A90.
- B. Fasteners: Rivets, bolts, or sheet metal screws.
- C. Hanger Rod: ASTM A36; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.
- 2.02 LOW PRESSURE DUCTWORK FABRICATION
 - A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible and as indicated. Provide duct material, gages, reinforcing and sealing for operating pressures indicated.
 - B. Construct T's, bends and elbows with minimum radius 1-1/2 times centerline duct width. Where not possible and where rectangular elbows are used, provide airfoil turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.
 - C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
 - D. Provide standard 45-degree lateral wye takeoffs unless otherwise indicated where 90-degree conical tee connections may be used.

2.03 VOLUME CONTROL DAMPERS.

- A. Manufacturers:
 - 1. Ruskin.
 - 2. Greenheck.
 - 3. Louvers and Dampers Inc..
 - 4. Approved Equal.
- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible and as indicated.

- C. End Bearings: Except in round ductwork 12 inches and smaller, provide end bearings.
- 2.04 FIRE DAMPERS
 - A. Manufacturers:
 - 1. Ruskin.
 - 2. Pottoroff.
 - 3. Greenheck.
 - 4. Approved Equal.
 - B. Provide in accordance with NFPA 90A and UL 555 and manufacturer's condition of listing. Dampers shall be permanently marked for use in dynamic systems.
 - C. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for closure under airflow conditions. Configure with blades out of air stream except for 1.0-inch pressure class ducts up to 12 inches in height.
 - D. Fusible Links: UL 33, separate at 160°F with adjustable link straps for combination fire/balancing dampers.

PART 3 - EXECUTION

- 3.01 EXAMINATION
 - A. Verify sizes of equipment connections before fabricating transitions.

3.02 INSTALLATION

- A. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible.
- B. Verify rated walls are ready for fire damper installation.
- C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- D. Use double nuts and lock washers on threaded rod supports.
- E. Provide back-draft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

- F. Provide duct access doors for inspection and cleaning of automatic dampers, duct coils, fire dampers and elsewhere as indicated. Provide duct access doors for inspection and adjustment of backdraft dampers. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access and as indicated. Review locations prior to fabrication.
- G. Provide duct test holes where indicated and required for testing and balancing purposes.
- H. Provide fire dampers at locations indicated on contract drawings. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- I. Install fire dampers in accordance with their listing.

3.03 INTERFACE WITH OTHER PRODUCTS

A. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide Pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

SECTION 15830 FANS

PART 1 - GENERAL

- 1.01 SUMMARY
 - A. Section Includes:
 - 1. Ceiling Exhaust.
 - 2. Packaged Heat Recovery Ventilators.
 - 3. Motors.
 - 4. Drives.
 - 5. Accessories.
 - B. Related Sections:
 - 1. Section 15080 Mechanical Insulation: Product requirements for power ventilators for placement by this section.
 - 2. Section 15810 Ducts: Product requirements for hangers for placement by this section.
 - 3. Section 16150 Wiring Connections: Execution and product requirements for connecting equipment specified by this section.

1.02 REFERENCES

- A. ABMA STD 9 (American Boiler Manufacturers Association) Load Ratings and Fatigue Life for Ball Bearings.
- B. AMCA 99 (Air Movement and Control Association) Standards Handbook.
- C. AMCA 210 (Air Movement and Control Association) Laboratory Methods of Testing Fans for Rating.
- D. AMCA 300 (Air Movement and Control Association) Reverberant Room Method for Sound Testing of Fans.
- E. AMCA 301 (Air Movement and Control Association) Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
- 1.03 SUBMITTALS

- A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
 - 1. Shop Drawings: Indicate size and configuration of fan assembly, mountings, weights, ductwork and accessory connections.
 - 2. Product Data: Submit data on all fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity and electrical characteristics and connection requirements.
 - 3. Manufacturer's Installation Instructions: Submit fan manufacturers instructions.

1.04 CLOSEOUT SUBMITTALS

- A. Division 1 Closeout Submittals.
- B. Operation and Maintenance Data: Submit instructions for lubrication, motor and drive replacement, spare parts list and wiring diagrams.

1.05 QUALIFICATIONS

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

1.06 DELIVERY, STORAGE AND HANDLING

A. Protect motors, shafts and bearings from weather and construction dust.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Do not operate fans for any purpose until ductwork is clean, filters in place, bearings lubricated and fan has been test run under observation.

1.08 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.09 WARRANTY

A. Division 1 – Closeout Submittals.

- B. Provide one year manufacturer warranty for fans.
- C. Furnish heat recovery ventilators with warranty as follows:
 - 1. Two year warranty on all parts not including heat recovery cores.
 - 2. Heat recovery cores shall have 15 year unconditional warranty.

1.10 EXTRA MATERIALS

A. Supply one set of belts for each fan.

PART 2 - PRODUCTS

2.01 CEILING EXHAUST FANS

- A. Manufacturers:
 - 1. Greenheck.
 - 2. ACME.
 - 3. Cook.
 - 4. Penn.
 - 5. Approved Equal.
- B. Construction:
 - 1. Centrifugal Fan Unit: Direct driven with galvanized steel housing, resilient mounted motor, wall cap with gravity back-draft damper.
 - 2. Disconnect Switch: Cord and plug in housing for thermal overload protected motor and wall mounted switch.
 - 3. Grille: Molded white plastic.

2.02 HEAT RECOVERY VENTILATORS

- A. Manufacturers:
 - 1. Lifebreath.
 - 2. Approved Equal.
- B. General: Furnish and install a heat recovery ventilator as indicated on the drawings. Unit shall be factory assembled, tested, and shipped as a complete, packaged assembly, for indoor mounting, consisting of the following:

- 1. Dual aluminum heat exchangers.
- 2. Supply and exhaust centrifugal blowers
- 3. Washable filters
- 4. Electronic control system
- C. Cabinet: Unit casing shall be of 20 gauge, pre-painted steel lined with foilfaced fiberglass insulation. Vibration Isolators shall be provided for the unit and installed by the Contractor.
- D. Heat Exchangers: Unit shall have dual modular aluminum plate heat exchanger cores, corrosion resistant.
- E. Blowers: Blowers shall be centrifugal, forward-curved and shall have permanently lubricated bearings. Separate blower shall be provided for supply and exhaust air.
- F. Motors: Motors shall be direct drive held in rubber isolated mounts for vibration control, multiple speed controls.
- G. Filter: Unit shall have washable air filters in both supply and exhaust air streams.
- H. Electronic Control System: Electronic programmable controller featuring 7day, 24-hour programming, digital dehumidistat, built-in air quality sensor, defrost mode, digital display and status lights, remote digital electronic 20/40/60 minute timers.

PART 3 - EXECUTION

- 3.01 INSTALLATION
 - A. Install in accordance with manufacturer's instructions.
 - B. Install fans with resilient mountings and flexible electrical leads.
 - C. Provide sheaves required for final air balance.
 - D. Provide safety screen where inlet or outlet is exposed.
 - E. Provide backdraft dampers on discharge of exhaust fans or as indicated; refer to Section 15820.
 - F. Do not operate fans in normal operation until ductwork is clean, filters are in place, bearings are lubricated and fan has been test run under observation.

SECTION 15850 AIR OUTLETS AND INLETS

PART 1 - GENERAL

- 1.01 SUMMARY
 - A. Section includes diffusers and registers/grilles.
 - B. Related Sections:
 - 1. Division 9 Painting: Execution and product requirements for Painting of ductwork visible behind outlets and inlets specified by this section.
 - 2. Section 15810 Ducts: Ductwork associated with air outlets and inlets.

1.02 REFERENCES

- A. ADC 1062 (Air Diffusion Council) Certification, Rating and Test Manual.
- B. AMCA 500 (Air Movement and Control Association) Test Method for Louvers, Dampers and Shutters.
- C. ASHRAE 70 (American Society of Heating, Refrigerating and Air Conditioning Engineers) Method of Testing for Rating the Airflow Performance of Outlets and Inlets.
- D. SMACNA (Sheet Metal and Air Conditioning Contractors' National Association) - HVAC Duct Construction Standard - Metal and Flexible.

1.03 SUBMITTALS

- A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
 - 1. Product Data: Submit data outlets and inlets sizes, finish, performance and type of mounting.

1.04 CLOSEOUT SUBMITTALS

- A. Division 1 Closeout Submittals.
- B. Project Record Documents: Record actual locations of air outlets and inlets.
- 1.05 QUALIFICATIONS

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

1.06 WARRANTY

- A. Division 1 Closeout Submittals.
- B. Provide one year manufacturer warranty for air outlets and inlets.

PART 2 - PRODUCTS

- 2.01 MANUFACTURERS GRILLES, REGISTERS, DIFFUSERS
 - A. Manufacturers:
 - 1. Titus.
 - 2. Lifebreath.
 - 3. Kreuger.
 - 4. Approved Equal.

2.02 CEILING DIFFUSERS

A. Type: round plastic, multi-core diffuser to discharge air in 360 degree pattern, adjustable cone to allow variable ventilation flow.

2.03 BASEBOARD CABINETRY GRILLES

- A. Type: Extruded aluminum blades with 0 degree deflection, 7/32 inch bars on 7/16 inch centers.
- B. Frame: Extruded aluminum mounting frame with countersunk screw mounting.
- C. Fabrication: Aluminum extrusions with factory clear lacquer finish.

2.04 DOOR GRILLES

- A. Type: Sight proof, 77° inverted V-shaped louvers of 0.04" extruded aluminum, 1-1/4 inch deep on 1/2 inch centers. Blades parallel to long dimension.
- B. Frame: 20 gage steel, 1-1/4" border width, with auxiliary frame with countersunk screw holes to give finished appearance on both sides of door, with factory baked acrylic white finish.

PART 3 - EXECUTION

- 3.01 EXAMINATION
 - A. Verify inlet/outlet locations.
 - B. Verify ceiling and wall systems are ready for installation.

3.02 INSTALLATION

- A. Install diffusers to ductwork with airtight connection.
- B. Provide balancing dampers on duct take-off to diffusers and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.
- C. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09900.
- 3.03 INTERFACE WITH OTHER PRODUCTS
 - A. Check location of outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry and lighting arrangement.

SECTION 15905 INSTRUMENTATION AND CONTROL ELEMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes thermostats, control valves, automatic dampers, damper operators and miscellaneous accessories.
- B. Related Sections:
 - 1. Section 15010 Basic Mechanical Requirements.
 - 2. Section 15180 Hydronic Piping: Installation of control valves, flow switches, temperature sensor sockets, gage taps.
 - 3. Section 15810 Ducts: Installation of automatic dampers.
 - 4. Division 16 Electrical.

1.02 REFERENCES

- A. AMCA 500 Test Methods for Louvers, Dampers and Shutters.
- B. NEMA DC 3 Low-Voltage Room Thermostats.
- C. NFPA 70 National Electrical Code.
- D. NFPA 90A Installation of Air Conditioning and Ventilation Systems.

1.03 SUBMITTALS

- A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
 - 1. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.
 - 2. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams and written detailed operational description of sequences. Submit schedule of valves indicating size, flow and pressure drop for each valve. For automatic dampers indicate arrangement, velocities and static pressure drops for each system.
 - 3. Manufacturer's Instructions: Provide for all manufactured components.

1.04 CLOSEOUT SUBMITTALS

- A. Division 1 Closeout Submittals.
- B. Project Record Documents: Record actual locations of control components, including thermostats and sensors.
- C. Revise shop drawings to reflect actual installation and operating sequences.
- D. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials and calibration tolerances.
- E. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owners name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and factory trained by manufacturer

1.06 REGULATORY REQUIREMENTS

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

1.07 WARRANTY

- A. Division 1 Closeout Submittals.
- B. Correct defective Work within a one year period after Substantial Completion.

PART 2 - PRODUCTS

- 2.01 MANUFACTURERS
 - A. Siemens.
 - B. Honeywell.
 - C. Approved equal.

2.02 CONTROL VALVES

- A. Globe Pattern:
 - 1. Up to 2 inches: Bronze body, bronze trim, rising stem, renewable composition disc, screwed ends.
 - 2. Over 2 inches: Iron body, bronze trim, rising stem, plug-type disc, flanged ends, renewable seat and disc.
 - 3. Hydronic Systems:
 - a. Rate for service pressure of 125 psig at 250°F.
 - b. Replaceable plugs and seats of brass.
 - c. Size for 3 psig maximum pressure drop at design flow rate.
 - d. Two way valves shall have equal percentage characteristics, three way valves linear characteristics. Size two way valve operators to close valves against pump shut off head.
- B. Electronic Operators:
 - 1. Valves shall spring return to normal position (full heat).
 - 2. Select operator for full shut off at maximum pump differential pressure.
- C. Radiation Valves:
 - 1. Bronze body, bronze trim, 2 or 3 port as indicated, replaceable plugs and seats, union and threaded ends.
 - 2. Rate for service pressure of 125 psig at 250°F.
 - 3. Size for 3 psig maximum pressure drop at design flow rate.
 - 4. Two way valves shall have equal percentage characteristics, three way valves linear characteristics. Size two way valve operators to close valves against pump shut off head.
 - 5. Operators (Modulating): Self contained, linear motorized actuator with approximately 3/4 inch stroke, 60 second full travel with transformer and SPDT contacts: 24 v DC, 6 watt maximum input.

2.03 INPUT/OUTPUT SENSORS

- A. Temperature:
 - 1. Resistance temperature detectors with resistance tolerance of plus or minus 0.1 percent at 70°F, interchangeability less than plus or minus 0.2

percent, time constant of 13 seconds maximum for fluids and 200 seconds maximum for air.

- 2. Measuring current maximum 5 mA with maximum self-heat of 0.031°F/mW in fluids and 0.014°F/mW in air.
- 3. Provide 3 lead wires and shield for input bridge circuit.
- 4. Use insertion elements in ducts not affected by temperature stratification or smaller than one square meter. Use averaging elements where larger or prone to stratification sensor length 8 feet or 16 feet as required.
- 5. Insertion elements for liquids shall be with brass socket with minimum insertion length of 2-1/2 inches.
- 6. Outside air sensors: Watertight inlet fitting, shielded from direct rays of sun.

2.04 THERMOSTATS

- A. Electric Room Thermostats:
 - 1. Type: NEMA DC 3, 24 volts, with setback/setup temperature control.
 - 2. Service: heating only or cooling and heating as required.
 - 3. Covers: Locking with set point adjustment, setpoint indication, with thermometer.
- B. Line Voltage Thermostats:
 - 1. Integral manual On/Off/Auto selector switch, single or two pole as required.
 - 2. Dead band: Maximum 2°F.
 - 3. Cover: Locking with set point adjustment, setpoint indication, with thermometer.
 - 4. Rating: Motor load.
- C. Room Thermostat Accessories:
 - 1. Insulating Bases: For thermostats located on exterior walls.
 - 2. Adjusting Key: As required for device.
 - 3. Thermostat Guards: Locking transparent plastic mounted on separate base.
- D. Immersion Thermostat:
 - 1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint and adjustable throttling range.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that systems are ready to receive work.
- B. Beginning of installation means installer accepts existing conditions.
- C. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.
- D. Coordinate installation of system components with installation of mechanical systems equipment.
- E. Ensure installation components are complementary to installation of similar components.
- F. Coordinate installation of system components with installation of mechanical systems equipment.

3.02 INSTALLATION

- A. Install in accordance with manufacturers instructions.
- B. Check and verify location of thermostats and other exposed control sensors with plans and room details before installation. Locate 48 inches above floor. Align with lighting switches.
- C. Mount freeze protection thermostats using flanges and element holders.
- D. Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.
- E. Provide separable sockets for liquids and flanges for air bulb elements.
- F. Provide valves with position indicators where sequenced with other controls.
- G. Provide conduit and electrical wiring in accordance with Division 16. Electrical material and installation shall be in accordance with appropriate requirements of Division 16.

SECTION 15950 TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes testing, adjusting and balancing of air systems, testing, adjusting and balancing of hydronic systems and measurement of final operating condition of HVAC systems.

1.02 REFERENCES

- A. AABC (Associated Air Balance Council) National Standards for Total System Balance.
- B. ASHRAE 111 (American Society of Heating, Refrigerating and Air-Conditioning Engineers) - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-conditioning and Refrigeration Systems.
- C. NEBB (National Environmental Balancing Bureau) Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems.

1.03 SUBMITTALS

- A. Submittal Requirements: In addition to submittal procedures as outlined under Division 1, mechanical submittals shall be submitted as follows:
 - 1. Test Reports: Indicate data on AABC, NEBB, or Contractors standard forms.
 - 2. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting and balancing of systems and equipment to achieve specified performance.
 - 3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect/Engineer and for inclusion in operating and maintenance manuals.
 - 4. Provide reports in hard cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side.

1.04 CLOSEOUT SUBMITTALS

A. Division 1 – Closeout Submittals.

B. Project Record Documents: Record actual locations of balancing valves and rough setting.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance or NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

1.06 QUALIFICATIONS

- A. Agency: Company specializing in the testing, adjusting and balancing of systems specified in this section with minimum three years documented experience certified by AABC or NEBB. Company shall maintain an office and staffing within 100 miles of project site.
- B. Perform Work under supervision of an AABC Certified Test and Balance Engineer, NEBB Certified Testing, Balancing and Adjusting Supervisor or registered professional engineer experienced in performance of this Work and licensed in the State of Alaska.

1.07 SEQUENCING

A. Sequence balancing between completion of systems tested and Date of Substantial Completion.

PART 2 - PRODUCTS Not used.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 5. Duct systems are clean of debris.

- 6. Fans are rotating correctly.
- 7. Diffuser cones are in place and open.
- 8. Air outlets are installed and connected.
- 9. Duct system leakage is minimized.
- 10. Hydronic systems are flushed, filled and vented.
- 11. Pumps are rotating correctly.
- 12. Proper strainer baskets are clean and in place or in normal position.
- 13. Service and balance valves are open.
- B. Submit field reports. Report defects and deficiencies noted during performance of services, which prevent system balance.

3.02 PREPARATION

A. Provide instruments required for testing, adjusting and balancing operations. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

3.03 INSTALLATION TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 10 percent of design.
- B. Air Outlets and Inlets: Adjust total space to within plus 10 percent and minus 5 percent of design. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
- C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.04 ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes and restoring thermostats to specified settings.

E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

3.05 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return and exhaust air quantities at site altitude.
- B. Make air quantity measurements in main ducts by pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts.
- E. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels.
- F. Provide written record with required and actual air quantities recorded at each outlet or inlet.
- G. Measure static air pressure conditions on air supply units, including filter and coil pressure drops and total pressure across the fan. Make allowances for 50 percent loading of filters.
- H. Measure temperature conditions across outside air, return air and exhaust dampers to check leakage.

3.06 WATER SYSTEM PROCEDURE

- A. Adjust water systems, after air balancing, to provide design quantities.
- B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow-metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
- C. Adjust systems to provide specified flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- D. Effect system balance with automatic control valves fully open or in normal position to heat transfer elements.
- E. Effect adjustment of water distribution systems by means of balancing valves. Do not use service or shut-off valves for balancing.

F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.07 SCHEDULES

- A. Equipment Requiring Testing, Adjusting and Balancing
 - 1. Plumbing Pumps
 - 2. HVAC Pumps
 - 3. Terminal Heat Transfer Units
 - 4. Heat Recovery Ventilators
 - 5. Fans
 - 6. Air Inlets and Outlets
- B. Report Forms
 - 1. Title Page:
 - a. Name of Testing, Adjusting and Balancing Agency
 - b. Address of Testing, Adjusting and Balancing Agency
 - c. Telephone and facsimile numbers of Testing, Adjusting and Balancing Agency
 - d. Project name
 - e. Project location
 - f. Project Architect
 - g. Project Engineer
 - h. Project Contractor
 - i. Project altitude
 - j. Report date
 - 2. Summary Comments:
 - a. Design versus final performance
 - b. Notable characteristics of system

- c. Description of systems operation sequence
- d. Summary of outdoor and exhaust flows to indicate amount of building pressurization
- e. Nomenclature used throughout report
- f. Test conditions
- 3. Instrument List:
 - a. Instrument
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Range
 - f. Calibration date
- 4. Electric Motors:
 - a. Manufacturer
 - b. Model/Frame
 - c. HP/BHP and kW
 - d. Phase, voltage, amperage; nameplate, actual, no load
 - e. RPM
 - f. Service factor
 - g. Starter size, rating, heater elements
 - h. Sheave Make/Size/Bore
- 5. V-Belt Drive:
 - a. Identification/location
 - b. Required driven RPM
 - c. Driven sheave, diameter and RPM
 - d. Belt, size and quantity
 - e. Motor sheave diameter and RPM

- f. Center to center distance, maximum, minimum and actual
- 6. Pump Data:
 - a. Identification/number
 - b. Manufacturer
 - c. Size/model
 - d. Impeller
 - e. Service
 - f. Design flow rate, pressure drop, BHP and kW
 - g. Actual flow rate, pressure drop, BHP and kW
 - h. Discharge pressure
 - i. Suction pressure
 - j. Total operating head pressure
 - k. Shut off, discharge and suction pressures
 - I. Shut off, total head pressure
- 7. Heat Recovery Ventilator
 - a. Location
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Arrangement/Class/Discharge
 - f. Air flow, specified and actual
 - g. Return air flow, specified and actual
 - h. Outside air flow, specified and actual
 - i. Total static pressure (total external), specified and actual
 - j. Inlet pressure
 - k. Discharge pressure

- I. Sheave Make/Size/Bore
- m. Number of Belts/Make/Size
- n. Fan RPM
- 8. Fan Data:
 - a. Location
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Air flow, specified and actual
 - f. Total static pressure (total external), specified and actual
 - g. Inlet pressure
 - h. Discharge pressure
 - i. Sheave Make/Size/Bore
 - j. Number of Belts/Make/Size
 - k. Fan RPM
- 9. Grille, Register, Diffuser Test Sheet:
 - a. GRD number
 - b. Room number/location
 - c. GRD type
 - d. GRD size
 - e. Area factor
 - f. Design velocity
 - g. Design air flow
 - h. Test (final) velocity
 - i. Test (final) air flow
 - j. Percent of design air flow

DIVISION 16 - ELECTRICAL

- 16010 Electrical General Provisions
- 16060 Grounding
- 16070 Electrical hangars and Supports
- 16075 Electrical Identification
- 16120 Wire and Cable
- 16130 Raceway and Boxes
- 16140 Wiring Devices
- 16141 Floor Boxes
- 16411 Enclosed Switches
- 16415 Underground Electrical Service
- 16442 Panelboards
- 16510 Lighting
- 16612 Fire and Security
- 16745 Telecommunication
- 16950 Electrical Testing

SECTION 16010 ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes general requirements for electrical installation and is applicable to all Division 16 Sections.

1.02 SCOPE OF WORK

- A. Provide all labor, equipment, materials, and services required for a complete installation, testing, and startup of all systems denoted on the plans and specifications.
- B. Bring questionable or obscure items, apparent conflicts between plans, specifications, governing codes or utilities regulations to the attention of the Project Manager in writing using the standard Request for Information (RFI) Format.
- C. Verify existing and local conditions affecting the electrical work prior to bid and commencement of project.
- D. Coordinate all work with the Project Manager, including but not limited to, electrical data, building security and fire alarm control panel. Provide and install all equipment according to all applicable requirements.

1.03 ELECTRICAL DRAWINGS AND SYMBOLS

- A. Electrical drawings are diagrammatic and are not intended to show all features of work. However, the Contractor shall provide products necessary for a complete and operable system in accordance with the NEC, EIA/TIA, NFPA 72, NFPA 101, IBC, and all state and local amendments.
- B. Install un-dimensioned electrical items in a manner to provide symmetrical appearance. Do not scale drawings for equipment location. Review architectural, structural and mechanical drawings for locations. Adjust work to conform to actual conditions.
- C. The drawings and specifications are complementary. Refer to specifications for description outlining products to be provided.
- D. Drawing symbols used for basic materials, equipment, etc., are denoted by industry standard symbols. Special items are denoted by symbol legend or called out on the drawings or specification.

1.04 DEFINITIONS

- A. "BASIS OF DESIGN" Particular specialized products around which a system was designed. In such cases, the products specified may be critical with regard to physical sizes and performance characteristics. Where variations or substitutions to products are made, the Contractor is solely responsible for resolving all impacts of such a deviation. Approval of a substitution and/or variation request does not relieve the Contractor of responsibility for complying with the design intent.
- B. "CALL OUT" Products specifically denoted by manufacturer's model and part number, or referenced standards listed on the drawings without further specification. In these cases the Contractor shall provide the products and/or perform in accordance with the references listed.
- C. "DATA" Telecommunication CAT 5e equipment.
- D. "EQUAL" A product, system or installation which:
 - 1. Meets or exceeds all ratings, performance characteristics, standard features and denoted options of specified item.
 - 2. Includes primary characteristics identified in the drawings and specifications.
 - 3. Complies with requirements similar to the "Basis of Design."
 - 4. Is produced by a manufacturer specifically listed as an acceptable manufacturer on the drawings, or in the specifications.
 - 5. Is acceptable and approved to the Architect/Engineer specifically addressed in writing.
- E. "EXPOSED" Exposed to view after construction is completed.
- F. "FURNISH" Purchase materials as shown and specified. Deliver to project site at location shown to be installed by supporting crafts.
- G. "INSTALL" Set in place and connect equipment furnished by others for a complete and ready to use installation.
- H. "PRODUCT" Term which includes materials, equipment, fixtures, and devices for any tangible item used on the project.
- I. "PROVIDE" Furnish all products, equipment, subcontracts, labor, testing, etc., required and install for a complete ready to use installation.
- J. "SHOP DRAWING" Detailed, dimensioned working construction drawing drawn to a particular scale adequately showing installation intent, details and coordination of interrelated trades.
- K. "SUBSTITUTION" A product, system or installation which is not listed as an acceptable manufacturer, but the Contractor warrants meets or exceeds

specified equipment denoted in the contract documents. Approval through submittal process is required to establish product or system is "equal".

- L. "WIRING" Electrical conductors, raceway, devices, connections and associated accessories, or any combination of labor and material thereof in order to provide a complete and operable system.
- M. "WEATHERPROOF" Electrical equipment noted as weatherproof or "WP" shall be provided with rain tight enclosures or device plates as applicable.

1.05 COORDINATION

- A. Exposed Raceways and Cables where specifically allowed shall be routed in such a manner agreeable to the Architect. Coordinate all such work prior to installation.
- B. Coordinate the work specified in this Division under the provisions of Division 1.
- C. Prepare shop drawings showing proposed rearrangement of work to meet job conditions, including changes to work specified under other sections. Obtain permission of Architect/Engineer before proceeding.
- D. At each switchboard, panel board and electrical device that requires working clearance by the NEC the contractor shall arrange equipment to provide adequate clearance including rearrangement of such equipment to optimize actual field conditions. The Contractor shall monitor the work of all trades to assure that the space and clearance requirements of the code are met.
- E. The horsepower and wattage of equipment denoted on the drawings are estimated requirements of equipment furnished under other divisions of this contract. Advise the Architect/Engineer of any equipment changes or substitutions affecting the electrical system. Coordinate overload elements to match actual equipment nameplates.
- F. Obtain written permission from Architect/Engineer prior to cutting, drilling or weakening structural components.

1.06 PAINTING AND REPAIR

- A. All building materials, equipment and existing furniture damaged during the installation of the work must be repaired or replaced with materials in like kind and quality of the original by skilled labor experienced in that particular building trade.
- B. Items scratched or marred in shipment or installation shall be refinished with touchup paint selected to match installed equipment finish.

1.07 CODES AND STANDARDS

- A. Codes: Perform all work in accordance with all latest legally enacted editions of National, State and Local codes including:
 - 1. NFPA 70 National Electrical Code (NEC).
 - 2. NFPA 72 and 101 Fire Alarm Design and Installation Requirements.
 - 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.

1.08 SUBMITTALS

- A. Provide submittals for products or systems specified by call out, equipment list items shown on the drawings and products or systems described in Division 16 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 for which material is being submitted. Provide additional tabs at the end for equipment called out on drawings, according to equipment name, type or equipment number.

- d. Material and tabs in the 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, addresses, nearest supplier addresses and phone number.
 - b. Equipment designation and/or model number.
 - c. Submit catalog cuts, printed product data, pamphlets and specification sheets.
 - d. Rough-in data and dimensional aspects.
 - e. Operational features, included options and characteristics.
 - f. Wiring diagrams.
 - g. All equipment characteristics required to verify short-circuit interrupting ratings as specified.
 - h. Shop drawings.
 - i. Documentation denoting equipment is listed by a third party testing organization acceptable to the authority having jurisdiction.
 - j. All proposed substitutions and deviations from the products or systems specified shall be denoted as such at the beginning of each section. Each deviation shall be specifically itemized for comparison to specified equipment. Submittal approval does not include any deviations not specifically itemized. Substitution submittal approval does not relieve the Contractor of responsibility for complying with design intent. Unapproved products or installation deviations shall be corrected as described by the Project Manager.
 - k. Delete all extraneous material data from submittal which does not apply to equipment specified and/or highlight the specific items which are being submitted on.
- B. Submittal review is for general design criteria and does not relieve the Contractor from any of the contract requirements. Partial submittals will be reviewed in the following categories:
 - 1. Systems Fire Alarm, Security
 - 2. Disconnects, Switchgear, Panels and Transformers
 - 3. Lighting

- 4. Raceways, Fittings, Supports, Wire, Cable and Wiring Devices
- 5. Telecommunication Equipment, Devices, Cable.

Submittals not conforming to these requirements will be returned for correction, without review.

1.09 QUALITY ASSURANCE

- A. Workmanship is considered important and is subject to approval. Employ workmen skilled in the trade and familiar with particular techniques applicable to various sections of work.
- B. Materials shall conform to applicable industry standards, and Underwriters Laboratories standards. Whenever possible, similar items shall be supplied by the same manufacturer throughout the project.

1.10 RECORD DRAWINGS

- A. Contractor shall maintain one set of electrical drawings and specifications of the most current issue on the job site and progressively record thereon any change in installation from that indicated on the drawings. Final approval will be withheld until drawings marked in a satisfactory manner are delivered to the Engineer.
 - 1. Mark record drawings with red pencil the actual installation which varies from the work originally shown.
 - 2. Include addendum and revisions items made during construction.
 - 3. Erase, white out or "X-out" to clearly convey as actual " as constructed" condition.
- B. Transmit the record drawing set to the Architect/Engineer at the completion of the work.

1.11 EQUIPMENT SCHEDULES

A. Fixture and equipment schedules on the drawings denoting capacities, ratings, sizes, etc., shown are the minimum acceptable and may not necessarily correspond with catalog ratings or equipment specified.

1.12 DEMONSTRATION OF ELECTRICAL SYSTEM

A. During final inspection, conduct an operating test for approval by Architect/Engineer. Demonstrate installation of the contract documents. Should any portion of the installation fail to meet requirements of Contract Documents, repair or replace items failing to meet requirements until items can be demonstrated to comply. Have instruments available for measuring voltage and current values, and for demonstration of continuity, grounds or open circuit conditions. Have personnel available to take measurements and make tests.

B. Furnish assistant to Architect/Engineer for inspection at any time, as requested, to remove covers, operate machinery, perform continuity tests, and as necessary to demonstrate quality and adequacy.

1.13 PROJECT CLOSE OUT

- A. Electrical Inspection Provide Owner with Certificate of Occupancy signed by the Inspector having jurisdiction.
- B. Test all equipment as required in Section 16950 Testing.
- C. Clean-Up Leave project completely free of debris resulting from electrical work, and leave all electrical items clean.

1.14 WARRANTY

- A. As required in the general conditions of the contract.
- B. All workmanship, labor and materials shall be warranted for a minimum period of one (1) year 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 by the Contractor promptly after written notice from the owner outlining the deficiency. This requirement shall survive the acceptance of the work under this Contract and termination of the contract.

1.15 OPERATION AND MAINTENANCE MANUALS

- A. Submittals shall comply with provisions of Division 1 and this section. Submit
 (3) copies of the manual no later than five (5) working days prior to final inspection.
- B. Manuals shall be assembled in three-ring binders. Binders shall be 3" thick or less, and more than one binder shall be used for each set of data if required to prevent overfilling. All information shall be arranged in the same order as the specifications, by equipment list item and by specific drawing call out as applicable, each section to identify equipment and specification number with a heavy paper divider with a protruding tab and label. The first section shall be the index. Shop drawings which are larger than 8-1/2" x 11" shall be individually folded so they are 8-1/2" x 11" or less and inserted behind the appropriate tabs.
- C. Provide the following items as applicable for each product or system:

- 1. Provide manufacturer's catalog cuts, brochures and descriptive literature. Highlight all applicable data or mark out information not applicable.
- 2. Narrative/diagrams required describing procedures for start-up, operation, emergency operation and shutting down of each system. If a particular sequence is required for operation, provide step by step instructions in chronological order.
- 3. Outline seasonal adjustments required.
- 4. Provide manufacturer's recommended preventative maintenance for each product, including time intervals for each task.
- 5. Provide instructions for all adjustments and minor repairs. Provide trouble shooting information for lighting equipment, motor starters, panelboards, and special systems.
- 6. Provide all information with regard to warranty and special requirements. Include copy of warranty, name, address and phone number of personnel to contact for warranty service.
- 7. Provide complete information on all replacement parts. Identify each part by manufacturer and part number (graphically when available).
- 8. Provide shop drawings for, but not limited to, Telecommunication System.
- D. Provide test reports for each system test required by Section 16950 Testing.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and Equipment shall be acceptable to the authority having jurisdiction as suitable for the use intended. All electrical equipment shall bear the seal of a nationally recognized testing laboratory for the purpose for which it is installed.

PART 3 - EXECUTION

- 3.01 WORKMANSHIP
 - A. All electrical work must be installed in strict accordance with the National Electrical Code and any applicable state or local codes. Equipment support and anchorage shall meet the seismic requirements of the International Building Code for the appropriate seismic zone.

SECTION 16060 GROUNDING

PART 1 - GENERAL

- 1.01 SUMMARY
 - A. Section includes:
 - 1. Rod electrodes.
 - 2. Wire.
 - 3. Mechanical connectors.
 - 4. Exothermic connections.
 - 5. Telecommunication Grounding and Bonding.

1.02 REFERENCES

- A. ANSI/TIA/EIA 607 Commercial Building Grounding and Bonding Requirements for Telecommunications.
- 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.
- 1.03 SYSTEM DESCRIPTION
 - A. Grounding systems use the following elements as grounding electrodes:
 - 1. Metal underground water pipe.
 - 2. Metal building frame.
 - 3. Concrete-encased electrode.
 - 4. Rod electrode.
- 1.04 PERFORMANCE REQUIREMENTS
 - A. Grounding System Resistance: 25 ohms maximum.
- 1.05 SUBMITTALS
 - A. Division 1 Submittal Procedures: Requirements for submittals and Section 16010 Electrical General Provisions.
 - B. Product Data: Submit data on grounding electrodes and connections.
- 1.06 CLOSEOUT SUBMITTALS
 - A. Operation and Maintenance Data: Submit Test Reports per Section 16950 Electrical Testing.

1.07 COORDINATION

- A. Division 1 Administrative Requirements: Requirements for coordination.
- B. Complete grounding and bonding of building reinforcing steel prior concrete placement.

PART 2 - PRODUCTS

- 2.01 ROD ELECTRODES
 - A. Product Description:
 - 1. Material: Copper-clad steel.
 - 2. Diameter: 3/4 inch.
 - 3. Length: 10 feet.
 - B. Connector: Connector for exothermic welded connection.

2.02 WIRE

- A. Material: Bare or insulated stranded copper. Use only insulated copper conductor for telecommunication grounding conductors.
- B. Grounding Electrode Conductor: Copper conductor bare or insulated.
- C. Bonding Conductor: Copper conductor bare or insulated.

2.03 MECHANICAL CONNECTORS

- A. General Use: Non-reversible crimp type lugs only. Use factory made compression lug for all terminations.
- B. Telecommunication Use: Copper, copper alloy, or Tin-plated copper. Nonreversible long barrel crimp type bolt lugs with two bolt tongues for 6 AWG or larger conductors. Crimp type one hole for conductors smaller than 6 AWG.

2.04 EXOTHERMIC CONNECTIONS

A. Product Description: Exothermic materials, accessories, and tools for preparing and making permanent field connections between grounding system components.

2.05 TELECOMMUNICATION GROUND BUS BAR

A. Wall mounted, Solid copper, 20 inches wide, 1/4" inch thick, pre-drilled lug attachment holes and two 4 inch insulated stand-off brackets.

PART 3 - EXECUTION

- 3.01 PREPARATION
 - A. Remove paint and surface contaminants at connection points.

3.02 SERVICE

- A. Provide an equipotential ground system for the building service by bonding all of the following systems and components to the service entrance ground bus:
 - 1. Metal underground water pipe.
 - 2. Metal building frame and pilings.
 - 3. Concrete-encased electrode.
 - 4. Metal piping systems.
 - 5. Rod electrodes.
 - 6. Utility neutral to the ground system at the service entrance disconnect switch.
 - 7. Telephone service entrance.
 - 8. Telecommunication TMGB.

3.03 GENERAL INSTALLATION

- A. Install rod electrodes at locations as indicated by the serving electrical utility.
- B. Install up to two ground rods per electrical service to achieve a minimum of 25 ohms to ground.
- C. Install grounding and bonding conductors concealed from view except in mechanical and electrical rooms.
- D. Provide raceway for each grounding or bonding conductor. Bond the raceway and conductor together at each ferrous conduit termination with grounding bushings.
- E. Provide exothermically welded connections to all connections that will be concealed or located below grade.
- F. Clean each mechanical connection and coat with antioxidant prior to connection.
- G. Bond together metal siding not attached to grounded structure; bond to ground.
- H. Install grounding and bonding in patient care areas to meet requirements of NFPA 99.
- I. Equipment Grounding Conductor: Install separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing. Provide bond to every electrical box and enclosure.
- J. Provide bonding for each metallic raceway and wireway system to provide continuous electrical continuity. Provide bond to every box and enclosure.

- K. Provide bonding jumper around inline meters, water heaters, filters, removable devices and discontinuities in metallic piping systems. Provide bonding jumper of equal to or larger than the grounding electrode conductor to that system required by NEC.
- L. Permanently ground entire light and power system in accordance with NEC, including service equipment, distribution panels, lighting panelboards, switch and starter enclosures, motor frames, grounding type receptacles, and other exposed non-current carrying metal parts of electrical equipment.
- M. Accomplish grounding of electrical system by using insulated grounding conductor installed with feeders and branch circuit conductors in conduits. Size grounding conductors in accordance with NEC. Install from grounding bus of serving panel to ground bus of served panel, grounding screw of receptacles, lighting fixture housing, threaded screw in light switch and outlet boxes or metal enclosures of service equipment.
- N. Grounding electrical system using continuous metal raceway system enclosing circuit conductors in accordance with NEC.
- O. Permanently attach equipment and grounding conductors prior to energizing equipment.
- 3.04 TELECOMMUNICATION GROUNDING AND BONDING
 - A. Provide telecommunication grounding in accordance with ANSI/TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications and as denoted by this specification.
 - 1. Provide a Telecommunication Grounding Bus bar (TGB) in the telecommunication room.
 - 2. Provide an insulated #2 AWG copper minimum or as denoted on the plans Telecommunication Bonding Backbone (TBB) conductor.
 - 3. Provide all bonds and bonding jumpers the same size as the TBB except where noted otherwise.
 - 4. Bond the TGB to the intersystem bonding termination located adjacent to the electrical service entrance ground.
 - 5. Provide a green color code or stripe with phase tape at each termination or accessible section.
- 3.05 FIELD QUALITY CONTROL
 - A. Test electrical service ground system per Section 16950 Electrical Testing.

SECTION 16070 ELECTRICAL HANGERS AND SUPPORTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Conduit supports.
 - 2. Formed steel channel.
 - 3. Spring steel clips.
 - 4. Equipment bases and supports.
 - 5. Seismic Restraints.

1.02 REFERENCES

- A. NFPA 70 (National Fire Protection Association) National Electrical Code.
- B. IBC (International Building Code) latest adopted edition.

1.03 SUBMITTALS

- A. Division 1 Submittals and Section 16010 Electrical General Provisions.
- B. Submit manufacturers Product Data:
 - 1. Hangers and Supports.
 - 2. Conduit Straps.
 - 3. Anchors.
 - 4. Seismic Shop Drawings.
- C. Manufacturer's Installation Instructions:
 - 1. Hangers and Supports: Submit special procedures and assembly of components.

PART 2 - PRODUCTS

2.01 CONDUIT SUPPORTS

- A. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads.
- B. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.
- C. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.
- D. Conduit clamps general purpose: One hole galvanized stamped steel or malleable iron for surface mounted conduits.

2.02 FORMED STEEL CHANNEL AND ACCESSORIES

- A. Product Description: U-channel strut Exterior and Wet Areas Hot dipped galvanized 12 gage thick steel. Dry Indoor Areas Zinc or Cadmium Plated 12 gage thick steel.
- B. Accessories: Modular to match channel finish and configuration by the same manufacturer.
- 2.03 SPRING STEEL CLIPS
 - A. Product Description: "Caddy" spring steel electrical support systems for each type required (Provide only where concealed in walls or above ceilings).
- 2.04 MANUFACTURED SEISMIC RESTRAINT SYSTEMS
 - A. Product Description: Provide pre-approved manufactured seismic restraint systems for all seismic support. Systems to be Superstrut seismic restraint system pre-approval No. R-0003, Kinline pre-approval No. R-0071, or B-Line pre-approval No. R-0114.
- 2.05 SEISMIC SUPPORT WIRE AND CABLE
 - A. Product Description: #12 gage ceiling support wire where concealed. Aircraft stainless steel cable where exposed.
- 2.06 CABLE TIES
 - A. Product Description: High strength nylon temperature rated to 185 degrees F. Self locking. Provide plenum rated cable ties where located above ceilings.

PART 3 - EXECUTION

- 3.01 INSTALLATION HANGERS AND SUPPORTS
 - A. Anchors and Fasteners:
 - 1. Concrete Structural Elements: Provide expansion anchors and powder actuated anchors.
 - 2. Steel Structural Elements: Provide beam clamps. Provide spring steel clips where concealed.
 - 3. Concrete Surfaces: Provide expansion anchors.
 - 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.
- 5. Provide conduit back spacers in all wet or wash down areas.
- C. Seismic Bracing:
 - 1. Support and brace all electrical equipment and associated raceways as required by the IBC, based on seismic information as determined by and shown on the structural drawings.
 - 2. Provide manufactured seismic restraint systems.
 - 3. Bracing is not required for individual raceways less than 2.5" inside diameter and conduits hung on hangers so that the top of the conduit is 12 inches or less from the bottom of the support hanger.
- D. Support vertical conduit at every floor.
- E. Install raceway supports in accordance with NEC and do not exceed 10 feet.
- F. Do not support raceways, low voltage pathways, cables, telecommunication pathways or boxes from ceiling suspension wires or suspended ceiling systems. Provide support from building structure independently to allow ceiling removal and replacement without removal of electrical system. Exception: Outlet boxes for ceiling mounted light fixtures, speakers and smoke detectors may be mounted in the ceiling system.
- G. Provide two minimum seismic support wires for each ceiling mounted light fixture weighing less than 50 pounds. Attach support wires to building structure independent from ceiling system and on opposing corners of the light fixtures to not allow fixture to drop more than 6 inches upon ceiling failure. Secure each end with three tight wraps within 1 inch at each end of the wire.
- H. Provide support for fixtures and components that weigh more than 50 pounds directly from building structure independent of wiring system capable of supporting total weight and seismic loading.
- I. Provide support for wall mounted emergency lights to electrical box and four independent wall mounted anchors.
- J. Provide swivel hangar assembly for pendant mounted light fixtures with restraining cables for seismic support.
- K. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
- L. Install multiple conduit runs on common hangers.
- M. Do not drill or cut structural members except where specifically approved.

3.02 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

- A. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.
- B. Construct supports of formed steel channel for seismic bracing. Brace and fasten with flanges bolted to structure.

SECTION 16075 ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 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.

1.02 SUBMITTALS

- A. Division 1 Submittal Procedures: Requirements for submittals and Section 16010 Electrical General Provisions.
- B. Product Data:
 - 1. Submit manufacturer's catalog literature for each product required.
 - 2. Submit electrical identification schedule including list of wording, symbols, letter size, color coding, tag number, location, and function.
- C. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.

1.03 ENVIRONMENTAL REQUIREMENTS

A. Install labels and nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

PART 2 - PRODUCTS

2.01 NAMEPLATES

- A. Product Description: Laminated three-layer plastic with engraved white letters on black background. Attach to equipment using threaded screws or poprivets.
- B. Letter Size:
 - 1. 1/4 inch high letters for identifying individual panel or equipment.
 - 2. 1/8 inch high letters for remaining lines with 1/8 inch spacing between lines.
- C. Minimum nameplate size: 1/8 inch thick with a consistent length and height for each type of nameplate wherever installed on the project.

2.02 LABELS

A. Product Description: Embossed adhesive tape labels, with 3/16 inch white letters on black background made using Dynamo 5500 label printer.

2.03 WIRE MARKERS

- A. Power and Lighting Description: Cloth tape type wire markers for all neutrals and Phase conductors.
 - 1. Power and Lighting Circuits: Panel board name and branch circuit or feeder number.
 - 2. Control Circuits: Control wire number as indicated on schematic and shop drawings.
- B. Low Voltage System Description: Printed label with unique wire number that is shown on shop drawing for system.
- C. Telecommunication Description: See section 16745 Telecommunication System.

2.04 UNDERGROUND WARNING TAPE

- A. Product Description: Red 6 inch wide detectable.
- B. Wording to read "Caution Buried Electric Line Below".
- 2.05 ONE-LINE DIAGRAM AND PANEL MAP
 - A. Product Description: Clear laminated one-line diagram and building panel board map screwed to wall on four corners each.
 - B. Provide final version electronically in AutoCAD format.
- 2.06 PANELBOARD CIRCUIT DIRECTORY
 - A. Typed schedule denoting each circuit load type and location by the room number or name as the final room numbers and names actually installed not the names or numbers shown on the contract drawings unless no changes were made.
 - B. Provide panel schedule in Microsoft Excel format.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install identifying devices after completion of painting.
- B. Nameplate Installation:
 - 1. Install nameplate parallel to equipment lines.

- 2. Secure nameplate to inside surface of door on recessed panel board in finished locations.
- 3. Panel board Nameplates.
 - a. Provide name plate for each new panel board with the following information:
 - 1) Line 1: Panel board Name.
 - 2) Line 2: Source from which the panel board is fed.
 - 3) Line 3: Voltage, phase and wire configuration.
 - 4) Line 4: AIC rating of the panel board.
- 4. Disconnects, Starters, or Contactors:
 - a. Provide nameplate for each device with the following information:
 - 1) Line 1: Load served.
 - 2) Line 2: Panel board and circuit number from which the device is fed.
 - 3) Line 3: Fuse or Circuit amperage and poles. Where fused disconnect denote the maximum fuse size to be installed.
- 5. Control or Low Voltage System Panels:
 - a. Provide nameplate for each control panel with the following information:
 - 1) Line 1: Panel name as shown on the shop drawings.
 - 2) Line 2: System Description the panel is controlling (Fire alarm, BAS).
 - 3) Line 3: Panel board and circuit number from which the panel is fed if applicable.
- C. Label Installation:
 - 1. Device Faceplate Labels: provide label on every outlet box, switch box, or point of connection label affixed at the top of the device plate denoting the panel board name and circuits numbers.
- D. Wire Marker Installation:
 - 1. Install wire marker for each conductor at panelboards; pull boxes, outlet and junction boxes, and each load connection.
 - 2. Junction boxes: Mark with outside cover of junction boxes with indelible black marker where boxes are concealed from view. Mark the panel board and circuit numbers of wiring on all junction boxes with sheet steel covers. On exposed junction boxes in finished areas, mark on inside of cover or device plate to allow circuit identification without removal of the device. Mark all other Special System junction boxes with sheet steel covers with appropriate system designation, e.g., "Telecom," etc.
 - 3. Color code phases, neutral, and ground per NEC requirements and Section 16120 Building Wire and Cable.
- E. Warning Placards:
 - 1. Provide warning placards and labels warning messages for all of the following cases:
 - a. Series Rated Equipment per NEC 110-22 and 240-86.
 - b. Multiple voltage system ungrounded conductor identification per NEC 210-4(d) at each panel board.
 - c. Multiple power service warning to single unit.

- d. External power sources that receive power from a second source and are not de-energized by the disconnecting means of the equipment.
- F. Underground Warning Tape Installation:
 - 1. Install underground warning tape along length of each underground conduit, raceway, or cable 6 to 8 inches below finished grade, directly above buried conduit, raceway, or cable.
- G. Provide laminated one-line diagram of building power system with all feeder overcurrent devices and conductor sizes shown.
- H. Provide circuit directory in every panel board with load data.

SECTION 16120 WIRE AND CABLE

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes the requirements, products, and installation methods for wire and cable, 600 volts or less.

1.02 QUALITY ASSURANCE

A. Conductors shall conform to UL and ICEA specifications.

1.03 SUBMITTALS

- A. Submit shop drawings and product data under the provisions of Division 1 and Section 16010.
- B. Submit manufacturer's instructions.
- C. Submit manufacturer's instructions for splicing, where applicable.

1.04 DESIGN REQUIREMENTS

A. Conductor size: Provide conductors sized in accordance with all ANSI/NFPA 70 requirements and guidelines.

PART 2 - PRODUCTS

2.01 BUILDING WIRE

- A. Thermoplastic-insulated Building Wire: NEMA WC 5.
- B. Rubber-insulated Building Wire: NEMA WC 3.
- C. Feeders and Branch Circuits: Copper, stranded conductor, 600 volt insulation, XHHW, or THHN, #10, smaller stranded or solid.
- D. Control Circuits: Copper, stranded conductor 600 volt insulation, XHHW or THHN, as indicated on installation schedule. Inside control panels MTW, XHHW, or THHN.

2.02 MC CABLE

- A. Type: Aluminum armored Type AC with Ground Health Care Facilities Rated.
- B. Basis of Design: Alflex Armorlite Type HCF
- C. Conductor: Bare annealed copper per ASTM B-3
- D. Insulation:
 - 1. Flame retardant, heat resistant PVC with flame, oil and gasoline resistant nylon jacket rated as Types THHN and THWN
- E. Ground Wire: Copper, sized per the NEC and UL, with green THHN/THWN insulation
- F. Insulation Covering: Moisture resistant, flame retardant fibrous wrap
- G. Bond Wire: Aluminum bond wire in intimate contact with the armor
- H. Construction: Individually wrapped conductors are twisted together, the bond wire runs longitudinally along the cabled core
- I. Armor: Aluminum Interlocked Armor
- J. Industry Standards and References:
 - 1. UL Standards 4 and 83
 - 2. ANSI Standards E119 and E814
 - 3. NEC 333 and 517
 - 4. IEEE 383
 - 5. Federal Specification JC-30B
- K. Color Code Power Conductors:
 - 1. ICEA Method 1 (colored compounds)
 - 2. A-Black, B-Red, C-Blue, Grounded Conductor-White, Ground-Green.

2.03 GROUNDING CONDUCTORS

A. No. 6 AWG and larger: Stranded copper, bare, soft drawn.

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- B. No. 8 AWG and smaller:
 - 1. Bare-solid copper, soft drawn.
 - 2. Insulated-stranded copper with green insulation.

2.04 TELECOMMUNICATION CABLE

A. See Section 16745.

PART 3 - EXECUTION

- 3.01 GENERAL WIRING METHODS
 - A. Provide quantity of conductors in each raceway as necessary for connected equipment, sized in accordance with NEC requirements, unless otherwise denoted larger or greater quantities, on the drawings.
 - B. Size conductors to provide maximum voltage drop not to exceed 3% in branch circuits or feeders, and a total of not more than 5% combined to the furthest outlet, based on steady, state load condition noted on the panel schedules, actual field conductor lengths, and NEC Table 9 values. In general, 20 amp circuit with one way lengths measured to furthest outlet from branch circuit breaker shall have a minimum size as follows:
 - 1. 120 volt circuits 75' to 125' shall be #10 AWG;
 - 2. 120 volt circuits 125' to 200' shall be #8 AWG;
 - C. Install all material and equipment in accordance with manufacturer's recommendation, instructions, and installation drawings, unless otherwise indicated.
 - D. Install conductors in approved raceways systems.
 - E. Use no wire smaller than 12 AWG for power and lighting circuits, and no smaller than 14 AWG for control wiring.
 - F. Splice only in junction or outlet boxes.
 - G. Neatly train and lace wiring inside boxes, equipment, and panelboards.
 - H. Group the ungrounded and grounded conductors of each multi-wire branch circuit with wire ties or similar means in at least one location within the panel board or other point or origination.
 - I. Make Conductor lengths for parallel circuits equal. Comply with NEC 310.4.
 - J. Provide conductors of same insulation type if used for similar purposes.

3.02 WIRING INSTALLATION IN RACEWAYS

- A. Pull all conductors into a raceway at the same time. Use UL listed wire pulling lubricant for pulling 4 AWG and larger wires.
- B. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.
- C. Completely and thoroughly swab raceway system before installing conductors.

3.03 CABLE INSTALLATION

- A. Provide protection for exposed cables where subject to damage.
- B. Support cables above accessible ceilings; do not rest on ceiling tiles. Use spring metal clips or metal cable ties to support cables from structure. Include bridle rings or drive rings.
- C. Use suitable cable fittings and connectors.
- D. Do not exceed manufacturer's recommended pulling tensions.
- E. Color codes for all conductors throughout the entire electrical system per Section 16075, Wire Identification.

3.04 WIRING CONNECTIONS AND TERMINATIONS

- A. Splice only in accessible junction boxes.
- B. Use solderless pressure connectors with insulating covers for copper wire splices and taps, 8 AWG and smaller. For 10 AWG and smaller, use insulated spring wire connectors with plastic caps.
- C. Use split bolt connectors for copper wire splices and taps, 6 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of the insulation value of conductor.
- D. Thoroughly clean wires before installing lugs and connectors.
- E. Make splices, taps and terminations to carry full ampacity of conductors withoutperceptible temperature rise.
- F. Terminate spare conductors with electrical tape.
- G. Flashover or insulation value of joints: Equal that of conductor. UL listed, rated 600 volts for general use and for use within fixtures.

3.05 FIELD QUALITY CONTROL

- A. Inspect wire and cable for physical damage and proper connection.
- B. Torque test conductor connections and terminations to manufacturer's recommended values.
- C. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.

3.05 WIRE AND CABLE INSTALLATION SCHEDULE

- A. All conductors shall be installed in raceways unless otherwise noted with insulation type as follows:
 - 1. Heated spaces THHN or XHHW;
 - 2. Outdoor, below grade, unheated areas, attics, crawl spaces XHHW.
SECTION 16130 RACEWAY AND BOXES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Metal conduit.
 - 2. Flexible metal conduit.
 - 3. Liquid tight metal conduit.
 - 4. Electrical metallic tubing.
 - 5. Nonmetal conduit.
 - 6. Fittings and conduit bodies.
 - 7. Wall and ceiling outlet boxes.
 - 8. Pull and junction boxes.
 - 9. Telecommunication Pathways.

1.02 REFERENCES

- A. National Electrical Manufacturers Association (NEMA):
 - 1. NEMA FB 1 (National Electrical Manufacturers Association) Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
 - 2. NEMA OS 1 (National Electrical Manufacturers Association) Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
 - 3. NEMA OS 2 (National Electrical Manufacturers Association) -Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.
 - 4. NEMA RN 1 (National Electrical Manufacturers Association) Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
 - 5. NEMA TC 2 (National Electrical Manufacturers Association) Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).
 - 6. NEMA TC 3 (National Electrical Manufacturers Association) PVC Fittings for Use with Rigid PVC Conduit and Tubing.

- 7. NEMA 250 (National Electrical Manufacturers Association) Enclosures for Electrical Equipment (1000 Volts Maximum).
- B. National Fire Protection Association (NFPA):
 - 1. NFPA 70 National Electrical Code.
- C. Telecommunications Industry Association (TIA) and Electronics Industries Association (EIA)
 - 1. ANSI/TIA/EIA 569 Commercial Building Standard for Telecommunication Pathways

1.03 SYSTEM DESCRIPTION

- A. Provide raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system. Note: It is assumed that MC cable will be the installation method of choice.
- B. Raceway Minimum Size:
 - 1. Below Grade: Provide 1 inch minimum.
 - 2. Above Grade or Slab on Grade: Provide $\frac{3}{4}$ inch minimum. Raceway may be reduced to $\frac{1}{2}$ inch for final connection of raceway up to 6 feet for connection to fixture or device where maximum conduit entry size is $\frac{1}{2}$ inch.
- C. Underground-outside Foundation Wall:
 - 1. Raceway: Provide rigid steel conduit and plastic coated conduit.
 - a. Provide detectable warning tape over all underground raceways per 16075.
 - b. Provide 3 inch minimum spacing between raceways.
 - c. Provide 0.75 inch minus material 6 inches above and below rigid steel conduit. Backfill remaining trench free of debris or rocks greater than 1 inch in diameter.
 - 2. Boxes and Enclosures: Provide concrete type 1A handhold.
- D. Under or In Slab on Grade:
 - 1. Raceway: Provide rigid steel conduit, plastic coated conduit, and nonmetallic conduit. Provide transition to rigid steel conduit 12 inches prior to exit penetration through foundations, concrete walls, block walls

or roofs. Provide transition to rigid steel conduit elbow and riser for penetration through slab. Arrange raceway so the curved portion of bend is not visible above finished slab. Route conduits in slabs to have 1 inch minimum cover.

- 2. Boxes and Enclosures: Provide concrete tight cast and sheet metal steel metal boxes.
- E. Outdoor Above Grade, Damp or Wet Locations:
 - 1. Raceway: Provide rigid steel, and electrical metallic tubing.
 - 2. Boxes and Enclosures: Provide weatherproof malleable iron for branch circuit junction and outlet boxes. Provide weatherproof NEMA 3R sheet metal for safety and disconnect switches and NEMA 4 sheet metal with gaskets for motor controllers and control panels.
 - 3. Fittings: Provide galvanized malleable iron with gaskets. Provide Myers threaded hubs for all conduit entries into top and side of sheet metal enclosures. Provide gland rain tight fittings for electrical metallic tubing.
- F. Concealed Dry Locations:
 - 1. Raceway: Provide rigid steel and electrical metallic tubing.
 - 2. Boxes and Enclosures: Provide sheet-metal boxes.
 - 3. Fittings: Provide cast and steel.
- G. Exposed Dry Locations:
 - 1. Raceway: Provide Surface Raceway. Provide rigid steel and electrical metallic tubing exposed in mechanical rooms, electrical rooms and rooms denoted specifically on the plans.
 - 2. Boxes and Enclosures: Provide Surface raceway and boxes by same manufacturer in all areas except in mechanical rooms, electrical rooms and rooms denoted specifically on the plans provide sheet-metal boxes with raised steel covers.
 - 3. Fittings: Provide galvanized malleable iron and steel.
- H. Telecommunication Grounding:
 - 1. Raceway: Provide aluminum conduit.
 - 2. Boxes and Enclosure: Provide sheet-metal boxes.
 - 3. Fittings: Provide copper free aluminum.
- I. Equipment Connections: Connections to light fixtures, motors, transformers, vibrating equipment or equipment that requires removal for maintenance or

replacement: Flexible metal conduit in dry locations and liquid tight flexible metal conduit in damp or wet locations. Maximum length 6 feet in length.

1.04 DESIGN REQUIREMENTS

- A. Conduit Minimum Raceway Size: Size all raceways not shown on the drawings to not exceed the percentage fill specified in the NEC Table 1, Chapter 9 using the conduit dimensions of the NEC Table 4, Chapter 9 and conductor properties of the NEC Table 5, Chapter 9. Where specific cable is not listed use major diameter provided by the manufacturer.
- B. Box Minimum Size: Provide all boxes sized and configured per NEC Article 314.
- C. ANSI/TIA/EIA 569 Commercial Building Standards for Telecommunication Pathways.

1.05 SUBMITTALS

- A. Division 1 Submittals and Section 16010 Electrical General Provisions.
- B. Product Data: Submit data for products to be provided.
- C. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

1.07 COORDINATION

- A. Division 1 Coordination and project conditions.
- B. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.
- C. Coordinate layout and installation of raceways and boxes to provide adequate headroom, working clearance and access.
- D. Coordinate outlet locations with Architectural drawings and casework shop drawings.
- E. Coordinate with architectural for finished wall thickness for installation of outlet boxes and extension rings.

- F. Coordinate mounting of outlet boxes on exterior walls to avoid penetration of vapor barrier.
- G. Coordinate installation of outlet boxes for equipment connected under Division 15.

PART 2 - PRODUCTS

- 2.01 METAL CONDUIT
 - A. Rigid Steel Conduit: ANSI C80.1, UL 6.
 - B. Rigid Aluminum Conduit: ANSI C80.5.
 - C. Fittings and Conduit Bodies: NEMA FB 1, UL 514B; Galvanized malleable iron with threaded hubs for all conduit entries. Provide threaded connections and couplings only. Set Screw and running thread fittings are not permitted. Provide copper free aluminum fittings and conduit bodies with Aluminum Conduit.
 - D. Provide bushings at all conduit terminations.

2.02 PVC COATED METAL CONDUIT

- Product Description: NEMA RN 1; rigid steel conduit with external PVC coating, 20 mil thick.
- B. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

2.03 FLEXIBLE METAL CONDUIT

- A. Product Description: UL 1, galvanized or zinc coated flexible steel construction.
- B. Fittings: NEMA FB 1. Galvanized malleable iron or steel with insulated throats.

2.04 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

- A. Product Description: UL 360, Interlocked steel construction with PVC jacket.
- B. Fittings: NEMA FB 1. Galvanized malleable iron or steel liquid tight.
- 2.05 ELECTRICAL METALLIC TUBING (EMT)
 - A. Product Description: ANSI C80.3, UL 797; galvanized steel tubing.

B. Fittings and Conduit Bodies: NEMA FB 1; galvanized steel or malleable iron, compression or set screw type. Die cast or pressure cast fittings and locknuts are not permitted.

2.06 NONMETALLIC CONDUIT

- A. Product Description: NEMA TC 2; Schedule 40 PVC.
- B. Fittings and Conduit Bodies: NEMA TC 3.

2.07 INNERDUCT

- A. Product Description: UL910 Plenum Rated; Indoor Corrugated.
- B. Fittings: By same manufacturer as duct.

2.08 SURFACE METAL RACEWAY

- A. Dual Channel
 - 1. Manufacturers:
 - a. Wiremold, Model V4000 or approved equal.
 - b. Substitutions: Division 1 Substitutions.
 - 2. Product Description: Dual-channel surface metallic raceway with fitted snap on cover, suitable for use as multi-outlet assembly. Keep data and power conductors separate at all times. Provide Category 5 rated raceway, fittings and components.
 - 3. Size: 4-3/4 inches wide x 1-3/4 inches deep. Two equal compartments.
 - 4. Receptacles: Provide accessories to accept receptacles as specified in Section 16140.
 - 5. Telecommunication Outlets: As specified in Section 16745.
 - 6. Device Spacing: As indicated on drawings.
 - 7. Channel Finish: Ivory.
 - 8. Fittings: Furnish manufacturer's standard couplings, entrance fittings, elbows, device brackets, end caps, radius corner inserts, seam covers, wire clips, device faceplates and connectors. Device fittings shall be V4007C-1R.
 - 9. Cuts: Perform all cuts with Wiremold 4000 raceway base and cover shear.

2.09 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: NEMA OS 1, UL514A galvanized steel with plaster ring where applicable.
 - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch male fixture studs where required.
 - 2. Concrete and Masonry: Concrete type with field installed tape cover to prevent concrete entry to raceway system.
 - 3. Minumum size 4 inches wide x 4 inches wide x 2-1/8 inch deep.
- B. Cast Boxes: NEMA FB 1, Type FD, galvanized malleable iron. Furnish gasketed cover by box manufacturer. Furnish threaded hubs.
- C. Wall Plates: As specified in Section 16140.

2.10 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

2.11 BUSHINGS:

- A. Non-grounding: Threaded impact resistant plastic.
- B. Grounding: Insulated galvanized malleable iron/steel with hardened screw bond to raceway and conductor lug.

2.12 LOCKNUTS:

A. Threaded Electro Zinc Plated Steel designed to cut through protective coatings for ground continuity.

2.13 WIREWAY

- A. Product Description: General purpose type wireway. Size per NEC minimum fill capacity required.
- B. Knockouts: Field install, no factory knockouts acceptable.
- C. Cover: Screw cover.
- D. Fittings and Accessories: Include factory couplings, offsets, elbows, adapters and support straps required for a complete system. Provide internal ground bonding jumper bonded to each section.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Ground and bond raceway and boxes in accordance with Section 16060.
- B. Fasten raceway and box supports to structure and finishes in accordance with Section 16070.
- C. Identify raceway and boxes with origin and destination in accordance with Section 16075.

3.02 INSTALLATION - GENERAL RACEWAY

- A. Provide raceways concealed in construction unless specifically noted otherwise. Do not route conduits on roofs, outside of exterior walls, or surface on interior finished walls unless specifically noted to do so on the plans.
- B. Raceway routing and boxes are shown in approximate locations unless dimensioned. Where raceway routing is not denoted field route to provide complete wiring system.
- C. The drawings do not necessarily show every pull or junction box required. Provide boxes as shown or as necessary to facilitate bend limitations and conductor pulling.
- D. Do not route raceways on floor. Arrange raceway and boxes to maintain a minimum of 6 feet 6 inches of headroom. Install raceways level and square to a tolerance of 1/8" per 10 feet. Route raceways parallel and perpendicular to walls and ceilings for all exposed and concealed areas.
- E. Tape around raceways and boxes that penetrate vapor barriers to establish airtight seal.
- F. Provide ground bushing on each raceway termination 1 inch or larger. Provide and size bonding conductor per NEC Article 250.
- G. Provide electrical service continuity with ground bushing on each service entrance raceway termination at pull enclosures, current transformer enclosures and service disconnect enclosures bonded to enclosures. Provide and size bonding conductor per NEC Article 250.
- H. <u>Provide</u> bonding at each end of raceways, boxes, or enclosures to the grounding electrode conductor where routed in a metallic system. Provide bond of equal size to the grounding electrode conductor size.
- I. Provide bushing at each raceway termination not installed within an enclosure threaded to the raceway end or connector.
- J. Provide permanent accessibility to all junction boxes; pull boxes and conduit access fittings.

- K. Arrange raceway supports to prevent misalignment during wiring installation.
- L. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- M. Group related raceway; support using conduit rack. Construct rack using steel channel specified in Section 16070; provide space on each for 25 percent additional raceways.
- N. Do not support raceway or power cables with wire or perforated pipe straps or cable ties. Remove wire used for temporary supports
- O. Do not attach raceway to ceiling support wires or other piping systems.
- P. Construct wireway supports from steel channel specified in Section 16070.
- Q. Route conduit in and under slab from point-to-point.
- R. Maintain clearance between raceway and piping for maintenance purposes.
- S. Maintain 12 inch clearance between raceway and surfaces with temperatures exceeding 104 degrees F.
- T. Cut conduit square using saw or pipe cutter; de-burr all conduit ends to smooth finish prior to installation.
- U. Bring conduit to shoulder of fittings; fasten securely. Where locknuts are used install with one inside box and one outside with dished part against box.
- V. Coat non-ferrous conduit threads prior to joining with conductive metallic grease antioxidant.
- W. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting.
- X. Install conduit threaded raintight hubs to fasten conduit to sheet metal boxes for all exterior or interior damp or wet locations. Sealing locknuts are not acceptable.
- Y. Install no more than equivalent of four 90 degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams and corners.
- Z. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.
- AA. Install fittings and flexible metal conduit to accommodate 3 axis movements where raceway crosses seismic joints.
- BB. Install fittings to accommodate expansion and contraction where raceway crosses control and expansion joints.

- CC. Install suitable pull string or cord in each empty raceway except sleeves and nipples.
- DD. Install suitable caps to protect installed conduit against entrance of dirt and moisture.
- EE. Surface Raceway: Install flat-head screws, clips, and straps to fasten raceway channel to surfaces; mount plumb and level. Install insulating bushings and inserts at connections to outlets and corner fittings. Provide divider to keep power and data pathways separate at all times.
- FF. Close ends and unused openings in wireway and surface raceway.
- GG. Do not intermix conductors from separate panelboards or any other system in the same raceway system or junction boxes unless specifically denoted otherwise.
- <u>HH.</u> Where conduit penetrates fire-rated walls and floors, provide mechanical firestop fittings with UL listed fire rating equal to wall or floor rating, seal opening around conduit with UL listed fire stop sealant or intumescent fire stop, preserving the fire time rating of the construction. Install in accordance with Division 7 Sealants.
- HH.<u>II.</u> Provide conduit sleeve through wall with insulated bushings on each end for all wall penetrations of cables. Size sleeve for NEC fill requirements.
- H.J. Route conduit through roof openings for piping and ductwork where possible; otherwise, route through roof pitch pocket.
- JJ.<u>KK.</u> Use non-hardening duct seal to satisfy requirement of Article 300-7, NEC for different temperature portions of raceways, including those passing from interior to exterior portions of structure.
- KK.<u>LL.</u> Provide blank covers or plates for all boxes that do not contain devices.
- Where specifically required for electrical connections to penetrate through the roofing system the physical location must be approved by the Project Manager. All penetrations shall be flashed and hot mopped or a pitch pocket installed to provide a weatherproof seal at minimum.
- MM.<u>NN.</u> Provide weather head on all raceway stub ups which are outdoors and do not terminate into equipment.
- <u>OO.</u> Paint all exposed conduits and junction boxes to match existing décor.
- 3.03 INSTALLATION GENERAL BOXES
 - A. Install wall mounted boxes at elevations to accommodate mounting heights as indicated on Drawings.

- B. Adjust box location up to 6 feet prior to rough-in to accommodate intended purpose.
- C. Orient boxes to accommodate wiring devices oriented as specified in Section 16140.
- D. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- E. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- F. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- G. Do not install flush mounting box back-to-back in walls; install with minimum 6 inches separation.
- Install with minimum 24 inches separation in fire rated walls. Limit penetrations in fire rated walls to 16 square inches each and a maximum total combined penetration area of 100 square inches in any given 100 square feet of wall. Where penetrations are in excess of these requirements provided UL listed fire stop wrap acceptable to Authority having Jurisdiction.
- I. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- J. Install stamped steel bridges to fasten flush mounting outlet box between studs.
- K. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- L. Install adjustable steel channel fasteners for hung ceiling outlet box.
- M. Do not fasten boxes to ceiling support wires or other piping systems.
- N. Support boxes independently of conduit.
- O. Install gang box where more than one device is mounted together. Do not use sectional box.

3.04 INSTALLATION – TELECOMMUNICATION PATHWAYS

- A. Provide continuous pathway system for all telecommunication cables. Provide continuous cable support system per Section 16745 Telecommunication Distribution System.
- B. Install the telecommunication pathways in accordance with requirements for Installation of General Conduit and General Boxes above unless superceded by more stringent requirements of this section or ANSI/EIA/TIA-569 – Commercial

Building Standard for Telecommunication Pathways and Spaces and Building Industry Consulting Service International (BICSI) Telecommunication Distribution Methods Manual guidelines and recommendations.

- C. Provide pathways for all telecommunication cables with Surface Raceway, Conduit, Cable tray, J-hooks, and chases for the entire length of each cable. Provide pathway capacity throughout entire system for each telecommunication outlet served sized to accommodate a minimum of four 4 pair 100 Ohm UTP cables from each outlet location to telecommunication room denoted on the plans.
- D. Clearances:
 - 1. Provide 3" minimum clearance from bottom of telecommunication pathway to ceiling tile and T-bar ceiling and 12 inches clear space above cable trays for access.
 - 2. Do not route telecommunication cables adjacent and parallel to unshielded and ungrounded power cabling.
 - 3. Do not route raceways over or adjacent to boilers.
 - 4. Do not route pathways in the floor slab of the telecommunication room.

5.	Provide the following minimum separation for telecommunication
	pathways as summarized in the following table:

EMI Source Condition	Minimum Separation Distance in Inches 480 V or Less			
	<2 KVA	2-5KVA	>5KVA	
Fluorescent and HID Light fixtures, unshielded power conductors, or electrical equipment to open non- ferrous telecommunication pathways	5	12	24	
Unshielded power conductors or electrical equipment to grounded ferrous metal telecommunication pathways	2.5	6	12	
Power conductors in enclosed in grounded ferrous metal conduit to grounded ferrous metal conduit telecommunication pathways	-	3	6	

E. Conduit Pathways:

- 1. Maximum allowable continuous conduit section length of 100 feet between pull boxes.
- Contain no more than two 90 degree bends or derate conduit capacity 15% for up to one additional 90 degree bend. Conduits less than 33 feet long, oversized one trade size or one of the 90 degree bends within 12

inches of a pull boxes may have up to three 90 degree bends without derating.

- 3. Rate each offset as a 90 degree bend.
- 4. Bond each conduit to telecommunication ground system.
- 5. Contain no 90 degree conduletes (LBs).
- 6. Do not use flexible metal conduit unless specifically noted on the plans or approved by the engineer where it is the only practical alternative. Increase raceway one trade size above required size where flexible metal conduit is used.
- 7. Terminate conduits routed to cable trays within 6 inches of tray. Provide conduit support to building structure within 24 inches of cable tray.
- 8. Terminate conduits and chases that protrude through floor in telecommunication rooms to 3" above finished floor. Terminate conduits and chases that protrude through finished ceiling or above within 12 inches of ladder rack, distribution frame or cable organizer.
- 9. Provide bend radius of 6 times of the internal conduit diameter of conduits up to 2 inches; 10 times of the internal conduit diameter of conduits above 2 inches and for all fiber optic raceways.
- 10. Provide minimum conduit size of 0.75 inch. Size all other conduits and chases according to the following table based on three cables at 0.24 inch diameter to each outlet shown.

Condu it Trade	Conduit Maximum Cable Capacity Based on two 90 degree bends and < 100 ft (Inches OD of Cable)									
size	(0.13	(0.18	(0.22	(0.24	(0.29	(0.31	(0.37	(0.53	(0.62	(0.70
	")	")	")	")	")	")	")	")	")	")
0.75"	6	5	4	3	2	2	1	0	0	0
1"	8	8	7	6	3	3	2	1	0	0
1.25"	16	14	12	10	6	4	3	1	1	1
1.5"	20	18	16	15	7	6	4	2	1	1
2"	30	26	22	20	14	12	7	4	3	2
2.5"	45	40	36	30	17	14	12	6	3	3
3"	70	60	50	40	20	20	17	7	6	6
3.5"							22	12	7	6
4"							30	14	12	7

F. Provide J-Hooks spaced maximum 5 feet on center to provide telecommunication pathway anywhere cable tray, conduit, or ladder rack is not denoted on the plans and 1 or more telecommunication cables are routed. Provide 50% spare capacity above the minimum system capacity requirements.

- G. Provide conduits denoted to contain inner ducts to be 4 inch outer conduits with at least three separate internal inner ducts the entire length of the raceway. Size inner ducts to use entire available capacity of the outer conduit.
- H. Boxes:
 - 1. Provide outlet boxes recessed in wall to be 4-11/16"x4-11/16"x2.5" with a single gang ring. Provide cut-in junctions boxes where required for existing walls to be 2"x3"x2.5".
 - 2. All boxes shall be readily accessible.
 - 3. Do not use boxes for angle pulls or change pathway direction. Locate pull boxes in straight through sections of horizontal conduit pathways.
 - 4. Provide pull boxes for 0.75 inch and 1 inch through pull for horizontal UTP cabling to be 4-11/16"x4-11/16"x2.5" minimum. Provide all other boxes sized per the following table:

Maximum	Minimum Size	For each		
Trade Size	Width	Length	Depth	additional conduit
Conduit		(direction of		increase width
		conduit)		
0.75"	4	12	3	2
1"	4	16	3	2
1.25"	6	20	3	3
1.5"	8	27	4	4
2"	8	36	4	5
2.5"	10	42	5	6
3"	12	48	5	6
3.5"	12	54	6	6
4"	15	60	8	8

3.05 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods in accordance with Division 7.
- B. Locate outlet boxes to allow luminaries positioned as indicated on reflected ceiling plan.
- C. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

3.06 ADJUSTING

- A. Adjust flush-mounting outlets to make front flush with finished wall material.
- B. Install knockout closures in unused openings in boxes.

3.07 CLEANING

A. Clean interior of boxes to remove dust, debris, and other material and clean exposed surfaces and restore finish.

END OF SECTION

SECTION 16140 WIRING DEVICES

PART 1 - GENERAL

- 1.01 DESCRIPTION: THIS SECTION DESCRIBES GENERAL REQUIREMENTS AND PRODUCTS TO FURNISH AND INSTALL UL DEVICES FOR THIS PROJECT.
 - A. Switches.
 - B. Receptacles.
 - C. Device plates and box covers.

1.02 QUALITY ASSURANCE

- A. Manufacturers and catalog numbers specified establish configuration, rating and quality level to be provided.
- B. References
 - 1. FS W-C-596 Electrical Power Connector, Plug, Receptacle, and Cable Outlet.
 - 2. FS W-S-896 Switch, Toggle.
 - 3. NEMA WD 1 General-Purpose Wiring Devices.
 - 4. NEMA WD 5 Specific-Purpose Wiring Devices.

1.03 SUBMITTALS

- A. Submit product data under provisions of Division 1 General Requirements and Section 16010.
- B. Provide product data showing configurations, finishes, dimensions, and manufacturer's instructions.

PART 2 - PRODUCTS

- 2.01 DEVICES
 - A. Provide all similar devices from the same manufacturer. Color of devices and device plates shall be gray.
 - B. Manufacturers:

- 1. Hubbell.
- 2. Leviton.
- 3. Pass & Seymour.
- 4. General Electric.
- 5. Bryant.
- 6. Arrowhart.
- 7. Substitutions: Under provisions of Division 1.

2.02 SWITCHES

- A. Provide switches as follows:
 - 1. Switches for Lighting Circuits or Inductive Loads: Industrial Specification grade AC general use snap switch with toggle handle, rated 20 amperes, back-wired clamp type terminals, NEMA WD 1. FS W-S-896.
 - a. Single pole, 1 hp at 120-277 volts AC minimum; grey plastic handle, quiet type. Body: Nylon.
 - b. Pilot Light Type: Red illuminated toggle when in "on" position.
 - c. Three-Way and Four-Way Switch: similar to single pole.
 - d. Key Switches: tamper-proof lock.

2.03 OCCUPANCY SENSORS - WALLSWITCH

- A. Manufacturer: Wattstopper DW-100 or equal.
- B. Description:
 - 1. Sensor shall be capable of detecting presence in the control area by detecting Doppler shifts in transmitted ultrasound and passive infrared heat changes.
 - 2. Sensor shall utilize Dual Sensing Verification Principle for coordination between ultrasonic and PIR technologies to reduce likelihood of false operations.
 - 3. For best results, sensor shall feature a trigger mode where the end-user can choose which technology will activate the sensor from off mode (initial), the type of detection that will reset the time delay (maintain), and the type of detection that will cause the sensor to be turned back on immediately after lights turned off due to lack of motion (re-trigger).

Selection of technologies for initial, maintain, and re-trigger shall be done with DIP switches.

- 4. Sensor shall have its trigger mode factory preset to allow for quick installation in most applications. In this default setting, both technologies must occur in order to initially activate lighting systems. Detection by either technology shall maintain lighting on, and detection by either technology shall turn lights back on after lights were turned off for five seconds or less in automatic mode and 30 seconds or less in manual mode.
- 5. Sensor shall have four occupancy logic options for customized control to meet application needs.
- 6. Ultrasonic sensing shall be volumetric in coverage with a frequency of 40 KHz. It shall utilize Advanced Signal Processing which automatically adjusts the detection threshold dynamically to compensate for constantly changing levels of activity and air flow throughout controlled space.
- 7. The PIR technology shall utilize a temperature compensated, dual element sensor and a multi-element Fresnel lens. The lens shall be Poly IR4 material to offer superior performance in the infrared wavelengths and filter short wavelength IR, such as those emitted by the sun and other visible light sources. The lens shall have grooves facing in to avoid dust and residue build up which affects IR reception.
- 8. Sensor shall utilize SmartSet[™] technology to optimize automatic time delay to fit occupant usage patterns. The use of SmartSet shall be selectable with a DIP switch.
- 9. Sensor shall utilize Zero Crossing circuitry to reduce stress on relay and therefore increase sensor life.
- 10. DW-100 sensor shall have no minimum load requirement and shall be capable of switching from 0 to 800 Watt incandescent; 0 to 800 Watt fluorescent or 1/6 hp @ 120 VAC, 50/60Hz.
- 11. To blend in aesthetically, sensor shall not protrude more than 3/8" from the wall and utilize color-matched lens.
- 12. To assure detection at desktop level uniformly across the space, sensor shall have a 28 segment, two-level, Fresnel injection molded lens.
- 13. Sensor shall feature a walk-through mode, where lights turn off three minutes after the area is initially occupied if no motion is detected after the first 30 seconds, set by DIP switch.
- 14. To avoid false on activations and to provide immunity to RFI and EMI, Detection Signature Analysis shall be used to examine the frequency, duration, and amplitude of a signal, to respond only to those signals caused by human motion.

- 15. Sensor shall cover up to 1,000 sq. ft. for walking motion, with a field view of 180 degree.
- 16. Sensor shall have automatic-on or manual-on operation adjustable with DIP switch.
- 17. Sensor shall have a time delay that is adjusted automatically (with the SmartSet setting) or shall have a fixed time delay of five to 30 minutes, set by DIP switches.
- 18. In automatic mode, sensor shall be capable to automatically return to automatic-on after lights are turned off manually.
- 19. Sensor shall have the option for an audible warning that shall beep to warn the end-user before lights turn off automatically.
- 20. Each sensing technology shall have a LED indicator that remains active at all times in order to verify detection within the area to be controlled.
- 21. Sensor shall have a service switch to allow end-users to operate the sensor in the unlikely event of a failure; set by a trim pot.
- 22. Sensor shall be able to control incandescent, magnetic low voltage, electronic low voltage, and fluorescent loads.
- 23. Sensor shall have a built-in light level featuring simple, one-step daylighting setup that works from 8 to 180 footcandles.
- 24. Switching mechanism shall be a relay(s). Triac and other harmonic generating devices shall not be allowed. Sensor shall have ground wire and grounded strap for safety.
- 25. The Dual Technology wall switch sensor shall be a completely self contained control system that replaces a standard toggle switch.
- 26. To ensure quality and reliability, sensor shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%.
- 27. Sensor shall have standard 5-year warranty and shall be UL and CUL listed.

2.04 RECEPTACLES

- A. Manufacturers:
 - 1. Hubbell.
 - 2. Cooper Wiring Devices
 - 3. Leviton

- 4. Pass-Seymore
- 5. Substitutions: Division 1 Substitutions
- B. Specification: Duplex Receptacle
 - 1. Straight Blade Duplex Receptacle Type 2 Pole, 3 Wire, Grounding
 - 2. Amperage: 20A
 - 3. Voltage: 125V
 - 4. Color: Gray
 - 5. NEMA Number: 5-20R
 - 6. Horsepower: 1
 - 7. Certifications:
 - a. UL Listed File E41978 Listed to UL Standards 498 and Federal Spec WC-596 for Receptacles, 2003 UL 943 Class A GFCI's Certified to CSA File LR2488.
 - 8. Hospital Grade (All areas other than Rooms 100-113)
 - a. Heavy Duty Duplex Receptacle Type Tamper Resistant, Hubbell HBL8300SGGYA or Equal
 - b. GFCI Receptacle: Commercial Hospital Grade Convenience Tamper Resistant and Weather Resistant receptacles with integral Class A ground fault circuit interrupter to meet regulatory requirements, Hubbell GFR8300GYTR or Equal.

2.05 DEVICE PLATES

- A. Interior-finished, dry area Device Plates: gray lexan smooth. Provide same manufacturer as device; meet UL 514 requirements.
- B. Exterior Switch Cover Plates: weatherproof, cast metal with hinged gasketed device covers. Flap to open in upward direction. Provide same manufacturer as outlet box.
- C. Exterior Outlet Cover Plates: Weatherproof, gasketed, cast metal, GFCI configuration where device is GFCI, vertical mount, outlet enclosure to allow device to remain weatherproof while in use.
- D. Interior Wet Area Outlet Cover Plates: Gasketed, cast aluminum, GFCI configuration where device is GFCI, vertical mount.
- E. Interior Dry, Unfinished Area Raised Cover Plates: Galvanized steel.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Provide specific-use receptacles at heights shown on Contract Drawings.
- B. Receptacles for electric ranges shall be installed so the attachment plug is accessible from the front of the range by removal of the range drawer.
- C. Install raised galvanized steel cover plates on all surface mounted and exposed device junction boxes in dry areas.
- D. Install device plates on switch, receptacle, and blank cover plates where device is not installed.
- E. Install all switches with switch travel in vertical direction.
- F. Install devices and device plates flush and level.
- G. Install receptacles with narrowest dimension in vertical direction. Install grounding terminal down unless receptacle faces text requires alternate mounting to be read.

END OF SECTION

SECTION 16141 FLOOR BOXES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes floor boxes.
- B. Related Sections:
 - 1. Division 7 Through-Penetration Firestop Systems.
 - 2. Section 16130 Raceway and Boxes.
 - 3. Section 16140 Wiring Devices: Receptacles for installation in floor boxes.

1.02 REFERENCES

- A. NECA (National Electrical Contractors Association)- Standard of Installation.
- B. NEMA OS 1 (National Electrical Manufacturers Association) Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

1.03 SUBMITTALS

- A. Division 1 Submittals: Submittal procedures.
- B. Product Data: Submit catalog data for floor boxes service fittings.

1.04 CLOSEOUT SUBMITTALS

- A. Division 1 Contract Closeout: Closeout procedures.
- B. Project Record Documents: Record actual locations of each floor box and routing of conduits that serve each box.

1.05 QUALIFICATIONS

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

PART 2 - PRODUCTS

2.01 FLOOR BOXES

- A. Manufacturers:
 - 1. Hubble LCFB Series
 - 2. Wiremold "Walkerbox" RFB Series.
 - 3. Substitutions: Division Substitutions.
- B. Floor Boxes: NEMA OS 1, 3-1/2 inches deep maximum.
- C. Adjustability: Fully adjustable.
- D. Material: Formed steel or cast metal.
- E. Shape: Rectangular.
- F. Cover: Recessed steel with carpet or tile insert, steel trim and wire management blocks. Cover shall be designed to prevent water, dirt, and debris from entering the power and communication devices.
- G. Convenience Receptacle Floorbox: Duplex or quadraplex receptacles as indicated on the drawings.
- H. Data/Communications Floorbox: Quantity of modular jacks as indicated on the Drawings, in floorbox manufacturer's mounting bracket or mount suitable for modular faceplate installation.

PART 3 - EXECUTION

- 3.01 EXAMINATION
 - A. Division 1 Coordination: Coordination and project conditions.
 - B. Verify locations of floor boxes and outlets prior to rough-in.
 - C. Verify that openings in access floor are in proper locations.

3.02 INSTALLATION

- A. Provide floor cut and complete repair as necessary to install floor boxes and associated conduits.
- B. Set floor boxes level.

- C. Install boxes and fittings to preserve fire resistance rating of slabs and other elements, using materials and methods specified in Division 1.
- D. Install floor finish material in floorbox cover to match adjacent floor finish material.
- E. Floor Box Requirements: Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.
- F. Boxes and fittings are indicated on Drawings in approximate locations unless dimensioned. Adjust box location up to 10 feet to accommodate intended purpose.

3.03 ADJUSTING

- A. Division 1 Contract Closeout: Testing, adjusting, and balancing.
- B. Adjust floor box flush with finish flooring material.

3.04 CLEANING

- A. Division 1 Contract Closeout: Final cleaning.
- B. Clean interior of boxes to remove dust, debris, and other material.

END OF SECTION

SECTION 16411 ENCLOSED SWITCHES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes fusible and non-fusible switches.

1.02 REFERENCES

- A. NEMA FU1 (National Electrical Contractors Association). Low Voltage Cartridge Fuses.
- B. NEMA KS 1 (National Electrical Contractors Association).- Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
- C. NETA ATS (International Electrical Testing Association) Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (International Electrical Testing Association).

1.03 SUBMITTALS

- A. Division 1 Submittals: Submittal procedures.
- B. Product Data: Submit switch ratings and enclosure dimensions.

1.04 CLOSEOUT SUBMITTALS

- A. Division 1 Contract Closeout: Closeout procedures.
- B. Project Record Documents: Record actual locations of enclosed switches and ratings of installed fuses.

1.05 QUALIFICATIONS

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

PART 2 - PRODUCTS

- 2.01 FUSIBLE SWITCH ASSEMBLIES
 - A. Manufacturers:

- 1. Square D
- 2. GE Electrical
- 3. Eaton Cutler-Hammer
- 4. Substitutions: Division 1 Substitutions.
- B. Product Description: NEMA KS 1, Type HD with externally operable handle interlocked to prevent opening front cover with switch in ON position, enclosed load interrupter knife switch. Handle lockable in OFF position.
- C. Fuse clips: Designed to accommodate NEMA FU 1, Class R fuses.
- D. Enclosure: NEMA KS 1, as required to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
 - 1. Interior Dry Locations: Type 1.
 - 2. Interior damp locations: Type 3R.
 - 3. Exterior Locations: Type 3R.
- E. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.
- F. Furnish switches with entirely copper current carrying parts.

2.02 NON-FUSIBLE SWITCH ASSEMBLIES

- A. Manufacturers:
 - 1. Square D
 - 2. GE Electrical
 - 3. Eaton Cutler-Hammer
 - 4. Substitutions: Division 1 Substitutions.
- B. Product Description: NEMA KS 1, Type HD with externally operable handle interlocked to prevent opening front cover with switch in ON position, enclosed load interrupter knife switch. Handle lockable in OFF position.
- C. Enclosure: NEMA KS 1, as required to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
 - 1. Interior Dry Locations: Type 1.

- 2. Interior damp locations: Type 3R.
- 3. Exterior Locations: Type 3R.
- D. Switches shall have all copper current carrying parts.
- E. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.

2.03 SWITCH RATINGS

A. Switch Rating: Horsepower or ampere rated for load as indicated.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install enclosed switches plumb. Provide supports in accordance with Section 16070.
- B. Height: 5 ft to operating handle.
- C. Locate and install engraved plastic nameplates under the provisions of Section 16075.
- D. Provide properly sized fuses in all fused switches.
- E. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.
- F. Spare parts: Provide three spare of each size and rating of fuse installed on this project.
- 3.02 FIELD QUALITY CONTROL
 - A. Division 1 Quality Control, Contract Closeout.

END OF SECTION

SECTION 16415 UNDERGROUND ELECTRICAL SERVICE

PART 1 - GENERAL

1.01 REQUIREMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.02 SCOPE

A. The work covered under this Section shall include furnishing and installing an underground electrical service complete as shown on the Drawings and herein specified.

1.03 QUALITY ASSURANCE

- A. All equipment, materials and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications.
- B. All equipment and material shall be listed by Underwriter's Laboratories, Inc. (UL) for their intended use and shall bear the UL label.
- C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.
- D. All electrical work and service entrance equipment specified under this Section of these Specifications shall conform to the requirements of the electrical utility company.
- E. The grounding systems shall comply with the NEC and as hereinafter specified.

1.04 SUBMITTALS

- A. Division 1 Submittal Procedures: Submittal procedures.
- B. Submit Utility-Company-prepared as-built drawings with final record documents.
- C. Submit Meterbase and CT enclosure information to McGrath Lighting and Power for approval prior to Ordering.
- 1.05 FIELD MEASUREMENTS

A. Verify measurements and clearance with existing conditions and electrical utility prior to starting work.

PART 2 - PRODUCTS

2.01 ELECTRICAL SERVICE

- A. Primary service shall be 120/208V, three phase, and 4 wire with transformer as furnished by the local electric utility.
- B. This local electric utility shall furnish and install secondary underground or overhead service to the building and extend to metering equipment as shown on the Drawings. Secondary voltage, phase, and number of wires shall be as shown on the Drawings.
- C. All necessary devices, such as meter sockets, meter connection boxes, meter enclosures; current and/or potential transformers, instrument transformer hangers, and cabinets shall be furnished by this Contractor unless specifically furnished by the electrical utility company.
- D. Size and configuration of equipment is to be per local utility's requirements.

2.02 MATERIALS AND COMPONENTS

- A. Materials shall be furnished and installed by this Contractor as shown on the Drawings and as herein specified.
- B. All components exposed to the weather shall be UL listed for the application and conditions.

PART 3 - EXECUTION

3.01 SERVICE INSTALLATION

- A. This Contractor shall furnish and install a metering system as shown on the Drawings and as required by the local electrical utility company serving the project.
- B. This Contractor shall make all necessary final agreements with the owner and electrical utility company for the installation of the permanent electrical service.
- C. Coordinate with serving utility and provide all equipment and requirements for service installation.
- D. Effective ground all enclosures service entrance equipment enclosures.
- E. Trenching, back fill, and installation of primary utility lines and service laterals to be completed by Utility.

F. Contact utility company regarding charges related to service installation. Coordinate with Owner's Project Manager for preparation and submittal of line extension application. All utility company charges related to this service extension shall be paid for directly by Owner.

END OF SECTION

SECTION 16442 PANELBOARDS

PART 1 - GENERAL

- A. The requirements of the Contract, Division 1, and Division 16 apply to work in this Section.
- 1.01 SECTION INCLUDES
 - A. Panelboards

1.02 REFERENCES

- A. The panelboards and protection devices in this specification are designed and manufactured according to latest revision of the following standards (unless otherwise noted).
 - 1. ANSI 61
 - 2. ANSI/NEMA KS 1, Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts)
 - 3. ANSI/NEMA PB 1, Panelboards
 - 4. ANSI/NFPA 70, National Electrical Code
 - 5. ASTM American Society of Testing Materials
 - 6. CSA C22.2 No. 29, Panelboards and Enclosed Panelboards
 - 7. CSA C22.2 No. 5.1, Molded Case Circuit Breakers
 - 8. Federal Specification W-C-375, Rev. B, Amend. 1, Circuit Breakers, Molded Case; Branch Circuit and Service
 - 9. Federal Specification W-P 115, Rev. C, Panel, Power Distribution
 - 10. NEMA AB 1, Molded Case Circuit Breakers and Molded Case Switches
 - 11. NEMA PB 1.1, General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less
 - 12. UL 489, Molded-Case Circuit Breakers and Circuit-Breaker Enclosures
 - 13. UL 50, Enclosures for Electrical Equipment
 - 14. UL 67, Panelboards

15. UL 943, Ground-Fault Circuit-Interrupters

1.03 DEFINITIONS

A. Overcurrent Protective Device -- a circuit breaker pole or single fuse. Example: a 2-pole device is considered 2 protective devices.

1.04 SYSTEM DESCRIPTION

- A. Short circuit rating of panelboards shall be the interrupting rating of lowest rated device in the panel or applicable UL series rating for proper main and branch device combinations.
- B. Panelboards shall have a maximum of 42 protective devices per panel, including sub-feeders and excluding main overcurrent protective devices. For more than 42 devices, 2 or more panelboards are required.
- C. Protective devices shall be molded case circuit breakers.

1.05 SUBMITTALS

- A. Manufacturer shall provide copies of following documents to owner for review and evaluation in accordance with general requirements of Division 1 and Division 16:
 - 1. Product Data on specified product;
 - 2. Shop Drawings on specified product;
 - 3. Certified trip curves for each specified product;

1.06 PROJECT RECORD DOCUMENTS

A. Maintain an up-to-date set of Contract documents. Note any and all revisions and deviations that are made during the course of the project.

1.07 OPERATION AND MAINTENANCE DATA

- A. Manufacturer shall provide copies of installation, operation and maintenance procedures to owner in accordance with general requirements of Division 1 and Division 16.
- B. Submit operation and maintenance data based on factory and field testing, operation and maintenance of specified product.
- 1.08 QUALITY ASSURANCE (QUALIFICATIONS)

- A. Manufacturer shall have specialized in the manufacture and assembly of panelboards for 10 years.
- B. Panelboards shall be listed and/or classified by Underwriters Laboratories in accordance with standards listed in Article 1.03 of this specification.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products in accordance with recommended practices in manufacturer's Installation and Maintenance Manuals.
- B. Deliver each lighting panel board in individual shipping cases for ease of handling. Each panel board shall be wrapped for protection.
- C. Inspect and report concealed damage to carrier within specified time.
- D. Store in a clean, dry space. Maintain factory protection or cover with heavy canvas or plastic to keep out dirt, water, construction debris, and traffic. (Heat enclosures to prevent condensation.)
- E. Handle in accordance with NEMA and manufacturer's written instructions to avoid damaging equipment, installed devices, and finish.

1.10 PROJECT CONDITIONS (SITE ENVIRONMENTAL CONDITIONS)

- A. Follow (standards) service conditions before, during and after panel board installation.
- B. Panelboards shall be located in well-ventilated areas, free from excess humidity, dust and dirt and away from hazardous materials. Ambient temperature of area will be between minus 30 and plus 40 degrees C. Indoor locations shall be protected to prevent moisture from entering enclosure.

1.11 WARRANTY

A. Manufacturer warrants equipment to be free from defects in materials and workmanship for 1 year from date of installation or 18 months from date of purchase, whichever occurs first.

1.12 MAINTENANCE SERVICE

A. Furnish complete service and maintenance of panelboards for 1 year from date of substantial completion.

1.13 FIELD MEASUREMENTS

A. Make all necessary field measurements to verify that equipment shall fit in allocated space in full compliance with minimum required clearances specified in National Electrical Code.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Square D Company products have been used as the basis for design. Other manufacturers' products of equivalent quality, dimensions and operating features may be acceptable, at the Engineer's discretion, if they comply with all requirements specified or indicated in these Contract documents.

2.02 EQUIPMENT

A. Furnish Panelboards, Type as indicated in drawings. Loadcenters and residential style are **not** acceptable.

2.03 COMPONENTS

Refer to Drawings for: actual layout and location of equipment and components; current ratings of devices, bus bars, and components; voltage ratings of devices, components and assemblies; and other required details.

- A. Ratings
 - 1. Panelboards shall be rated as indicated in drawings.
 - 2. Maximum current ratings for mains, sub-feeds and branches, respectively, shall be as specified in drawings.

B. Enclosure

- 1. Boxes shall be a nominal 20 inches wide and 6 inches deep with wire bending space per National Electric Code.
- 2. Fronts shall be reinforced steel with concealed hinges. Trim clamps are unacceptable.
- 3. All door locks shall be corrosion proof Valox (or equal) with retractable latches. All door locks shall be keyed for a single key.
- 4. Clear Lexan (or equal) directory card holders shall be permanently mounted on front door.
- 5. All panel board series ratings shall be prominently displayed on dead front shield.

- 6. Interiors shall permit top or bottom incoming cables.
- C. Bus bars
 - 1. Bus bars shall be phase sequenced, fully insulated and supported by high impact Noryl (or equal) interior base assemblies.
 - 2. Bus bars shall be mechanically supported by zinc finished galvanneal steel frames to prevent vibration and damage from short circuits.
 - 3. Terminations shall be UL tested and listed and suitable for UL copper wire.
 - 4. Provide 1 continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors for plug-in or bolt-on branch circuit breakers. Bus bars shall be rated as indicated in drawings.
 - 5. Split solid neutral bus shall be plated and located in main compartment for all incoming neutral cables to be same length.
 - 6. Lugs shall be rated for 75 degree C terminations.
 - 7. Lug bodies to be bolted in place.
- D. Circuit Breakers
 - 1. Molded case circuit breakers shall be plug-in or bolt-on devices for 120/208V panels.
 - 2. All circuit breakers shall have thermal and magnetic trip elements in each pole.
 - 3. 2 and 3 pole breakers shall have internal common trip crossbars for simultaneous tripping of each pole.
 - 4. Circuit breakers shall not be restricted to any mounting location due to physical size.
 - 5. Main and sub-feed circuit breakers may be vertically or horizontally mounted.
 - 6. Branch breaker panel board connections shall be copper to copper.
 - 7. All panel board terminations shall be rated as indicated in drawings.
 - 8. All breakers shall have an over center mechanism and be quick make and quick break.
 - 9. All breakers shall have handle trip indication and a trip indicator in window of circuit breaker housing.

- 10. Breaker handle and faceplate shall indicate rated ampacity.
- 11. Circuit breaker escutcheon shall have standard ON/OFF markings.
- 12. Main breakers shall be UL listed for use with: Shunt, Under Voltage, and Ground Fault Shunt Trips; Auxiliary and Alarm Switches; and Mechanical Lug Kits.
- 13. Branch breakers shall be UL listed for use with: Shunt Trips, Auxiliary and Alarm Switches.

2.04 FINISH

- A. Boxes shall be corrosion resistant, zinc finish galvanized.
- B. Fronts shall be powder finish painted ANSI 61 gray.

PART 3 - EXECUTION

- 3.01 EXAMINATION
 - A. Verify that panelboards are ready to install.
 - B. Verify field measurements are as shown on Drawings.
 - C. Verify that required utilities are available, in proper location and ready for use.
 - D. Beginning of installation means installer accepts conditions.

3.02 INSTALLATION

- A. Install per manufacturer's instructions.
- B. Install required safety labels.
- C. Install multi-pole circuit breakers or other approved means of simultaneously disconnecting all ungrounded conductors where the branch circuit originates for each multi-wire branch circuit.

3.03 FIELD QUALITY CONTROL

- A. Inspect installed panelboards for anchoring, alignment, grounding and physical damage.
- B. Check tightness of all accessible mechanical and electrical connections. Minimum acceptable values are specified in manufacturer's instructions.
- C. Test each key interlock system for proper functioning.
3.04 ADJUSTING

A. Adjust all circuit breakers, access doors, operating handles for free mechanical and / or electrical operation as described in manufacturer's instructions.

3.05 CLEANING

- A. Clean interiors of panels to remove construction debris, dirt, shipping materials.
- B. Repaint scratched or marred exterior surfaces to match original finish.

END OF SECTION

SECTION 16510 LIGHTING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes lighting, lamps, ballasts, and accessories.

1.02 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).

1.03 SUBMITTALS

- A. Division 1 Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate dimensions and components for each luminary's not standard product of manufacturer.
- C. Product Data: Submit dimensions, ratings, and performance data.

1.04 QUALIFICATIONS

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

1.05 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 - PRODUCTS

2.01 LIGHTING

- A. Product Description: Complete interior luminaire assemblies, with features, options, and accessories as scheduled.
- B. Refer to Division 1 Product Requirements for product options.

2.02 GENERAL AND ACCESSORIES

A. Provide fixtures in conformance with the Fixture Schedule, with all required flanges and supports. Lighting fixtures shall be provided complete with all suspension, trim, mounting, and operating accessories normally considered necessary for a complete, functional, and safe installation, whether specifically called for in the Contract Documents or not.

2.03 LENSES

A. Lenses for recessed fluorescent fixtures shall be 100 percent virgin acrylic with a minimum overall thickness of 0.125 inch, except where specifically noted.

2.04 BALLASTS

- A. Provide energy-saving electronic ballasts, with less then 10% THD.
- B. Sound Rated A
- C. CBM approved and conform to UL 935.

2.05 LAMPS, FLUORESCENT

- A. Provide as scheduled. T8 32 Watt; CRI > 80. General Electric type SPX35 or equal.
- B. Unless otherwise indicated, compact fluorescent lamps shall be amalgam type, 4 pin base, 3500 degree K., CRI 82 or greater, RE835.

2.06 FLUORESCENT EMERGENCY BALLASTS

- A. Manufacturer: Bodine Co. Inc. Type B50ST or Equal.
- B. Capable of operating 2 lamps for 90 minutes
- C. Nickel-cadmium battery
- D. Test: Automatic code compliance testing.
- E. Warranty: 5 Years

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install suspended luminaries using pendants supported from swivel hangers. Install pendant length required to suspend luminaries 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 fixtures according to the requirements of the UBC as well as any local amendments.
- D. Clean all fixtures and lenses prior to final acceptance.
- E. Support luminaries larger than 2 x 4 foot size independent of ceiling framing.
- F. Locate recessed ceiling luminaries as indicated on reflected ceiling plan.
- G. Install surface mounted luminaries plumb and adjust to align with building lines and with each other. Secure to prevent movement.
- H. Exposed Grid Ceilings: Support surface-mounted luminaries on grid ceiling directly from building structure.
- I. Install recessed luminaries to permit removal from below.
- J. Install recessed luminaries using accessories and fire stopping materials to meet regulatory requirements for fire rating.
- K. Install clips to secure recessed grid-supported luminaries in place.
- L. Install wall-mounted luminaries at height as indicated on Drawings or as scheduled.
- M. Install accessories furnished with each luminary.
- N. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaries.
- O. Install specified lamps in each luminary.
- P. Ground and bond lighting in accordance with Section 16060.

3.02 FIRE-RESISTIVE CEILINGS

A. Provide "tenting" or other protection acceptable to the Authority Having Jurisdiction for fixtures installed in fire-resistive ceilings to maintain the fire-resistive rating of the complete assembly.

3.03 PERFORMANCE SPECIFICATION

A. The Fixture Schedule is a general guide to type, quality and other characteristics. Fixtures of equal or better performance and quality may be substituted, subject to approval.

END OF SECTION

SECTION 16612 FIRE AND SECURITY

PART 1 - GENERAL

- 1.01 DESCRIPTION:
 - A. These specifications include the furnishing, installation, and connection of the fire alarm and security equipment required forming a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, sensors, control panel, auxiliary control devices, keypads, annunciators, power supplies, and wiring as shown on the drawings, specified herein and as required to meet governing codes.
 - B. The contractor shall use these specifications and drawings and provide a complete fire alarm and detection design as required to be in compliance with NFPA, IBC, IFC, NEC, and other governing codes. The drawings may not show all required equipment and devices which may include connections to sprinkler systems, fire pumps, detectors in crawlspaces, attics, above ceiling spaces, etc.
 - C. The work covered under this Section shall also include furnishing and installing a centrally controlled complete and satisfactorily operating security intrusion system for the pick-up, amplification, and annunciation of building intrusion signals; fire alarm activation and trouble signals; and building low temperature signals to the Owner's central office.
 - D. The fire alarm system shall comply with requirements of NFPA Standard No. 72 for protected premises signaling systems except as modified and supplemented by this specification. The system field wiring shall be supervised either electrically or by software-directed polling of field devices.
 - E. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm and burglary applications and shall be installed in compliance with the UL listing.
 - F. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final check-out and to ensure the systems integrity.

1.02 SCOPE:

- A. A new microprocessor controlled fire alarm shall be installed in accordance with specifications and drawings.
- B. Basic Performance:
 - 1. Initiation Device Circuits (IDC) shall be wired Class B (NFPA Style B).

- 2. A single ground or open on any initiating device circuit or Notification Appliance Circuit (NAC) shall not cause system malfunction, loss of operating power or the ability to report an alarm.
- C. Basic Fire Alarm System Functional Operation
 - 1. When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:
 - a. Indicate the zone in alarm.
 - b. Activate audible and visual alarm notification appliances.
 - c. Activate the central station interface (and send pre-recorded voice message to owner specified phone number).
 - 2. The security system shall be furnished and installed as shown on the Drawings and as specified herein and shall function as follows:
 - a. Monitor the normally closed-door switch zones and activate on circuit opening. Zones shall be circuited as shown on the Drawings.
 - b. Monitor the fire detection and alarm system through normally closed contacts at the fire alarm control panel to activate by contact break on alarm condition and on a trouble condition.
 - c. Respond to motion detection contacts. Zones shall be circuited as shown on the Drawings.
 - d. Provide remote arming and disarming of the system from a semiflush mounted keypad.

1.03 QUALITY ASSURANCE

- A. All equipment and materials for this system shall be listed by Underwriter's Laboratories, Inc. (UL), bear the UL label, and shall be installed in accordance with all requirements of the National Electrical Code (NEC), all state and local codes, and these Specifications.
- B. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.
- C. This Contractor shall furnish submittals for all components of the fire and security system in accordance with SECTION 16010 of these Specifications. Submittals shall include the following for review.
 - 1. A complete list by model number of each component of the system with a statement of how many pieces of each model to be furnished and a listing of the specific data sheet.

- 2. A description of the system as it functions by component in the system using model numbers where applicable.
- 3. A data sheet shall be furnished for each component of the system. The specific information shall be highlighted.
- 4. A detailed set of floor plans for the complete building shall be furnished showing the locations of all equipment and devices and their required interconnections. Security devices shall be zoned as shown on the Drawings. The interconnections shown shall indicate the number, size, and type of wires as described in this Specification. The layout of all security intrusion system equipment and devices shall closely follow that shown on the Drawings.
- 5. A detailed drawing shall be furnished of each type of device showing the exact terminal designations.
- 6. A detailed list shall be furnished of each type of device in the system stating its program function in the system.
- D. This Contractor shall furnish and install all outlet boxes, conduit, wiring, door switches, security motion detectors, equipment enclosures, terminals, and all other accessories required to install a security intrusion system as herein specified and as indicated on the Drawings. The system shall be installed, connected, tested, and left in a first class operating condition.
- E. Catalog numbers specified for the security system constitute type, quality, and operating characteristics of the equipment and system to be furnished. The master and all peripheral devices that comprise the system shall be listed by Underwriter's Laboratories, Inc., (UL) and shall bear the UL label and shall be installed in accordance with all requirements of the National Electrical Code (NEC), all local codes, and these Specifications.

1.04 DOCUMENTATION

- A. This Contractor shall furnish to the Contractor four (4) bound copies of complete operating and maintenance instructions of the system including circuit diagrams and all other information necessary for the proper operation, service, and maintenance.
- B. This Contractor shall furnish to the Contractor a set of "as-built" drawings complete with field wiring diagrams.

1.05 TRAINING

A. This Contractor shall furnish the Owner's designated representative eight (8) hours of on-the-job technical service instructions in the operating, maintenance, and troubleshooting of the system.

1.06 SYSTEM TEST AND ACCEPTANCE

- A. Prior to the Architect/Engineer's final site visitation, this Contractor shall conduct an operating test of the complete system including each device. The system shall test free from grounds, shorts, and other faults. All connections shall be thoroughly checked for mechanical and electrical connection. All equipment shall be demonstrated to operate in accordance with the requirements set forth in these Specifications and as shown on the Drawings.
- B. This Contractor shall perform all tests in the presence of the Owner. This Contractor shall furnish all personnel for use in the test.
- C. When the work on the system has been completed and is ready for final review, a visit shall be made by the Owner at which time the Contractor shall demonstrate that the requirements of the Contract as it applies to this system have been carried out and that the system has been adjusted and operated in accordance herewith.

1.07 WARRANTY

A. This Contractor shall deliver the work in first-class operating condition in every respect. This Contractor shall also warrant that the material, equipment, and workmanship furnished shall be entirely free from defects. This Contractor shall repair or replace any material, equipment, or workmanship in which defects may develop within two (2) years after date of final acceptance by Owner at no additional expense to the Owner.

PART 2 - PRODUCTS

- 2.01 EQUIPMENT AND MATERIAL, GENERAL:
 - A. All equipment and components shall be new, and the manufacturer's current model.
 - B. All equipment and components shall be installed in strict compliance with manufacturers' recommendations.
 - C. All Equipment shall be attached to and ceiling/floor assemblies and shall be held firmly in place. (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.
- 2.02 CABLE:
 - A. MC Cable:
 - 1. The System shall be wired utilizing Fire Approved and Color Coded MC Cable suitable for use as Hospital Rated.

- 2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760). Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG (1.02 mm) for initiating device circuits and signaling line circuits, and 14 AWG (1.63 mm) for Notification device circuits.
- 3. All field wiring shall be completely supervised.
- B. Terminal Boxes, Junction Boxes and Cabinets:
 - 1. All boxes and cabinets shall be UL listed for their use and purpose.
- C. The Alarm Control Panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as FIRE AND SECURITY ALARM. Fire alarm control panel primary power wiring shall be 12 AWG (3.25 mm). The control panel cabinet shall be grounded securely to either a cold water pipe or grounding rod.

2.03 CONTROL PANEL (FACP):

- A. Basis of design is Ademco VISTA-128FB-24. Substitutions are acceptable. The FACP shall communicate with and control the following types of equipment used to make up the system: smoke detectors, manual pull stations, alarm notification appliances, security motion sensors, and other system controlled devices.
- B. The FACP shall have the following features:
 - 1. Supports addressable access control points using optional features (1 to 8 doors)
 - 2. Supports CCTV applications using optional switcher module
 - 3. Identifies the point or zone of a fire or alarm, using the annunciator
 - 4. Stores up to 512 events and accommodate 150 user codes
 - 5. Program and maintained with Windows based software
 - 6. Provide eight hardwired zones standard, expandable to 120 addressable points/zones or 128 wireless points/zones
 - 7. Control eight separate areas independently (8 partitions)
 - 8. Provide two on-board notification (bell) circuits delivering 2.3A @ 12V or 3.4amp @ 24V.
 - 9. Capable of automatic smoke detector sensitivity maintenance testing Notification Appliance Circuit's (two)
 - 10. Additional Features:

- a. Programmable
- b. Temporal code compliant
- c. Individually silenceable
- d. Programmable on-board auxiliary relay
- 11. SIA false alarm reduction features:
 - a. Exit error logic
 - b. Exit delay reset
 - c. Cross zoning
 - d. Call waiting defeat
 - e. Recent close report
- 12. Supports commercial hardwired, addressable polling loop and Wireless zones
 - a. Hardwired zones
 - (1) Provides eight style B hardwired zones
 - (2) EOLR supervised for Fire and UL burglary installations
 - (3) Supports N.O or N.C. sensors
 - (4) Individually assignable to one or all eight partitions
 - (5) Up to 16 two-wire smoke detectors each zone 1 and 2 (total 32)
 - (6) Up to 50 two-wire glassbreak detectors on zone eight
 - b. Addressable polling loop technology
 - (1) Supports up to 120 two-wire multiplex zones/points
 - (2) Global polling technology for faster processing
 - (3) Increased current draw capacity (128mA)
 - (4) Supervised by panel
 - (5) Individually assignable to partitions, notification circuit (bell)
 - (6) output or aux relay

- (8) Extender/Isolation bus module
- (9) Two-wire smoke detector zone/group expansion module adds two or four zones
- (10) Eight zone Class A and B extender module
- (11) Eight zone Class B extender module
- (12) One zone supervised contact monitor module
- c. UL Listed wireless expansion
 - (1) Supports up to 128 wireless zones using 5881 receiver
 - (2) Supervised by control for check-in signals
 - (3) Tamper protection for transmitters
 - (4) Individually assignable up to eight partitions
 - (5) Supports UL268/NFPA listed wireless smoke detectors
- 13. Access control integration
 - a. Full integration with Optional Access Control System Complete Gateway
- 14. Access functions:
 - a. Event reporting
 - b. Local printer of access or VISTA related event
 - c. Scheduled uploading of events to central station
 - d. Stored events for one call retrieval
- 15. Communication digital and voice communication, including but not limited to, sending pre-recorded voice message to owner selected phone number.
 - a. Phone mapping by zone response type
 - b. Supports and includes Interactive Phone Voice Module
 - c. Panel operation during download
 - d. Uploading equipment list to central station

- e. Communication via Optional Gateway Module (VGM)
- C. SPECIFICATIONS
 - 1. Cabinet dimensions:
 - a. 18"h x 14.5"w x 4.3"d
 - 2. Environmental:
 - a. Storage temp:
 - (1) -10°C to 70°C
 - b. Operating temp:
 - (1) 0°C to 50°C
 - c. Humidity:
 - (1) 85% RH
 - 3. EMI:
 - a. Meets or exceeds the following requirements:
 - (1) FCC Part 15, Class B Device
 - (2) FCC Part 68
 - (3) IEC EMC Directive
- D. AGENCY LISTINGS
 - 1. Burglary:
 - a. UL609 Grade A Local Mercantile Premises and Mercantile Safe and Vault
 - b. UL611/1610 Grades A, AA, Central Station
 - c. UL365 Grades A, AA Police Connect
 - 2. Fire:
 - a. UL864/NFPA72 Local, Central Station and Remote Station
 - b. Factory Mutual
 - c. UL985

2.04 POWER REQUIREMENTS

- A. Electrical:
 - 1. Primary power:
 - a. 80VAC @ 72 VA ADEMCO No. 1450
 - 2. Quiescent current draw:
 - a. 350mA
 - 3. Backup battery:
 - a. 12VDC, 12AH min to 34AAH max
 - b. Lead acid battery (gel type)
 - 4. Alarm power:
 - a. 12VDC, 1.7A max for each notification (bell) circuit output
 - 5. Aux. standby pwr:
 - a. 12VDC, 1A max
 - 6. Total power:
 - a. 2.3A at 12VDC, 3.4A at 24VDC from all sources
 - 7. Standby time:
 - a. 24 hours with 1A standby load or 60 hours with 205mA max standby load using 34AAH battery
 - 8. Fusing:
 - a. Battery input, aux. and notification (bell) circuit outputs are protected using PTC circuit protectors. All outputs are power limited.

2.05 MAIN DIALER:

- A. Line seize:
 - 1. Double Pole
- B. Ringer equiv.:
 - 1. 0.7B

- C. Formats:
 - 1. ADEMCO Low Speed, ADEMCO 4+2 Express, ADEMCO High Speed, ADEMCO Contact ID, Sescoa and Radionics
- D. Communication:
 - 1. Digital
 - 2. Voice: Send pre-recorded voice message to owner selected phone number.
- 2.06 SYSTEM COMPONENTS:
 - A. Addressable Smoke Detectors
 - 1. Basis of Design: Ademco 5192SD/5192SDT
 - 2. Primary Features:
 - a. Low profile design
 - b. Addressable loop device
 - c. Automatic maintenance reporting
 - d. Photoelectric smoke detector
 - e. Provide with optional integral 135 deg. F fixed temperature heat sensor where indicated on drawings
 - f. Simple 2 wire installation
 - g. Tamper resistant
 - h. DIP switch or serial number programmable
 - B. Manual Pull Station
 - 1. Basis of Design: Ademco 5140MPS-2
 - 2. Primary Features
 - a. Aluminum die cast
 - b. Key reset and test
 - c. Screw terminals
 - d. Gold contact SPST

- e. ADA compliant
- f. UL, CSFM, MEA listed and approved
- C. Chime/ Strobe
 - 1. The chime appliances shall be System Sensor SpectrAlert series.
 - 2. The chime shall be UL Listed under Standard 464 for Private Mode Audible Signal Appliances and chimes equipped with strobes shall be listed under UL Standard 1971 for Emergency Devices for the Hearing-Impaired. In addition, the strobes shall be certified to meet the requirements of FCC Part 15, Class B and shall incorporate low temperature compensation to ensure the lowest possible current consumption.
 - 3. All chimes shall use solid state components and shall provide field selectable single stroke or vibrating operation with volume control and tone control.
 - 4. All models shall have a listed Anechoic sound output of 83 dB at 10 feet and a listed frequency response rate of 800 to 1200 Hz.
 - 5. All inputs shall employ terminals that accept #12 to #18 AWG wire sizes.
 - 6. The strobe portion of the appliance shall produce a flash rate of one (1) flash per second over the Regulated Voltage Range and shall incorporate a Xenon flashtube enclosed in a rugged Lexan® lens. The strobe shall be of low current design and shall have Zero Inrush.
 - 7. Where wall mount, Multi-Candela Chime Strobes are specified, the strobe intensity shall have a minimum of four (4) field selectable settings and shall be rated per UL 1971 for: 15, 30, 75 or 110 candela. The selector switch for selecting the candela shall be tamper resistant and not accessible from the front of the appliance. The 15/75 candela strobe shall be specified when 5 candela UL 1971 listing with 75 candela on-axis is required (e.g. ADA compliance).
 - 8. For ceiling mount applications, the strobe intensity shall be 75 or 100 candela.
- D. Horn/ Strobe (Weatherproof)
 - 1. The notification appliance shall be a Wheelock Series MT audible/visual appliance or equivalent.
 - 2. Notification appliance shall be electronic and use solid state components. Electromechanical alternatives are not approved.
 - 3. Each electronic appliance shall provide eight (8) field selectable alarm tones. The tones shall consist of: HORN, BELL, MARCH TIME HORN, CODE-3 HORN, CODE-3 TONE, SLOW WHOOP, SIREN and HI/LO. Tone

selection shall be by durable dip switch assembly and not clips or jumpers. The audible and the strobe shall be able to operate from a single NAC circuit while producing any of these tones.

- 4. The appliance shall provide two output sound levels: STANDARD and HIGH dBA. The HIGH dBA setting shall provide a minimum 5 dBA increase in sound output at nominal voltage.
- 5. The HIGH anechoic dBA measurement at 10 feet at the alarm HORN SETTING shall be 101 dBA minimum for MT and 99 dBA minimum for MT Strobes, at nominal voltage.
- 6. Operating voltages shall be either 12 VDC or 24 VDC using filtered power or unfiltered power supply (full-wave-rectified).
- All models shall have provisions for standard reverse polarity type supervision and IN/OUT field wiring using terminals that accept #12 to #18 AWG wiring.
- 8. Combination audible/visual appliances shall incorporate a Xenon flashtube enclosed in a rugged Lexan® lens or equivalent with solid state circuitry.
- 9. Strobe shall produce a flash rate of one (1) flash per second minimum over the voltage range. The strobe intensity shall be rated per CAN/ULC-S526-M87 for Candela. The 15/75 candela strobe shall be specified when 15 candela with 75 candela intensity on-axis is required. All Listed strobe appliances shall incorporate low temperature compensation to insure the lowest possible current consumption. Strobe activation shall be via independent input or from the same input circuit as the audible.
- 10. The combination audible/visual appliances may be installed outdoors and surface mounted. They shall mount to standard electrical hardware requiring no additional trimplate or adapter. The aesthetic appearance shall not have any mounting holes or screw heads visible when the installation is completed.
- 11. The appliance shall be finished in a textured red color.
- 12. The audible appliance may be installed indoor or outdoor with the proper back box.
- E. Motion Detector, Passive Infrared and Microwave
 - 1. Basis of Design: Ademco V-Plex , dual technology Model # QUEST2260SN.
 - 2. Detection Method: Passive infrared and Microwave
 - 3. Coverage: 60'x75'
 - 4. Detection Zones

- a. 38 zones (11 long range, 11 over 6 intermediate, 5 over 5 short range, and 1 lookdown)
- 5. Pulse Processing
 - a. Standard or Intermediate, selectable bia a dip switch
- 6. Mounting
 - a. 7' (2.1m), nominal
- 7. Indicators
 - a. Red and green LED with enable/disable switch
- 8. Input Voltage
 - a. 9-13V at polling loop terminals with reverse polarity protection
- 9. Current
 - a. 3 mA Conditional microwave mode
 - b. 6 mA Normal mode (LED disabled)
 - c. 8 mA Normal mode (LED enabled)
- 10. Standby
 - a. Power source should be capable of at least 4 hours of battery standby
- 11. Microwave Frequency Band
 - a. S-band: 2.54 GHz.
 - b. X-band: 10.525 GHz.
 - c. K-band: 24.125 GHz.
- 12. Operating Temp
 - a. 0° to 50° C.
- 13. Operating Humidity
 - a. Up to 95% RH (max.), non-condensing
- 14. Dimensions
 - a. 2.8" W x 5.2" H x 2.2" D (71mm x 132mm x 56mm)

- 15. Accessories:
 - a. Swivel bracket
- F. Keypad
 - 1. Basis of Design: Ademco 6139
 - a. Display: large, two line, 32 character, backlit customized English language display that indicates warnings and zone. The console is the system's information center, providing the status of your system at-a-glance, with all information clearly displayed in a bright, extra large liquid crystal display (LCD) window. Arranged in a telephone touchpad configuration. Keys are backlit.
 - b. Programmable to specific needs. Each protection zone is custom-programmed into the control by your alarm installer and is identified by name. You are instantly aware of the status of your security system. Depending on your system, different emergency situations can signal a 24-hour central station in case of a fire, police, or personal problem. Built-in self-help A self-help feature (on select controls) reviews the basic system functions and operation, displaying them in the console window; especially helpful to new users. It is activated by simply pressing any desired function key for five seconds.
 - 2. Keypad features:
 - a. New attractively designed white keypad with removable door
 - b. New easy-touch plastic white keys that are backlit for easy visibility
 - c. Large type that can display 2 lines of English text
 - d. Separate keys for emergencies
 - e. Built-in sounder makes audible "beeps" for entry/exit delays, system status and other alarm conditions
 - f. All protection zones and system events are displayed in simple English words
 - g. User-friendly all system functions are clearly marked on the touch pad. Operation is simplified by using a uniform "security code + command" entry to perform any desired function.
- G. Low Temperature Alarm
 - 1. Basis of design: FBII T300. Temperature sensor equipped as a dual temperature sensor, the TS-300 provides simultaneous operation of local and remote probes.

- 2. Features
 - a. Programmable hysteresis
 - b. Output matrix mapping
 - c. Alarm memory (Up to 8 events)
 - d. Audible alarm with silence timeout which can be programmed to resound according to user preferences.
 - e. Simultaneous operation of local and remote probes
 - f. Programmable Alarm Delay ignores temporary conditions
 - g. Audible Alarm with Silence Timeout
- 3. Specifications:
 - a. Temperature Range/Accuracy (Local Sensor): 32°F to 140°F (0°C to 60°C)
 - b. +/-3°F (+/-1.7°C)
 - c. Temperature Range/Accuracy (Remote Probe): -40°F to 140°F (-40°C to
 - d. 60°C) +/-4°F (+/-2.2°C)
 - e. Minimum Span between Hi and Low Limits: 4°F (2.2°C)
 - f. Alarm Delay: 0-255 minutes in 1 minute increments
 - g. Alarm Output Type: (2) Form A reed relays
 - h. Alarm Output Resistance: 25 ohms maximum
 - i. Alarm Output Rating: 50mA/30VDC maximum
 - j. Audible Alarm: 4kHz, 75dB@10cm pulsed 750 mS on/off
 - k. Audible Alarm Silencing: 0-255 minutes in 1-minute increments
 - I. Input Voltage: 7 to 16 VDC
 - m. Input Current: 25 mA (max.)
 - n. Case Dimensions: 4" x 2.6" x 0.9"

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.
- B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
- C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
- D. At the final inspection a factory trained representative of the manufacturer of the major equipment shall perform the tests in Section 3.2 TEST.
- E. Manual pull stations shall be suitable for semi-flush mounting on standard single gang box, and shall be installed not less than 42 inches (107 mm) or more than 48 inches (122 mm) above the finished floor. Manual Stations shall be UL listed.

3.02 TEST

- A. Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system.
- B. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
- C. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
- D. Verify activation of all flow switches.
- E. Open initiating device circuits and verify that the trouble signal actuates.
- F. Open and short notification appliance circuits and verify that trouble signal actuates.
- G. Ground circuits and verify response of trouble signals.
- H. Check presence and audibility of tone at all alarm notification devices.
- I. Check installation, supervision, and operation.

- J. Verify that each initiating device alarm is properly received and processed by the FACP (Walk Test).
- K. Conduct tests from the FACP to verify trouble indications for common mode failures, such as alternating current power failure.
- 3.03 FINAL INSPECTION:
 - A. At the final inspection a factory-trained representative of the manufacturer of the major equipment shall demonstrate that the systems function properly in every respect.
- 3.04 INSTRUCTION:
 - A. Provide instruction as required to the building personnel. "Hands-on" demonstrations of the operation of all system components and the entire system shall be provided.

END OF SECTION

SECTION 16745 TELECOMMUNICATION SYSTEM

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide the equipment, materials, and labor to install the systems shown on the drawings and specified herein. This shall include (but not be limited to) provision of all raceways, sleeves, boxes, line and low voltage wire and cable, patch cords, pull ropes (in unused conduits), panels, outlets, jacks, connections, cable management, labeling, testing and all other material, equipment, and labor required to make the systems fully operational.

1.02 COORDINATION

A. Necessity to coordinate this work with the Owner and the Contracting Agency is emphasized. The Contractor shall be responsible for any omissions, delays and additional cost due to lack of coordination or approval from the same in accordance with the latest Cat 5e proposed standards.

1.03 CODES AND STANDARDS

- A. Where a Nationally Recognized Testing Laboratory (NRTL) listing or classification exists for a product and the product is suitable for the purpose specified and indicated, the product shall bear the appropriate marking indicating the listing or classification.
- B. Where a UL Standard is in effect, equipment shall:
 - 1. Meet that Standard.
 - 2. Bear the UL Label.

1.02 SUBMITTALS

- A. The following shall be submitted in accordance with Section 16010 and Division
 1 in sufficient detail to show full compliance with the specification:
 - 1. Manufacturer's Catalog Data shall be submitted for the following items. Data shall include a complete list of parts, special tools, and supplies with current unit prices and source of supply.
 - a. Copper Cable
 - b. Copper Modular Jack

- c. Patch Panels
- d. Information Outlets
- e. J-hooks
- f. Racks
- g. Patch Cords
- 2. SHOP DRAWINGS
 - a. Work shall be laid out in advance. Shop drawings shall be submitted to the Project Manager for approval before work begins.
 - (1) Shop Drawings shall include:
 - Dimensioned layout of major pathways, including jhooks, sleeves and large conduits (2" and larger.) and location of all fire wall penetrations.
 - (ii) Plan drawings indicating locations and identification of work area outlets, nodes, telecommunications closets (IDFs), and backbone (riser) cable runs.
 - (iii) Plan view of telecommunication zones denoting each outlet associated homerun destination.
 - (iv) Oneline diagram of the telecommunication grounding plan.
 - (v) Telecommunications Rooms (TRs) and equipment room (ER and/or MDF) termination detail sheets.
 - (vi) Patch panel schedules for each patch panel denoting room number, outlet ID, and port number.
 - (vii) Labeling and administration documentation.
 - (viii) Provide in AutoCad 14 or later electronic format with pen configuration file and hard copy for line weights.

1.05 LABELING SYSTEM

- A. Labeling shall conform to ANSI/TIA/EIA-606 standards. In addition, provide the following:
 - 1. Label each outlet with permanent self-adhesive label with minimum 3/16-in. high characters.

- 2. Use labels on face of data patch panels. Provide facility assignment records in a protective cover at each telecommunications closet location that is specific to the facilities terminated therein.
- 3. Labels shall be machine-printed. Hand-lettered labels shall not be acceptable
- 4. Label outlets with closet number cable is run from (TCx), followed by room number in which outlet is located (xxxx), followed by a single number to indicate particular outlet within room (Jx), i.e.,T2-B103-J2.
- 5. Label patch panels with room number in which outlet is located (xxxx), followed by a single number to indicate particular outlet within room (Jx), followed by a singe number to indicate particular connector in the outlet. i.e., B103-J2-1.
- 6. Mark up floor plans showing outlet locations, type, and cable marking of cables. Turn these drawings over to the owner two (2) weeks prior to move in to allow the owner's personnel to connect and test owner-provided equipment in a timely fashion.

1.06 QUALITY ASSURANCE PLAN

- A. Contractor shall prepare a quality assurance plan which provides a detailed outline of all testing to be accomplished. Quality assurance plan shall include, as a minimum, a schedule of when tests will be performed relative to installation milestones, specific test procedures that will be used, a list of test equipment that will be used including manufacturer, model number, calibration certification, and range and resolution accuracy. Test plan shall be submitted to the Owner for approval at least 30 days prior to the start of testing.
- B. Perform all Work in accordance with all regulatory rules and regulations as well as references in this specification.
- C. Perform all Testing in accordance with ANSI/TIA/EIA-568-A and ANSI/TIA/EIA-TSB 67 specifications and submit all printed reports.

1.07 REFERENCE CODES AND STANDARDS

- A. Design, manufacture, test, and install telecommunications cabling networks per manufacturer's requirements and in accordance with NFPA-70 (National Electrical Code), state codes, local codes, requirements of authorities having jurisdiction, and particularly the following standards:
 - 1. ANSI/TIA/EIA-568-B.1,2,3: Commercial Building Telecommunications Cabling Standard.
 - 2. ANSI/TIA/EIA-569-A: Commercial Building Standard for Telecommunications Pathways and Spaces.

- 3. ANSI/TIA/EIA-606 -- The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
- 4. ANSI/TIA/EIA-607 -- Commercial Building Grounding and Bonding Requirements for Telecommunications.
- 5. Install cabling in accordance with the most recent edition of BICSI® publications:
 - a. BICSI -- Telecommunications Distribution Methods Manual.
 - b. BICSI -- Cabling Installation Manual.

1.08 WORKMANSHIP

- A. Components of the system shall be installed in a neat, workmanlike manner. Wiring color codes shall be strictly observed and terminations shall be uniform throughout the system. Identification markings and systems shall be uniform. TIA/EIA 568A wiring codes as shown on the drawings shall standardize all wiring
- B. Install materials and equipment in accordance with applicable standards, codes, requirements, and recommendations of national, state, and local authorities having jurisdiction, and National Electrical Code® (NEC) and with manufacturer's printed instructions

1.09 QUALIFICATIONS

- A. The telecommunications work specified in this Section is acknowledged to require special skills mastered by education, experience, or both. Bidders for telecommunications work described in this Section shall be specialty telecommunications contractors, who may be a division or subcontract of the Division 16 Subcontractor.
- B. Specialty Subcontractors bidding telecommunications work shall have a minimum of three years experience in the construction, testing, and servicing of systems of the type and magnitude specified herein. This Subcontractor shall have completed at least three projects equal or larger in size than this project within the past three years. The Subcontractor shall have direct access to all tools and test equipment required to complete the telecommunications work when the work is bid.

1.10 REGULATORY REQUIREMENTS

- A. All Work shall conform to the requirements of NFPA 70.
- B. All Work shall conform to the requirements of all Federal, State and Local Electrical and Telecommunications Regulations.

1.11 TERMINOLOGY

- A. "TDS" shall refer to the Telecommunication Distribution System cabling and hardware infrastructure internal and external to a building or buildings used to transmit voice and data, etc.
- B. "Stations" shall refer to individual telephone or computers, or remote peripherals of those systems (e.g., printers, facsimile machines, modems, etc.
- C. "Outlets" shall refer to the group of receptacles or jacks at the location where the stations connect.
- D. "Jacks" or "Ports" shall refer to the individual receptacles where phones, computers, etc. connect.
- E. "Station Cables" shall refer to the horizontal cables connecting patch panels or terminal blocks in the Telecommunications Closets to the stations.
- F. "Pathways" shall refer to conduits, sleeves, cable trays, distribution rings, etc., which are employed to route backbone and stations cables between equipment rooms, telecommunications closets, stations, outlets, etc.
- G. "Terminal Blocks" shall refer to multiple punch down cable terminations.
- H. "Patch Panels" shall refer to rack or frame mounted multiple punch down cable terminations with RJ-45 style, 8-position jacks on the face for "plug and play" cross connect capability.
- I. "Cable Management" shall refer to rings, troughs, gutters etc., mounted in conjunction with telecommunications distribution equipment and terminal blocks, for the orderly routing of cables, patch cords, etc.
- J. "LEC" shall refer to the Local Exchange Carrier providing telephone service to the facility.

1.12 PROTECTION OF OWNER'S FACILITIES

- A. Effectively protect the owner's facilities, equipment, and materials from dust, dirt, and damage during construction.
- B. Remove protection at completion of the work.

1.13 AS-BUILTS

A. Three (3) sets of as-built drawing shall be delivered to the owner within four (4) weeks of acceptance of project by the owner. A set of as-built drawings shall be provided to the owner electronic media form, 3.5" floppy or CD-ROM and utilizing CAD software that is acceptable to the owner. The magnetic media shall be delivered to the owner within four (4) weeks of acceptance of project by owner.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Provide products of manufacturers as named in individual articles
 - 1. Submittals to be approved by the Project Manager before installation.
 - 2. Where no manufacturer is specified, provide products of manufacturers in compliance with requirements.
 - 3. 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.
 - 4. Provide products that are suitable for intended use, including, but not limited to environmental, regulatory, and electrical requirements.
- B. Structured Cat 5e cabling systems will include copper cable, and connecting hardware. Including but not limited to jacks/connectors, faceplates, patch cables. Provided equipment from the following list of approved manufacturers. Provided only equipment from one of the three following approved systems:
 - 1. Belden/Krone/Siecor
 - a. Cable -- DataTwist350 (1701A)
 - b. Patch Panel -- 'Patch Plus Patch Panel' Krone 6653 1 742-48 '4RMS' cable management included
 - c. Connector Krone K600 series
 - d. Patch cables Krone
 - 2. Berk-tek / Ortronics
 - a. Cable -- Berk-tek LANmark350
 - b. Patch Panel -- Ortronics OR-851004038 '2RMS' with management Ortronics OR-60400057 '2RMS'
 - c. Connector Series II 'Connectors will need special tabs that include numbers for ports'
 - d. Patch cables Ortronics
 - 3. Lucent
 - a. Cable -- Lucent 2061
 - b. Patch Panel -- Lucent PM2150B-48 cable management included

- c. Connector Lucent MPS100E Series
- d. Patch cables Lucent

2.02 EQUIPMENT

- A. Connectors & Face plates
 - 1. All jacks shall be pinned to 568-B wiring standard
 - 2. Prefer angled face plates or connectors
- B. Patch Cables
 - 1. Cat 5e patch cable shall be included in the project and delivered to the site. The quantity shall be equal to the number of new terminated patch panel ports doubled. Half the patch cable will be 10' in length the other half will be 7' length.
- C. Equipment Racks
 - 1. Open frame, 19 in. equipment rack, 7 foot overall height with flange base
 - 2. Mounting rails drilled front and back and tapped to EIA standards
 - 3. 40+ RMS
- D. J-Hooks
 - 1. CAT 5 rated
 - 2. Sized for 20% spare future capacity for all branches.

PART 3 - EXECUTION

3.01 GENERAL

- A. PRE-INSTALLATION SITE SURVEY
 - 1. Prior to start of systems installation, meet at the project site with the owner's representative and representatives of trades performing related work to coordinate efforts. Review areas of potential interference and resolve conflicts before proceeding with the work. Facilitation with the General Contractor will be necessary to plan the crucial scheduled completions of the equipment room and telecommunications closets
- B. Examine areas and conditions under which the system is to be installed. Do not proceed with the work until satisfactory conditions have been achieved

- C. Provide, connect and test all equipment and materials for the systems herein specified and shown on the drawings. All wiring shall be run in pathway or raceway and shall be neatly tied or laced in cabinets and terminated on appropriate terminating hardware provided for the purpose. Each cable shall be identified by an approved marking system at each end.
- D. Outlet/Jacks shall be identified with machine printed labels. Hand lettered labels shall not be used.
- E. Wherever materials, methods or placements of materials and equipment for the communications work is provided by other Subcontractors or the Owner, it shall be the responsibility of this specialty Subcontractor to coordinate that work and assure that it is provided in such a manner as to enhance the final system operation.
- F. Test the systems, demonstrate operation to the Contracting Agency and provide training as specified.
- G. Work under this section shall be closely coordinated with work under other sections of the project.
- H. Tie wraps shall not deform the cable insulation when tightened.

3.02 DELIVERY AND STORAGE

- A. Receive, check, unload, handle, store, and adequately protect equipment and materials to be installed as part of the contract. Include delivery, unloading, setting in place, fastening to walls, floors, ceilings, or other structures where required, interconnecting wiring of system components, equipment alignment and adjustment, and other related work whether or not expressly defined herein.
- B. The contractor is responsible for safekeeping of all equipment and materials, on the job site. The owner assumes no responsibility for protection of above named property against fire, theft, and environmental conditions.
- C. Cables shall be tested immediately upon receipt and received or rejected and returned based upon testing or visual inspection.
- D. Report and record all serial numbers received and/or rejected.
- E. All inspection and testing shall be performed under the observation of the Contracting Agency at the Contracting Agency's option. Provide three (3) working days advance notice of tests.

3.03 CABLE INSTALLATION

A. Follow cable manufacturer's specification regarding handling methods, retaining/support methods, bending radius and maximum pulling tension limitations.

B. Telecommunication cables shall not be installed in the same raceway as power cables.

3.04 SUPPORT AND ROUTING OF CABLES

- A. Station cables and tie cables installed within ceiling spaces shall be routed through these spaces at right angles to electrical power circuits and supported only from the structure. Riser and tie cables shall be extended between TC's utilizing the interfloor conduit sleeves
- B. Use of ceiling tiles, grid or hanger wires for support of cables shall be prohibited
- C. Install a complete set of supporting rings, hoods and other supporting hardware for this system as part of the contract. All supporting hardware shall be submitted to the engineer for approval prior to installation
- D. Support cable installed above removable ceilings every four- (4) feet with Jhooks or equivalent attached to permanent structures from the outlet stub to the Telecommunication closet. Cable is not to be attached to or lay on other cables, pipes or conduit
- E. Use 3/8 inch threaded rods with c-hangers for supporting raceway
- F. Maintain a minimum clearance of;
 - 1. 5 inches from unshielded power lines or electrical equipment (lights, motors, etc) for circuits of less than 2kVA
 - 2. 12 inches for 2 5 kVA circuits
 - 3. 24 inches for circuits greater than 5Kva.
 - 4. 4 feet from transformers and motors over $\frac{1}{2}$ HP.

3.05 HORIZONTAL CABLING

- A. Install station cabling to the nearest communications closet, unless otherwise noted
- B. Install cables in one continuous piece. Splices will not be allowed
- C. Do not exceed 90 meters cable length for any connection
- D. Adhere to manufacturer's published specifications for pulling tension, minimum bend radii, and sidewall pressure when installing cables
- E. Where manufacturer does not provide bending radii information, minimum bending radius shall be 10 times cable diameter
- F. Installation shall conform to the following basic guidelines:

- G. Use of approved wire, cable, and wiring devices
- H. Neat and uncluttered wire termination
- I. When terminating cable, only remove as much cable jacket as needed to terminate properly to the connecting hardware
- J. Cable pairs shall not be untwisted more the .5 inch at the point of termination
- K. Install 1-foot cable service loop for all horizontal cable at or near the workstation outlet.

3.06 RACEWAY INSTALLATION

- A. Provide raceway of required size and type where indicated on job drawings; Provide accessories required for a complete installation
- B. Route raceway to avoid interferences, using standard sections and a minimum number of field-cut sections.
- C. Route raceway to avoid interference with removal and installation of lighting fixtures and devices of other systems which require servicing or operation
- D. Remove any sharp burrs or edges from raceway
- E. Completed raceway runs shall have no cracks or openings at coupled sections
- F. Strict adherence to the National Electrical Code is required for any raceway penetrations of fire-rated walls or penetrations.
- G. Data-Power poles are provided to extend voice, data and electrical capabilities from an overhead modular system to the work area level

3.07 DISTRIBUTION PATHWAYS

- A. Layout distribution pathways in accordance with the contract drawings and cable spacing requirements. Set j-hooks so that taps or changes in direction do not exceed 45 degrees.
- B. Mount Cat5 rated J-hooks on 12-inch nominal lengths of P-1000 metal strut. Mount strut securely to the building structure. Maximum spacing shall be 4 feet on center.
- C. Coordinate the layout of pathways with all other trades. Report conflicts to Contracting Agency for resolution by the Contracting Agency.

3.08 INTERCONNECTIONS

- A. Interconnections at all terminal hardware shall be provided to form a complete and functioning system.
- B. Equipment cables shall be interconnected to horizontal cabling on Termination Modules color-coded Blue.

3.09 DAMAGE AND DEFECTS

- A. Use a tension-monitoring device to ensure that the maximum pulling tension that may be applied to the cable to be pulled into a conduit section is not exceeded. Provide replacement cable if cable manufacturer's maximum pulling tension is exceeded at any time during a pull.
- B. Cable shall be carefully inspected for sheath defects or other irregularities as it is paid out from the reel. When defects are detected, pulling shall stop immediately and the cable section shall be repaired or replaced at the discretion of the Contracting Agency. A system of communications shall be maintained between pulling and feed locations so that pulling can be stopped instantly, when required.
- C. Adequate care shall be exercised when handling and storing reels of cable to prevent damage to the cable. Cable with dents, flat spots, or other sheath distortions shall not be installed.

3.10 LAYOUT

- A. All work shall be laid out in advance. Cables shall be racked and supported in a workmanlike fashion. All work shall be labeled according to ANSI/TIA/EIA 606, and color-coded according to BICSI Standards.
- B. Pairs from each cable shall be terminated sequentially from left to right, top to bottom starting with the lowest assigned number at the upper left-hand corner of the panel.
- C. Keep up to date "As-built" record drawings at each job site detailing the layout of all data racks and telephone, data and trunk terminal blocks on terminal boards, including a typed listing of cables/rooms served by each terminal block. Refer to Section 16010 for other Record Document requirements
- D. Layout Shop Drawings shall be prepared using CAD. Final approved Shop Drawings shall be updated with precise "as-built" conditions and shall be submitted with the Operations and Maintenance Manuals. File format shall be AutoCAD "DWG" or "DXF".

3.11 TERMINATIONS

A. Cables shall be marked with wire markers at both ends, and terminals on terminal blocks shall bear the cable number.

B. Wire twist shall be maintained to within 0.5" of the terminal block fingers.

3.12 GROUNDING

- A. Grounding shall conform to ANSI/TIA/EIA 607 Commercial Building Grounding and Bonding Requirements for Telecommunications, National Electrical Code® and manufacturer's grounding requirements as minimum.
- B. Ground equipment racks, housings, messenger cables, and raceways.
- C. Connect cabinets, racks, and frames to single-point ground which is connected to building ground system via #2 AWG green insulated copper grounding conductor.

3.13 COMPLETION AND TESTING

- A. Telecommunications System test reports shall be submitted to and approved by the Contracting Agency. The test reports shall certify that the Telecommunication system is complete, passes all test criteria, is fully operational, and that all work has been witnessed as specified.
- B. After installation and test of each system is complete, each system and the entire system shall be demonstrated and tested for proper operation. The Contractor shall schedule a demonstration with the following representatives present:
 - 1. Contractor's representative.
 - 2. Manufacturer's representative for each major communications subsystem.
 - 3. Contracting Agency's representative.
- C. The Contractor shall provide all forms, instrumentation and test equipment, loads, and other consumables required to demonstrate the systems to the Contracting Agency's satisfaction.
- D. Final Inspection Test Criteria:
 - 1. Perform test on every horizontal cable from patch panel to station outlet or other cables installed.
 - 2. ANSI/TIA/EIA-568-B.1,2,3: Commercial Building Telecommunications Cabling Standard.
 - 3. Test to be Link Test.
 - 4. Configure test instrument for TIA 568-A TSB95 Link, NVP and cable criteria to match manufacturer's data for tested cable.
 - 5. Provide detailed test results and full spectrum plot data saved in native electronic instrument format to 350 MHZ for future analysis of test results in the O&M Manual.

- 6. Test to record all available tests and analyze the following criteria for each cable and pairs:
 - a. Cable Identification Number to match plans.
 - b. Wiremap.
 - c. Length.
 - d. Propagation Delay.
 - e. Delay Skew.
 - f. NEXT.
 - g. Return Loss.
 - h. Attenuation.
 - i. ACR.
 - j. ELFEXT.
 - k. Power Sum NEXT.
 - I. Power Sum ACR.
 - m. Power Sum ELFEXT.
 - n. Impedance.
- 7. Propagation Delay and Delay Skew Specification for 100 ohm 4-pair cable.

3.14 OPERATING AND MAINTENANCE MANUALS

- A. Prepare manuals describing the servicing and maintenance requirements for the equipment being provided as required in this Section of these specifications.
- B. Information contained in the manuals shall consist of catalog data on each item, together with parts lists, wiring diagrams, test reports, description of routine maintenance required, suggested frequency of maintenance and recommended practices, and shall be 8-1/2 inches by 11 inches in size. Catalog pages and data in manuals shall be neat, clean copies. Drawings shall be accordion folded to above size. An index shall be provided which shall list all contents in an orderly manner. Include corrected shop drawings in the maintenance manuals. Each copy of the instruction manual shall be adequately labeled for identification and shall include plastic tabs coordinated with the index.
- C. Refer to "Submittals" requirements of this Section for additional O&M requirements.
 - 1. Submit project record drawings in both paper and electronic (electronic format shall be AutoCAD, Ms Word, and Excel) format at conclusion of the project and include:
 - a. Cat 5e test results for each cable installed in electronic and hard copy format.
 - b. Approved shop drawings,
 - c. Plan drawings indicating locations and identification of work area outlets, nodes, telecommunications closets (IDFs), and backbone (riser) cable runs.

- d. Telecommunications closets (TCs) and equipment room (ER and/or MDF) termination detail sheets.
- e. Cross-connect schedules including entrance point, main crossconnects, intermediate cross-connects, and horizontal crossconnects
- f. Labeling and administration documentation
- g. Warranty documents for equipment
- h. Copper certification test result printouts and diskettes

END OF SECTION
SECTION 16950 ELECTRICAL TESTING

PART 1 - GENERAL

1.01 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. Electrical Service and Separately Derived System Ground Testing.

1.02 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.

1.03 SUBMITTALS

- A. Division 1 Submittal Procedures: Requirements for submittals and Section 16010.
- B. Product Data: Submit technical information for each test instrument to include manufacturer, model number, serial number, ratings, accuracy, and National Institute of Standards and Technology (NIST) Traceable calibration certification.

1.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit Test Reports per Section 16010.

1.05 COORDINATION

A. Division 1 - Administrative Requirements: Requirements for coordination.

B. Provide written 72 hours advance notice of all tests to be performed to allow the Project Manager to witness.

1.06 REQUIRED TEST INSTRUMENTS

- A. MEGOHMMETER
 - 1. Product Description: 1000 Volt DC, portable, insulation and resistance test Megohmmeter.
 - 2. Equipment Accuracy:
 - a. 2000 Megohm Range 3% of full Scale.
- B. BRANCH CIRCUIT ANALYZER
 - 1. Product Description: Branch circuit analyzer capable of receptacle testing of voltage drop under load, hot-neutral-ground conductor resistances, common mode (N-G) Voltage, and G.F.C.I. trip point.
 - 2. Manufacturer: SureTest. Model: ST-1THD Wiring/Harmonic Distortion Analyzer.
 - 3. Equipment Accuracy:
 - a. Accuracy 1% full scale \pm 1 digit True RMS.
- C. TELECOMMUNICATION UNSHIELDED TWISTED PAIR TEST METER
 - 1. Product Description: Hand-Held Cat 5E Level III Telecommunication Cable Analyzer to 350 MHZ.
 - 2. Manufacturer:
 - a. HP WireScope Model: 350.
 - b. Fluke Model: DSP 4000.
 - 3. Equipment Accuracy: Per TIA/EIA TSB95.
- D. GROUND RESISTANCE CLAMP-ON METER
 - 1. Product Description: Digital, direct reading clamp-on resistance ground tester.
 - 2. Manufacturer: AEMC. Model: 3711 or 3731.
 - 3. Equipment Accuracy:
 - a. 1.0 to 50.0 Ohms 6 (1.5% + 0.1 Ohm)
 - b. 50.0 to 100.0 Ohms 6 (2.0% + 0.1 Ohm)
 - c. 100 to 200 6 (1.5% + 0.1 Ohm)
 - d. 200 to 400 Ohms 6 (1.5% + 0.1 Ohm).
 - e. 400 to 600 Ohms 6 (1.5% + 0.1 Ohm).
- E. MULTIMETER
 - 1. Product Description: Digital True RMS Multimeter.
 - 2. Equipment Accuracy:
 - a. AC Voltage Range: 0.75% 6 3 last single digits at 60 Hz.
 - b. AC Current Range: 0.90% 6 3 last single digits at 60 Hz.
 - c. DC Voltage Range: 0.25% 6 1 last single digit.
 - d. DC Current Range: 0.75% 6 1 last single digit.
 - e. Resistance Ranges: 0.50% 6 1 last single digit.
 - f. Frequency Range: 0.10% 6 1 last single digit @ 60 Hz.
- 1.07 TEST INSTRUMENT CALIBRATION
 - A. All test equipment shall be in good mechanical and electrical condition.

- B. Provide calibration for each test instrument directly traceable to the National Institute of Standards and Technology (NIST) of higher accuracy than that of the instrument tested.
- C. Provide calibration labels visible on all test equipment. Records, which show date and results of instruments calibrated or tested, shall be kept up-to-date.
- D. Calibrate instruments in accordance with the following frequency schedule:
 - 1. Field instruments: 12 months maximum.
 - 2. Up to date instrument calibration instructions and procedures shall be maintained for each test instrument with the equipment.
- 1.08 MINIMUM REPORT INFORMATION
 - A. Report Criteria: After each test, promptly submit one copy of report to the Project Manager. Include information on the report form where included within this specification otherwise provide form with the minimum following information:
 - 1. Date issued.
 - 2. Project title and number.
 - 3. Name of Tester and witnesses.
 - 4. Date and time of sampling or inspection.
 - 5. Identification of product and specifications section.
 - 6. Type of inspection or test.
 - 7. Date of test.
 - 8. Results of tests.
 - 9. Indicate compliance or non-compliance with Contract Documents.
 - 10. Final adjustment setting values where applicable.

1.09 GENERAL REQUIREMENTS

- A. Submit test results within 3 working days of each test and included in the O&M manual.
- B. Provide qualified personnel at site to perform all testing.
- C. Perform specified testing of products in accordance with specified standards or as denoted in this specification whichever is more stringent.
- D. Promptly notify the Project Manager of irregularities or non-conformance of Work or products.
- E. Perform additional tests when test is performed incorrectly, deemed inaccurate, or incorrectly documented.
- F. The Contractor shall provide all forms, instrumentation and test equipment, loads, and other consumables required to demonstrate the systems to the Project manager's satisfaction.
- G. Perform all testing prior to substantial completion or system acceptance.
- H. Retest all material, cables etc that are disturbed after testing.

I. Replace and retest all material installed which does not meet or exceed the minimum acceptable limits set forth in this specification in accordance with the contract original requirements at no additional charge to Contract Sum/Price.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 FEEDER CONDUCTOR TEST

- A. Tests Criteria:
 - 1. Use Megohm meter to test all feeder cables.
 - 2. Perform insulation-resistance test on each conductor with respect to ground and adjacent conductors. Applied potential 1000 volts DC for 600 volt rated cable.
 - 3. Perform test immediately after installation.
 - 4. Clean exposed cable ends with clean cloth and alcohol.
 - 5. Test duration shall be one minute.
 - 6. Disconnect conductors from all equipment.
 - 7. Record the resistance of the insulated conductor under test with all other conductors connected together and to ground (metallic raceway, grounding conductor, etc).
 - 8. Perform continuity test to insure correct cable connection.
- B. Test Values:
 - 1. Minimum insulation-resistance value: 50 megohms.
 - 2. Investigate deviations between adjacent phases.

RECEPTACLE BRANCH CIRCUIT TEST

- C. Test Criteria:
 - 1. Use Branch Circuit Analyzer to perform the tests.
 - 2. Test minimum 10% of installed receptacles of which at least one will be on each circuit. Select receptacles to test to be at the end of the string or branch of the circuits. Test each receptacle located adjacent to telecommunication equipment.
 - 3. Record Line Volts.
 - 4. Record Line Voltage Drop % at 15 Amp Load.
 - 5. Record Resistance of Hot in Ohms.
 - 6. Record Resistance of Neutral in Ohms.
 - 7. Record Resistance of Ground in Ohms.
- D. Test Values:
 - 1. Maximum Resistance of Hot: 0.5 Ohms.
 - 2. Maximum Resistance of Neutral: 0.5 Ohms.
 - 3. Maximum Resistance of Ground: 0.5 Ohms.

RECEPTACLE GROUND FAULT CIRCUIT INTERUPPTER TEST

- E. Test Criteria:
 - 1. Use Branch Circuit Analyzer to perform test of each GFCI protected receptacle.
 - 2. Record ma of trip.
- F. Test Values:
 - 1. Trip Range: Between 6-9 ma within 6.5 seconds.

TELECOMMUNICATION UNSHIELDED TWISTED PAIR TEST

G. Refer to 16745 for testing requirements.

ELECTRICAL SERVICE GROUND TESTING

- H. 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.
- I. Test Values:
 - 1. Ground maximum resistance: 25 Ohms.

END OF SECTION