SPECIFICATIONS

NEW FIRE STATION #4
FOR
SAN ANGELO FIRE DEPT.
SAN ANGELO, TEXAS

JUNE 1, 2016

PROJECT NO. 201436

If this document is not SIGNED and DATED on the seal, then it is NOT FOR REGULATORY APPROVAL, PERMITTING OR CONSTRUCTION.

REGISTERED ARCHITECT
GARY DONALDSON
5138
STATE OF TEXAS
2/10/17

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SET	NO.

ARCHITECTURAL SPECIFICATIONS:

STRUCTURAL SPECIFICATIONS:

M.P.E. SPECIFICATIONS:

ARCHITECTURAL SPECIFICATIONS

GENERAL:

1. Site of the project is located at 3415 Edgewood Dr., San Angelo, Texas at the corner of S. Chadbourne St. (Farm to Market 1223) & Edgewood Dr.

2. Before submitting a bid for this work, each Bidder is responsible for having examined the site and is aware of existing conditions under which he will operate and could in any manner affect the work under this Contract. No allowance will be made subsequently in this connection to Contractor for error or negligence on his part, or slight discrepancies in Drawings.

SCOPE OF WORK:

The City of San Angelo will be seeking sealed proposals for the construction of one (1) new station for the San Angelo Fire Department.

Fire Station No. 4 contains 11,100 sq. ft. and is located on new property obtained by the City of San Angelo.

All Contractors, regardless of proposal submitted, shall be subject to submissions criteria set forth by the City of San Angelo in accompanying sections in the bid documents.

CHANGE ORDERS:

General Contractor shall include all documentation necessary to complete a change order and/or change order request including but not limited to cost invoices for materials and labor (where applicable), subcontractor invoices etc. General Contractor's overhead and profit multipliers as set forth in the contract shall be calculated and included in the change order.

Note: Subcontractors (and suppliers where applicable) shall agree to an overhead and profit multiplier not to exceed that as set forth in the contract for the General Contractor.

CONSTRUCTION CONTINGENCY TO PROPOSAL OR QUOTE:

General Contractor shall include in his bid as part of the Base Proposal a construction contingency of $150,000 to cover contingencies. No work shall be implemented under this allowance except at the instruction of the Architect or the Owner. Any unused balance of this allowance shall be deducted from the final payment to the General Contractor.

Note that the General Contractor's profit and overhead for the items drawn from the contingency shall be included in the Base Bid itself and not part of the above contingency fund. Copies of labor time sheets and materials invoices shall be submitted with request for payment for additional work from this contingency.

CASH ALLOWANCES SCHEDULE:

Cash allowances shall be incorporated into the bids submitted by each relevant Subcontractor to the General Contractor for inclusion into the Base Bid. Allowance shall cover all expense necessary to the Owner.

General Contractor's profit and overhead shall be included in the bid itself and not considered a part of the allowance expense.

Landscaping - $20,000
Interior Room Signs - $200
Face Brick Veneer - $600 per thousand

DESCRIPTION OF ALTERNATES:

Add Alternate No. 1: Furnish & install new 30'-0" wide driveway section that connects north parking lot with west parking lot. Refer to Partial Site Plan drawing C/A-1 for detailed info.

Add Alternate No. 2: Furnish & install (3) three 14' x 14' automatic "Bi-folding" apparatus doors (as per spec. section 1040-2) located on east side of engine bay in lieu of (base bid) standard type overhead sectional doors (as per spec. section 1034).

Add Alternate No. 3: Furnish & install (3) three 14' x 14' automatic "High-Speed" apparatus doors (as per spec. section 1040-3) located on east side of engine bay in lieu of (base bid) standard type overhead sectional doors (as per spec. section 1034).

Add Alternate No. 4: Furnish & install (5) five "AirVac" recirculation systems to filter the engine bay exhaust. Refer to drawing sheet M-2 for specifications.

UNIT PRICING:

Bidders shall provide the following concrete foundation unit pricing for the Owner in the event that footage is either to be added or deleted. Refer to Specification Section 01151 for additional info. Note that these unit costs shall be included on the project's bid proposal form.

1. Unit price for 18" diameter drilled pier casing per lin/ft.

2. Unit price for 24" diameter drilled pier casing per lin/ft.

3. Unit price for 30" diameter drilled pier casing per lin/ft.

GENERAL:

A.I.A. General and Supplementary Conditions govern work of this Section.

USE OF PREMISES:

1. Owner retains the right at all times to deliver, place, and install furnishings, equipment, etc., as work progresses where there is no interference with the Contractor. Such preliminary occupancy shall not be construed as acceptance of such portions of the building.

2. Adjacent Property: Under no circumstances will any persons connected with this contract use any adjacent property outside project limits for purpose of parking, fabricating, or storing materials.

PROTECTION:

1. General Contractor shall protect all existing streets, walks, curbs, fences, landscaping, etc., make all necessary repairs at his own expense, and maintain them during the course of the work.

2. General Contractor shall, before starting work, erect such protections and barricades around site of construction or as required by law, ordinances of authorities having jurisdiction, and comply with requirements of the Specifications.

3. Contractor shall at all times provide protection against weather, rain, windstorms, frost, or heat so as to maintain all work, materials, apparatus, and fixtures free from injury, theft or damage.

4. At the end of the day's work, all new work likely to be damaged shall be covered in such a manner as to provide maximum protection.

5. Fire Protection: General Contractor and Subcontractors shall observe and Contractor shall enforce throughout the period of construction all requirements of city, county, state, and insurance authorities to minimize fire hazards during the progress of the work. In addition, the Contractor shall post signs and warnings as required to insure that these requirements are observed.

EXAMINATION OF SITE, PLANS, SPECIFICATIONS, & CONTRACT DOCUMENTS:

1. All bidders submitting proposals for this work shall first examine the site and all conditions thereon and/or therein.

2. All proposals shall take into consideration all such conditions as may affect the work under this contract, including but not limited to:

    a. Soil and water conditions likely to be encountered.

b. Improvements to be protected and the safety of persons in and around the work areas.

c. Disposal sites for surplus materials not designated to be salvaged.

d. Methods of providing ingress and egress to private properties.

e. Methods of handling traffic during construction of entire work.

3. All bidders shall satisfy themselves as to existing grades, actual formation, and soil conditions.

4. Bidders are advised that Plans, Specifications, and other documents on file with Owner shall constitute all information which the Owner will furnish.

5. Existing Structures: Drawings indicate locations of all known surface and subsurface structures. However, locations of utility mains, water mains, conduits, sewers, etc. may be unknown and neither the Architect or the Owner assume any responsibility for failure to show them in their exact location. Work shall be stopped immediately upon encountering such obstructions.

WORK LAYOUT:

1. Locate, protect reference points. Lay out work, lines, levels, grades, measurements of building, paving, walks, utilities, and other work.

2. Provide, maintain well-built batter boards at corners and establish bench marks at two widely separated points. As work progresses, establish bench marks on floor; lay out, on forms or rough flooring, exact location of partitions as a guide to all trades.

REQUIREMENTS FOR RECORD DOCUMENTS:

1. Contractor shall maintain at the site one (1) copy of all Drawings, Specifications, Addenda, approved Shop Drawings and Contract Modifications, and all project correspondence. Contractor shall maintain Drawings and Specifications in good order and marked to record all changes made during construction. Contractor shall keep on the site of work a copy of the current and updated Contract Drawings and Specifications.

2. Contractor shall maintain this record set of drawings and specifications which reflect the "As-Constructed" conditions and representations of the work performed, whether it be directed by Addendum, Change Order or otherwise.

3. Prior to final payment, Contractor shall furnish two (2) complete sets of "mark-up" blueline “As-Constructed” drawings and specifications for filing and distribution to the Owner.

PROGRESS SCHEDULE:

Contractor, immediately after being awarded the Contract, shall prepare and submit an estimated progress schedule for the work. The progress schedule shall be related to the entire project to the extent required by the Contract Documents. This schedule shall indicate the dates for the starting and completion of the various stages of construction and shall be revised as required by the conditions of the work.

CONTRACTOR’S RESPONSIBILITIES:

1. Project superintendent shall be responsible to do the first in the series of punch lists that lists all items deficient for each subcontractor and these are to be completed prior to the Architects/Owners walk-thru and punch list.

2. Contractor shall provide materials and placement of required items in order to eliminate barriers to the physically handicapped. General Contractor shall direct any question about the handicap requirements to the Architect. Contractor shall verify any T.A.S. (Texas Accessibility Standards) requirements and locations with the Architect prior to installation.

ADA - TAS SHEETS

Sheets ADA-TAS 1 and 2 are included in the plans to serve as a guide for the Contractor in matters relating to the requirements of Americans with Disabilities Act and Texas Accessibility Standards. Contractor shall refer to these sheets for items and/or dimensions not specifically shown on other drawings or details within the plans.

PROJECT SUPERINTENDENT

Contractor shall employee an experienced, full-time project superintendent to oversee and supervise the work. Contractor shall establish a temporary project office within the facility or a free-standing building on site and provide a plan layout area within this office. Include lines of communication for telephone, fax, email, etc.

GENERAL:

Purpose of this Section is to establish the procedures for submitting and approval of shop drawings and samples.

SCHEDULE:

Contractor shall compile and submit a complete schedule of all shop drawings and samples required for the project. This schedule shall be submitted to Architect for distribution.

SHOP DRAWINGS AND SAMPLES:

All shop drawings and samples shall be in accordance with the General Conditions of the Contract (AIA Document A201), Section 4.12, especially noting the following:

1. Contractor shall review for quality, quantity and dimensions all shop drawings and samples prior to submission to Architect. No shop drawings or samples will be reviewed by Architect until checked by Contractor.

2. At the time of submission, Contractor shall submit in writing and/or diagram of any deviation in the shop drawings or samples from the requirements of the Contract Documents.

3. All charges relating to shop drawings, or revisions thereof, samples, or resubmittals shall be the responsibility of the Contractor(s) and included in the original contract bid.

4. Contractor shall be responsible for all postage and/or shipping charges for shop drawings and samples to and from the Architect's office.

SUBSTITUTIONS:

Products not specified herein, which are comparable in quality and design, may be submitted for approval. Before any such approval, the Contractor and/or supplier must provide the following:

1. Contractor shall approve all items as outlined elsewhere in this Section.

2. Contractor and/or suppliers submitting items for substitution shall prepare a detailed comparison between the specified item & the substitute item, proving their equality in design, quality, & performance.

Only after the above conditions are met will such substitute items be reviewed for approval.

SAMPLES:

1. Samples of required materials shall be submitted to the Architect and shall be of a size large enough to determine patterns, colors, textures, etc. All samples shall be submitted early on in the project and in a expeditious manner.

2. Actual samples submitted shall be of the material specified (or provide allowance) i.e., fabric shall be fabric, metal shall be metal etc.

CONTRACTOR'S RESPONSIBILITIES:

Contractor shall provide materials and placement of required items in order to eliminate barriers to the physically handicapped. General Contractor shall direct any question about the handicap requirements to the Architect. Contractor shall verify any T.A.S. (Texas Accessibility Standards) requirements and locations prior to submission or installation.

GENERAL:

Furnish, install, maintain temporary facilities, utility services necessary for expeditious and safe completion of the project. Remove all temporary facilities upon completion of the project.

FIELD OFFICE AND UTILITIES:

1. Office for General Contractor shall be watertight, painted, heated, ventilated, and lighted. Provide with doors, locks, table, bench, and rack for Drawings.

2. Light, Power, and Heat: General Contractor shall furnish all temporary light and power, complete with wiring, lamps, similar equipment as required for completion of the proper execution of work including inspection. General Contractor shall provide approved temporary heating as required for proper protection, during all work. Electrical Contractor shall furnish connection of temporary electric service for General Contractor.

3. General Contractor, as stated, shall furnish and pay for all building permits and temporary utilities; however, it is required that Plumbing, Mechanical and Electrical Contractors make taps and connections as necessary for the General Contractor.

SANITARY FACILITIES:

1. From commencement to completion of operations, approved sanitary arrangements shall be provided by the General Contractor in the form of porta-toilets or other acceptable means. Toilets shall be serviced as required by code. Toilets shall be located on site and within fenced areas when provided.

2. All sanitary arrangements shall be acceptable to public authorities having jurisdiction.

TEMPORARY ENCLOSURES, PUMPING, AND SHORING:

1. General Contractor shall provide, maintain on premises where directed, watertight storage sheds with wood floors raised above the ground for all materials which might be damaged by weather.

2. Plumbing, Heating, and Electrical Contractors shall provide their own storage for their own use.

3. Contractor shall enclose construction sire perimeter in its entirety with temporary chainlink fencing.

4. Operate suitable pumping equipment as necessary to keep excavations, pits, trenches, other temporary or permanent parts of the work free of water.

5. Provide shoring, cribbing, retaining structures, etc., to support structures, excavations, and other elements under construction.

6. Close windows, doors, like openings with watertight coverings to protect work, equipment from damage by weather or to permit carrying out work under proper conditions of temperature and humidity.

SCAFFOLDING, HOISTING, TEMPORARY ELEVATORS:

1. General Contractor shall furnish, maintain all equipment such as temporary ladders, stairs, scaffolds, runways etc., as required for proper execution of the work.

2. All such apparatus, equipment, construction shall meet all requirements of the labor laws and other state and local laws applicable thereto, and and all insurance requirements.

3. General Contractor shall install, operate hoists, elevators. Other contractors, subcontractors shall arrange with General Contractor for use of same. General Contractor shall, at his option, assess others using hoists, elevators, on an hourly basis including cost of power and operation.

PROTECTION:

General Contractor shall provide protection of all adjacent properties, provide safety equipment required, protect materials, new construction and other damageable items as require protection. Repair work to these items shall be provided by General Contractor at his expense.

TESTING:

Testing required under this contract shall be performed by an independent testing laboratory selected and paid for by the General Contractor, and approved by the Architect. Tests shall consist of select fill compaction and moisture, concrete, and special materials. Tests required with one (1) copy each to the Architect, Contractor, and Structural Engineer.

STORAGE AND HANDLING OF MATERIALS:

General Contractor shall provide areas and shelter for storage and protection of all materials delivered to the site. Material shall be stored in such a manner as to prevent any damage to the product or material stored. All materials shall be kept dry, ventilated, and protected from extreme temperature changes. All materials shall be delivered to the job site in original containers.

COOPERATION WITH OTHER TRADES:

General Contractor shall coordinate all subcontractors and work to prevent any conflicts in work schedule. All trades shall coordinate with each other in related areas.

PROJECT SIGN:

1. General Contractor shall furnish and install a single-faced billboard type sign of not less than 4'-0" x 8'-0" 10mm corrugated plastic sheeting and mounted not less than 4'-0" above the ground. One Job site sign shall be located on site where directed.

2. Sign and lettering shall be done in methods approved by the Architect.

3. Lettering shall include but not be limited to the following: Name of the Project, Name of the Owner, Name of the Architect, Name of the Engineers, and Name of the General Contractor.

DAMAGE:

Contractor shall be responsible for scratches and damage to finish materials, equipment, fixtures and related materials and workmanship prior to acceptance by Owner. Contractor shall repair or replace all damaged or defective materials and workmanship at no cost to Owner.

CLEANING:

1. Building: Each Contractor and Subcontractor shall be responsible for cleaning, removing and disposing of debris from building during progress of work. Final cleaning of building and polishing of hardware and glazing materials, etc. shall be the responsibility of the General Contractor.

2. Grounds: Each Contractor or Subcontractor using ground area shall clean the area used for temporary facility and storage of materials, restoring the ground area to a clean, neat condition.

3. Project: Shall be kept clean and uncluttered during construction. If the project is not clean after five (5) days written notice, monthly payments will be withheld until project is clean as required by Architect.

GENERAL:

To provide guidelines and requirements for the General Contractor to comply with State and Federal Handicap Regulations for Prevention of Architectural Barriers, Texas Accessibility Standards.

CONTRACTOR'S RESPONSIBILITIES:

Contractor shall provide materials and placement of required items in order to eliminate barriers to the physically handicapped. Contractor shall verify the following items and locations prior to installation.

PHYSICALLY HANDICAPPED REQUIREMENTS:

The following list of barrier prevention measures shall be applicable to this project, and shall be required. All items not specified within other sections of these documents or shown on the plans shall be required as listed below:

1. Doors:

    a. Doorways shall have a minimum clear opening of 32" with door open 90° measured between the face of the door and the stop.

    b. Handles/knobs mounted at 42" maximum above finish floor.

    c. Changes in level at doors shall not exceed 1/2" in height including threshold.

    d. Door closer force shall not exceed 5 lbs. on interior doors or 8.5 lbs. on exterior doors.

4. Toilet Rooms:

    a. Toilet stall partitions shall be mounted a minimum of 9" above finish floor.

    b. Grab bars shall be 33" - 36" to the top above finish floor and 1 -1/4" to1 -1/2" in diameter, with a 1 -1/2" clear space between the grab bar and the wall. Minimum lengths of grab bars are 36" behind water closet and 42" at sides of water closet. Locate grab bars as required and as shown on Plans. Grab bars and their fasteners must support 250 lbs. force, minimum.

    c. One designated water closet seat shall be 17" - 19" above finish floor, and 16"-18" from a side wall with a grab bar. Flush controls shall be 28" minimum, 44" maximum above finish floor and located on the wide side of the compartment.

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d. At least one designated lavatory shall be mounted with 29" clear to the bottom of the apron. This height must remain clear for a distance of 10” from front face of the fixture. Hot water and drain pipes shall be insulated or otherwise covered at designated lavatory, and have no sharp or abrasive surfaces under the lavatory.

e. At least one designated urinal shall be mounted 17" from finish floor to basin openings. Flush controls shall be 28”” minimum and 44” maximum above finish floor.

f. Designated mirrors shall be a maximum of 40" from finish floor to bottom of mirror reflective surface and must be min. of 74” high at topmost edge.

g. Designated shelves shall be a maximum of 44" above finish floor.

h. Designated dispensers and disposal units shall be 48" maximum from control device to finish floor.

5. Drinking Fountains/Electric Water Coolers:

Spout openings shall be a maximum of 36" above finish floor.

6. Identification and Warning:

a. Room identification signs shall be mounted 60" above finish floor to centerline of sign.

b. Door handles to hazardous areas shall be knurled.

c. Warning signals shall be both visual and audible. (See Electrical)

SUBSURFACE INVESTIGATION:

The City of San Angelo has authorized borings to be made for the New Fire Station No. 4 at three locations on this site by Enprotec/Hibbs & Todd, Inc., Abilene, Texas, dated September 14, 2015. The logs of borings indicate materials penetrated at specific locations of the borings as shown on Site Plan Z/A-1 of the drawings. The following 25 pages are the complete report.

The City of San Angelo and Architect assume no responsibly for any interpretations made on the basis of the subsurface investigation information contained in these contract documents.

GENERAL:

Furnish all materials, equipment, and labor to complete the demolition and clearing of the areas as shown on the Drawings.

UTILITIES AND EQUIPMENT:

Before starting construction, disconnect or arrange for disconnection or relocation of all utilities within construction area in such a manner that utility functions in other parts of site are not interrupted.

CONSTRUCTION AREAS:

Contractor shall keep his storage and work areas at locations as approved or as shown on the Drawings unless other areas are requested and assigned to him.

CLEAN-UP AND DISPOSAL OF MATERIAL:

1. Remove all debris, rubbish, and related items from the site. Do not store or accumulate on the site.

2. Material or debris shall not be burned on the premises.

GENERAL:

Furnish labor, materials, appliances, method required.

WORK INCLUDED IN THIS SECTION:

Install termite preventative treatment as described below under all new building areas and to a minimum distance of 3'-0" outside building lines on all sides of building.

MATERIALS:

Dursban TC in designated concentration of 1.0% in water emulsion.

If this product or any component of this product has been cited by the EPA as a health hazard as applied here, then Architect shall be notified in writing prior to bidding.

APPLICATION:

1. Apply an overall treatment under entire surface of floor slab, including poured floors and entrance platforms. Apply at rate of one (1) gallon per ten (10) square feet.

2. Critical Areas: Apply along both sides of foundation wall and at all penetrations through slab or beams at rate of two (2) gallons per five (5) linear feet per foot of depth.

3. Application must strictly follow instructions of EPA Registered Label on insecticide container.

4. Apply treatment immediately prior to concrete pouring. Treatment shall not be made when the soil or fill is excessively wet or immediately after heavy rains to avoid surface flow of the toxicant from application site. Unless the treated areas are to be immediately covered, precautions shall be taken to prevent human or animal contact with the treated soil.

5. Application must be made by a licensed exterminator, experienced in the business not less than five (5) years.

GUARANTEE:

Furnish written guarantee to Owner guaranteeing the effectiveness of soil treatment against termite infestation for a period of not less than five (5) years from date of treatment. Any evidence of infestation within the guarantee period will require treatment without additional cost to the Owner.

GENERAL:

Furnish all top soil in areas not paved or as indicated on Drawings. See related work in other Sections: Site Preparation and Grading; Building Excavation and Backfilling.

FINE GRADING:

Fill subgrade with topsoil as indicated on Site Plan to a depth of not less than 8". Disc and cross-disc with a disc harrow, float to a reasonable fine grade, 4" below finish grades at building.

TOP SOIL:

Clean top soil or sandy loam shall be free of all lumps, debris, grass, roots, weeds, rocks, etc.

WORKMANSHIP:

1. At least 60 days before anticipated date of completion of building, remove all debris and material from the site. Keep site clean through completion.

2. Place top soil, fine grade and rake smooth to elevations indicated on Drawings at least 30 days before completion of job.

3. General Contractor shall co-operate with Landscape Contractor and/or Lawn Sprinkler Contractor.

4. Bring finish grade at building line, walks as indicated on Drawings.

5. Note that a landscaping plan shall be developed at a later date to where the actual areas & depths of topsoil will be set to their corresponding function.

GENERAL:

Furnish all labor and materials necessary to construct and support prefinished metal panel privacy fence(s) as shown on Plans. Provide and install fence panels, posts, rails, braces, trim, gates, hardware and all accessories as required for a complete and proper installation. Also included in this Section is excavation for post base footings and concrete anchorage.

ACCEPTABLE MANUFACTURERS:

Fence system shall conform to Architectural Privacy Fence System by "Berridge Manufacturing Company", San Antonio, Texas or equal.

MATERIALS:

1. Preformed, prefinished 24 gauge, 6'-0" high nominal height metal fence panels and flashings in color and profile as selected from manufacturer's standard line with all miscellaneous trim, closures and accessories.

2. 16-gauge galvanized posts set at 10'-0" O.C., 24-gauge galvanized studs, tracks, and blocking.

3. Concealed fasteners: Galvanized Steel. Where required exposed fasteners with washers painted to match finish of fence shall be required.

4. Prefinished Metal shall be prefinished Galvalume - ASTM 792-86 AZ-50 or Hot-Dipped Galvanized – ASTM A446-85 Grade C G90 Coating A525-86 24-gauge core steel.

5. Vehicular Gates: One (1) pair 6' high x 16' opening cantilevered slide gates complete with all cross members, fittings, rollers and hardware at south side of Fire Fighter parking lot under base bid proposal & one (1) pair under Add Alternate No. 1 (north side).

6. Automatic Sliding Gate Operators: One (1) (2 total operators) dual gate version equal to "Nice Apollo" #7300ETLDUAL-1K complete with solar charging at located at south side of Fire Fighter parking lot under base bid proposal. Verify actual type and options available for operator control for approval.

7. Contractor shall furnish and install concrete pad foundation as per manufactures specification complete with all required utility rough-ins.

SHEET MATERIALS FINISH:

1. Finish shall be full strength Kynar 500 Fluoropolymer coating applied by manufacturer on a continuous coil coating line, with a top side dry film min. thickness of 0.70 to 0.80 mil over 0.20 to 0.30 mil prime coat, to provide a total dry film thickness of 1.00 plus or minus 0.10mil. Bottom side shall be coated with primer with a dry film thickness of 0.30 plus or minus 0.05 mil. Finish shall conform to all tests for adhesion, flexibility, and longevity as specified by Kynar 500 finish supplier.

2. Strippable film shall be applied to the top side of the painted coil to protect the finish during fabrication, shipping and field handling. Strippable film must be removed before installation. Any scratched surfaces shall be touched up with paint supplied by manufacturer with manufacturer's instructions included.

FENCE & GATE INSTALLTION:

1. Grade shall be prepared and any surface irregularities removed, which may cause interference with installation of fence.

2. Holes shall be excavated for posts to diameter and spacing indicated on drawings and to suite local conditions for proper anchorage and stability.

3. Fence installation shall be in accordance with manufacturer's instructions and details. All exposed adjacent flashing shall be of the same material and finish as fence panels. Hem all exposed edges of flashing on underside, 1/2 inch.

4. Posts shall be centered and aligned in excavated holes to proper depth. Concrete shall be placed around posts and vibrated or tamped for consolidation.

5. Vertical and top alignment of posts shall be verified for plumb and true before concrete hardens.

6. Gates shall be supported by separate posts. Hinged side of gate shall not be attached to building wall. Install gates plumb, level and secure for full width of clear opening. Type and quantity of hinges shall be based on weight, height, and gate usage.

DELIVERY, STORAGE AND HANDLING:

1. Upon receipt of panels and other materials, installer shall examine the shipment for damage and completeness.

2. Panels shall be stored in a clean, dry place. One end should be elevated to allow moisture to run off.

3. Panels with strippable film must not be stored in the open, exposed to sun.

4. Stack all materials to prevent damage and to allow for adequate ventilation.

SUBMITTALS:

1. Submit detailed drawings showing layout of fence panels, anchoring details, joint details, trim, flashing, and accessories.

2. Submit a sample of each type of fence panel profile, including color chips.

WARRANTY:

1. Manufacturer shall provide twenty-year paint finish warranty against cracking, peeling and fading (not to exceed 5 N.B.S. units).

2. Installer shall provide warranty against defects of installed fence system for period of two (2) years from date of substantial completion.

GENERAL:

1. Furnish labor, equipment and materials to complete masonry work.

2. Furnish face brick for sample panel. Submit samples of materials for reinforcement ties, anchors, accessories of actual size, finish and configuration proposed.

MASONRY UNITS AND TIES:

1. Face Brick: Masonry Contractor shall include in bid an allowance of $600.00 per thousand for purchase of face brick, F.O.B. job site. Provide solids wherever flat side of brick is exposed.

2. Concrete Masonry Unit:(CMU)

   A. 12" Concrete Masonry Unit: 16" long x 12" wide x 8" high nominal face dimensions (15 5/8" x 7 5/8" x 7 5/8" actual).

   B. 8" Concrete Masonry Unit: 16" long x 8" wide x 8" high nominal face dimensions (15 5/8" x 7 5/8" x 7 5/8" actual).

   C. Manufacture concrete masonry units using ASTM C331 aggregate for a dry net weight of not more than 105 lbs. per cubic foot.

   D. Cure units in moisture controlled atmosphere or in an autoclave at normal pressure and temperature to comply with STM C90, Type 1.

   E. Hollow CMU units: ASTM C90, Grade NI
   Solid CMU units: ASTM 145, Grade NI

   F. Concrete masonry units required to have a fire resistance rating of 3 - hours shall be provided full height from floor slab to roof deck where shown on Plans. Units shall be composed of unexpanded slag, cinders, scoria or limestone and have an equivalent thickness of not less than 4". Equivalent thickness is solid thickness that would be obtained if the same amount of concrete obtained in a hollow unit were recast with core holes".

3. Interior CMU Joint Reinforcement, Ties, Accessories: Width of units shall be wall width minus 2", "Dur-O-Wall" standard weight or equal triangular ties and column anchors at steel columns in all masonry walls at 8" above floor, lintels, bond beams and spaced as noted above.

4. Exterior CMU Joint Reinforcement, Ties, Accessories: Equal to “Bok-Lok” #BL-30 wire truss type horizontal reinforcement run continuously in all masonry walls 8" above floor or lintels at every 16" o.c. thereafter; width of units shall be 2" less than wall thickness. Do not run through wall control joints.

5. Wall Ties for Face Brick and CMU Construction: Equal to "Blok-Lok" cavity wall anchoring system with “Wedge-Lok” insulation retainer clips. Wall ties shall be installed at 16” on center in each direction.

6. Adjustable Wall Ties for Face Brick and Drywall Construction: Equal to "Dur-o-Wall #DA210X veneer anchor screw on plate and #DA700 series triangular rod ties. Plate leg length shall match rigid insulation thickness and secure with #DA807 #10 metal stud veneer screws. Do not run through wall control joints.

GENERAL INSTALLATION:

1. Protect facing material against staining, keep tops of wall covered with non-staining, waterproof covering when work is not in progress. When work is resumed, clean tops of loose mortar. Wet thoroughly in dry weather.

2. Wet brick with absorption rate of more than 0.7 oz/min from 3 to 4 hours before use. Employ method to insure each unit is uniformly wet. Units shall be free from surface water when laid.

3. Do not lay masonry in freezing weather unless suitable means are provided to heat materials, protect work from cold and frost, and insure that the mortar will harden without freezing. No antifreeze ingredient shall be used.

4. Examine all architectural, structural, mechanical and electrical drawings for requirements to accommodate all trades.

5. Figured dimensions of walls, spacing of brick courses, etc. are based on modular sized units with joints 3/8" thick, except as otherwise required for pattern work or special details. Provide special brick shapes as required and shown on Drawings. Unless otherwise noted or directed, all masonry courses shall be laid dead level.

6. Masonry shall be laid in bond patterns and coursings as shown on Drawings. Unless otherwise directed, all tooled joints shall be concave. Verify with Architect.

7. This contractor shall see that proper provisions are made for all mechanical parts, leaving all chases, recesses, openings, etc. Bolts or plates required by other subcontractors shall be set to templates or dimensions furnished by them. Build in all expansion joints to details and elevations.

8. Build in grounds, ties, reinforcing and nailing boards as required and where directed. Set all bucks, blocking and anchors as required.

9. Rowlock and soldier courses shall be mitered and the first three bricks each way from the corner shall be set in epoxy mortar.

10. Adequately brace all walls so that wind and other forces will not cause damage.

11. Form chasings, recesses, openings, slots, etc. Patch masonry as required for all trades. Set bolts, plates, etc. required by other subcontractors to templates or dimensions furnished by them.

12. At shelf angles as shown on Drawings: Provide standard 1/4" thick neoprene pad equal to AA Wire Products Company #AA3405. Do not attach pad by any means other than by natural friction.

LAYING MASONRY UNITS:

1. Lay plumb, true to line in running bone, one head joint breaking midway over unit below, or in pattern shown. Lay in full beds of mortar with shove joints, full head joints. No furrowing of bed joints, no slushing of head joints.

2. Make bed, head joints uniform, not exceeding 1/2". When mortar becomes thumbprint hard, make tool joints by striking with round pointing tool to make a hard, dense surface. Type of joint shall be as selected by Architect. Verify with Architect.

3. Reinforce wall as indicated herein or on Drawings.

MORTAR AND GROUT:

1. Mortar to be type "S" and in conformance with ASTM 91, latest edition. Mortar proportions to be as follows:

   1 cubic foot Masonry Cement
   1/2 cubic foot Portland Cement
   3 3/8 to 4 1/2 cubic fees of Sand

2. Mortar color shall be as directed by the Architect.

3. Grout shall be "non-shrink".

4. Use of mortar which has started initial set is prohibited. Addition of calcium and chloride is prohibited.

5. Epoxy mortar mix: Use mix #PG-2089 as manufactured by Permagile Industries, or approved equal. Mix and install as recommended by manufacturer. Mix only amount which can be used within 45 minutes. Epoxy mortar shall be used as indicated on Drawings or Specifications

REPAIR, POINTING AND CLEANING:

1. At completion, inspect joints. Where defective, cut out mortar 1/2", brush out, wet down, point with same mortar.

2. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar pointed to eliminate evidence of replacement.

3. Keep masonry clean as work progresses, brush off excess mortar at time for tooling joints. At completion, clean down masonry exposed in finish, remove mortar stains, dirt, etc. Do not use wire brush, acid or coloring matter without approval. Masonry shall be thoroughly cleaned with water-clear Sure-Klean 600 detergent in strict accordance with manufacturer's directions. Follow immediately by thoroughly rinsing with clean water.

WEEP HOLES:

1. Provide weep holes by means of installing mortar maze weep vents at head joints in course below finish floor and above sidewalks or other adjoining surfaces.

2. Space weep holes as shown on Drawings. Weep holes shall be 48" o.c., maximum.

SAMPLES:

1. Lay up a sample panel of face brick, approximately 4'-0" x 4'-0" using mortar. If necessary to insure an acceptable brick job, additional samples shall be laid in mortar. Do not proceed with brick work until sample has been approved.

2. Brick work on the building shall match the approved sample. Do not move, alter or destroy the approved sample panel until brick work is complete.

SPECIAL NOTE:

Contractor’s cost shall include laying a minimum of (2) two different brick colors in the form of soldier and/or rowlock courses to form accents.

GENERAL:

1. Furnish and install miscellaneous items of metal work required for proper execution of this project, complete with anchorages, nuts, bolts, screws, fasteners, sleeves, accessories necessary for proper assembly, installation, and fitting to adjoining work.

2. Deliver anchors, sleeves, items to be build into concrete and masonry to respective trades at proper time for setting.

SHOP DRAWINGS:

Submit four (4) sets of shop, setting drawings, manufacturer's brochures; show materials, sizes, assembly, connections, anchorages, relation to other materials, trades and finishes.

MATERIALS:

1. Structural Steel Shapes: ASTM A-36

2. Nuts, Bolts: ASTM A-307

3. Malleable Iron: ASTM A-47, high grade white iron castings, fully annealed, of uniform ductile structure throughout.

4. Aluminum: Alloy 6063-T6 for extrusions; Alloy B-214 for castings.

FABRICATION:

1. Form work true to detail with clean, straight, sharply defined profiles. Surfaces shall be smooth unless otherwise noted. Weld, rivet permanent connections. Where necessary to use screws or bolts, countersink heads, screw up tight, nick threads to prevent loosening.

2. Joint Fastenings: Concealed where practical. Details of assembly, thickness of metal, to give strength equal to adjoining sections. Welded joints shall be continuous or spot welded where specified; dress face of welds flush, smooth. Form joints exposed to weather to exclude water. Provide holes, connections for work of other trades.

SHOP PAINTING:

1. Paint work other than galvanized or metals with non-ferrous coatings after fabrication.

2. Clean off rust, millscale, dirt, oil, grease. Apply one shop coat of Red Oxide paint work into corners, joints. Do not apply to damp surfaces or when temperature is below 40 degrees Fahrenheit.

HANDLING:

Carefully handle items specified to be completely factory finished to prevent abrasion of finish. Where such abrasion may occur, and it is not feasible to touch-up, all exposed surfaces shall be carefully refinished so that they will be equivalent of original factory finish.

BOLTS, ANCHORS, INSERTS, DRIVE PINTS, EXPANSION SHIELDS, LAG SCREWS, TOGGLE BOLTS, AND OTHER REQUIRED FASTENING DEVICES:

1. Provide such items of kind, size, spacing required for anchoring, attachment of wood, miscellaneous, or structural metals to concrete, masonry or steel.

2. Partial listing of items, type of fastenings, anchors required:

    a. Wedge Inserts Set in Concrete to Support Lintels, Shelf Angles: Holmann & Barnard Inc., long wedge type malleable iron No. LW-340, complete with bolts. Space 4'-0" on center.

    b. Dovetail Slots for Masonry Anchors: Holmann & Barnard No. 305-1, 16 gauge galvanized steel sheet with insert.

    c. Build Cleveland galvanized masonry wall plugs into masonry joints to receive nailing for fastening cabinet work, trim, similar items. Space at 16" on center for running trim or sub-trim.

    d. Bolt studs, framing abutting masonry or concrete with 3/8" x 8" J-bolts, nuts, and washers at top and bottom, 4'-0" on center.

SHELF ANGLES, LOOSE LINTELS:

Furnish in maximum practical lengths, miter corners. Drill for anchor bolts. Show bolt settings on shop drawings. Minimum bearing for loose lintels: 8".

GENERAL:

1. Work Included: Joint covers for expansion joints.

2. Related Work: Preparation of joint, setting and joint cover into adjacent work, non-shrink grout for block outs and adjacent finishes.

3. System Description: Joint covers shall permit restrained movement of joint without disengagement of cover. Covers shall be bi-directional with 50% movement capabilities.

4. Submittals: Submit shop drawings and product data indicating joint cover profile, details, dimensions, location within the work, affected adjacent construction, anchorage, finishes, splices and accessories.

5. Delivery, Storage and Handling: Provide temporary protective cover on anodized aluminum.

PRODUCTS:

1. Acceptable Manufacturers: Specifications are based on "C/S Construction Specialties Company for interior covers and Schuller for exterior expansion joints.

2. Materials: Aluminum: 6063-T5 extrusions; 6061-T6 plate; 5052-H32 sheet

FABRICATION:

1. Flexible Joint Covers

    a. Joint covers shall consist of cover plate fastened through center of spring steel centering bars. Bars shall have corrosion resistant coating and shall be attached to nylon spheres which are retained in tracks in extruded base members. Set centering bars diagonally at 20" on center maximum. Spherical and Pin Type Centering Bars must be fully engaged with the base member.

    b. Cover Plates: Aluminum with fluted surface.

2. Fabricate special transitions, corner fittings and enclosures. Miter and weld joints.

3. Shop assemble components and package with anchors and fittings. Provide components in single lengths where possible; minimize site splicing.

ALUMINUM FINISHES:

1. Floors: Mill finish

2. Walls and Ceilings: Clear anodized, AA M43-C21-A21

3. Surfaces Contacting Concrete: Zinc chromate shop coating

EXECUTION:

1. Examination: Verify that field measurements (and block out dimensions) are as shown on shop drawings.

2. Installation: Install joint covers to manufacturer's instructions. Align work plumb, level and flush with adjacent surfaces. Rigidly anchor to substrate. Make allowances for change in joint size due to difference between installation and building operating temperatures.

3. Adjusting and Protection:

    a. Adjust joint cover to freely accommodate joint movement.

    b. Protect installation from damage by work of other Sections. Where required, remove and store cover plate and install temporary protection over joints; reinstall cover plate before completion of Work.

SCHEDULE:

1. Interior Vertical Walls and Ceilings: C/S Model SMC-1N W/RFX-1W fire barrier.

2. Interior Floor at door openings: C/S Model PC-100

3. Interior Floor/Wall: C/S Model PCW-100

4. Exterior Masonry Brick: Schuller Expand-O-Gard Style WS

DESIGN:

1. Quality and design of wood members and their fastenings used for load supporting purposes shall conform to accepted engineering practice.

2. All members shall be framed, anchored, tied and braced so as to develop the strength and rigidity necessary for the purposes for which they are used.

3. Preparation, fabrication and installation of wood members and the glues, connectors and mechanical devices for the fastening thereof shall conform to accepted engineering practices.

QUALITY OF MATERIALS:

1. All lumber, including end-jointed lumber, used for load supporting purposes shall be identified by the grademark of an approved lumber grading or inspection bureau or agency.

2. Under no circumstances will used concrete form boards be allowed for framing or blocking purposes.

MINIMUM LUMBER GRADES:

Minimum grade of lumber used for light frame construction shall be:

1. For joists and rafters: Those obtained in NFoPA Design Values for Joists and Rafters:

2. For loadbearing studs: #2 Grade, SPF.
   For nonloadbearing studs: #2 Grade SPF.

MOISTURE CONTENT:

All lumber and plywood members, including pressure treated, 2" thick and less shall contain not more than 19% moisture at the time of permanent incorporation in building or structure.

SLEEPERS AND SILLS ON CONCRETE SLAB:

Sleepers and sills on concrete or masonry slabs at or below grade shall be of approved wood of natural decay resistance or pressure treated wood.

WOOD BLOCKING:

Provide blocking and lookouts as required for securing work in place. Install two rows of horizontal 2x8's cont. blocking as required for installation of gear lockers in Room 133.

BRACING OF EXTERIOR STUD WALLS:

1. Not less than three studs shall be installed at every corner of an exterior wall.

2. Stud walls shall be braced by one of the following methods:

   a. Nominal 1 x 4 continuous diagonal strips set into the face of the studs and top and bottom plates at each corner of building.

   b. Plywood sheathing panels not less than 4' wide and 8' long (or full wall height) applied either vertically or horizontally.

3. Studs shall be capped with double top plates installed to provide overlapping at corners and at intersections with bearing partitions.

OPENINGS IN EXTERIOR WALLS:

1. Headers shall be provided over each opening in exterior bearing walls. Headers may be of two pieces of nominal 2" framing lumber set on edge and nailed together or may be of solid lumber of equivalent size.

2. A wall stud shall be at each side of the opening with the ends of the header supported as follows:

   a. For openings 3' or less wide, each end of the header shall rest on single header stud or may be supported by framing anchors attached to the wall stud.

   b. For openings more than 3' but not more than 6' wide, each end of the header shall rest on a single header stud.

   c. For openings more than 6' wide, each end of the header shall rest on two header studs.

CEILING JOIST AND RAFTER FRAMING:

1. Maximum spans for ceiling joists and rafters shall be in accordance with the NFoPA Span Tables for Joists and Rafters.

2. Where rafters meet to form a ridge, they shall be placed directly opposite each other and nailed to a ridge board not less than1 1/2" thick, and not less in depth than the cut end of the rafters.

3. Ceiling joists shall be continuous or securely joined where they meet over interior partitions to provide a continuous tie across the building.

4. Valley and hip rafters shall be 2" deeper than the jack rafters.

TRUSSED RAFTERS:

1. Trussed rafters shall be designed in accordance with accepted engineering practice.

2. The design of metal plate connected wood roof trusses shall comply with TPI Design Specifications For Light Metal Plate Connected Wood Roof Trusses.

ROOF SHEATHING:

All rafters and roof joists shall be covered with sheathing as detailed.

FASTENING SCHEDULE

Number	Connection	Fastener	Spacing
	Top or sole plate to stud, end nailed	16d common	2
	Stud to sole plate, toe nail	8d common	4
	Doubled studs, face nail	10d common	24" o.c.
	Doubled top plates, face nail	10d common	16" o.c.
	Top plates, lap and intersections face nail	2-16d or 3-10d common	
	Continuous header, two pieces	16d common	16" o.c. along each edge
	Ceiling joists to plate, toe nail	8d common	3
	Continuous header to stud, toe nail	8d common	3
	Ceiling joists, laps over	3-16d or 4-10d common	face nail partitions
	Ceiling joists to parallel rafters, face nail	3-16d or 4-10d common	
	Rafter to plate, toe nail	8d common	3

Number Connection	Fastener or Spacing	
Built up corner studs	16d common	24”o.c.
Built-up girders and beams, of three members	20d common	32" o.c. at top & bottom & staggered 2 ends & at each splice
Studs to sole plate, end nail	16d common	2 each end
Plywood Roof & Wall Sheathing:		
19/32" or greater	8d common	6" o.c. edges & 12" o.c. inter-mediate
5/8" Gypsum Sheathing :	12 ga 1 1/4" large head corrosion resistant	4" o.c. at edges 8" o.c. at other
5/8"Gypsum Wallboard:	1 1/2" drywall nail**	7" o.c. on ceilings 8" o.c. on walls

**Drywall nails shall conform to ASTM C-514.

GENERAL:

Furnish and deliver all architectural woodwork shown on Drawings and specified herein. Architectural woodwork includes all exterior and interior woodwork exposed to view in finished building, except as listed below; and includes plywood, doors, etc.

WORK NOT INCLUDED IN THIS SECTION:

1. Carpentry: Division 5, Section on Carpentry

2. Finish Hardware: Division 8, Section on Finish Hardware

3. All wood products such as flooring, trusses or specialty items which are specified elsewhere.

QUALITY STANDARDS:

1. Standards:

   A. "Quality Standards" of the Architectural Woodwork Institute shall apply and by reference are hereby made a part of this specification. Any reference to Premium, Custom, or Economy in this specification shall be defined in the latest edition of AWI "Quality Standards".

   B. Any item not given a specific quality grade shall be Custom grade as defined in the latest edition of the AWI "Quality Standards".

2. Competence: Approved woodwork manufacturer must have a reputation for doing satisfactory work on time and shall have successfully completed comparable work.

3. Construction Methods:

   A. Interior millwork and trim shall conform to design and details shown. Where practical, work shall be finished, sanded, and assembled at mill. All millwork and trim shall be finished smooth and free from machine or tool marks that will show through the finish. All nail heads shall be set to receive putty. All finished millwork shall be hand sanded prior to finishing.

   B. All joints shall be tight and formed to conceal shrinkage. Shop miters shall be glued. Make dowels and tenons to a driving fit. Make outside joints to exclude water and set in with lead paste or waterproof glue. Make shop joints of interior work with waterproof glue or hot glue under pressure.

C. Door trim (where applicable) shall be in single length without splicing; corners shall be mitered. Running finish shall be in long lengths and jointed only where solid fastenings can be made. End joints in built-up members shall be well distributed. Miter exterior corners and cope interior angles on all trim pieces.

D. Assemble panel work in such a manner to allow free movement of panels. Prime or stain panels before framing into place. Applied mouldings shall be secured to stiles and rails and not to panels.

E. Provide blocking and lookouts as required for securing work in place. Do not install any trim paneling or door frames until all surfaces have been primed. Where required, carefully scribe woodwork to other adjacent work.

F. Erect cabinets straight, level and plumb, and securely anchor in place. Scribe and closely fit cabinets to adjacent work.

SUBMITTALS:

1. Shop Drawings: Before proceeding with work, prepare and submit to the Architect for approval shop drawings of all millwork. Drawings shall indicate kind of material, size of members, method of securing members together and to adjacent work. Submit manufacturer's descriptive literature of specialty items not manufactured by the architectural woodworker.

2. Samples:

   A. Submit samples of each wood specie which is to receive transparent finish at job site.

   B. Submit finished samples of each finish to be applied at the factory.

FIELD DIMENSIONS:

Woodwork manufacturer is responsible for details and dimensions not controlled by job conditions and shall show on his shop drawings all required field measurements beyond his control. General contractor and the woodwork manufacturer shall cooperate to establish and maintain these field dimensions.

PRODUCT HANDLING:

Woodwork manufacturer and the contractor shall be jointly responsible to make certain that woodwork is not delivered until building and storage areas are sufficiently dry so that woodwork will not be damaged by excessive changes in moisture content. Do not store or install millwork in any part of building until concrete, masonry, and plaster/drywall work are dry.

TRIM:

1. Architectural Woodwork Institute Quality Grade: Custom
2. Solid Wood: Natural Red Oak, plain sawn
3. Plywood: Natural Red Oak, plain sliced

CASEWORK:

1. Architectural Woodwork Institute Quality Grade: Custom
2. Construction: Details shall conform to reveal overlay design.
3. Exposed and Semi-Exposed Parts: Natural Red Oak, plain sawn

FLUSH DOORS:

Interior Doors*:

A. Faces: Red Oak, plain sliced

B. Architectural Woodwork Institute Quality Grade: Custom

C. Construction: AWI-SRC (stile and rail core)

* Provide standard door warranties.

HARDWARE:

1. Rough Hardware: Contractor to provide and install all rough hardware and metal fastenings as shown on Drawings, specified herein, or required for proper installation of carpentry and millwork. Nails,, screws, bolts, and similar items shall be of sizes and type to rigidly secure members in place.
2. Cabinet Hardware: Furnish and install following finish cabinet hardware:

A. Drawer Slides: K-V No. 1395 full extension nylon roller drawer slides

B. Adjustable Shelf Hardware: K-V No. 255 standard and K-V No. 256 support

C. Drawer and Door Pulls: Stanley 4483 (finish as selected)

D. Hinges: European style (finish as selected)

E. Locks: Sargent 4142 (finish as selected)

GENERAL:

This Section includes following horizontal, vertical and trim pieces of solid composite surface product types: Counters, splash surfaces (other than Kitchen) shower surround walls and window sills.

SUBMITTALS:

1. Product data for each type of product indicated.

2. Shop drawings:
   A. Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.
   B. Show full-size details, edge details, thermoforming requirements, attachments, etc.
   C. Show locations and sizes of furring, blocking, including concealed blocking and reinforcement specified in other Sections.
   D. Show locations and sizes of cutouts and holes for plumbing fixtures and other items installed in solid surface.

3. Samples:
   A. Submit minimum 2" by 2" sample in selected finish
   B. Indicate full range of color and pattern variation.
   C. Approved samples will be retained as a standard for work.

4. Maintenance data:
   A. Submit manufacturer's care and maintenance data, including repair and cleaning instructions.
   B. Maintenance kit for finishes shall be submitted.
   C. Include in project closeout documents.

QUALITY ASSURANCE:

1. Fabricator/installer qualifications: Work of this section shall be by a certified fabricator/installer, certified in writing by the manufacturer.

2. Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this project and whose products have a record of successful in-service performance.

DELIVERY, STORAGE AND HANDLING:

1. Deliver no components to project site until areas are ready for installation.

2. Store components indoors prior to installation.

3. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

WARRANTY:

Provide manufacturer's 10 year warranty against defects in materials. Warranty shall provide material and labor to repair or replace defective materials.

MANUFACTURERS:

Manufacturers subject to compliance with requirements, provide products by the following or equal:

Staron Solid Surfaces, Lotte Advanced Materials USA, Inc., 14251 E. Firestone Blvd., Suite 101, La Mirada, CA 90638. Website: http://www/staron.com

MATERIALS & ACCESSORIES:

1. Staron Sheet:
   - A. Homogenous sheet composed of a blend of natural minerals and 100 % acrylic resin (methylmethacrylate) complying with ANSI Z124.3 or ANSI Z124.6, Type 6 having minimum physical and performance properties specified. Surface finish shall be semi-gloss.
   - B. Superficial damage to a depth of 0.010" shall be repairable by sanding and/or polishing.
   - C. Flammability Test (flame spread and smoke developed) passed NFPA 255 with Class A rating.
   - D. Food Zone Service passed NSF 51.
   - C. Countertop Thickness: ½" thick with 1-1/2" high edge detail.
   - D. Sidewall splash: Applied 1/2" thick.
   - E. Three (3) Shower Walls: ¼" thick wall panels run horizontally.

2. A. Joint and Laminating (sheet to sheet) Adhesive: Manufacturer's standard two-part Staron Joint Adhesive kit to create inconspicuous, nonporous joints.
   - B. Adhesive for Bonding Staron Sheet to other Materials or Substrate: 100 % silicone sealant complying with ASTM C 920 or neoprene-based panel adhesive.

3. Sealant: Manufacturer's standard mildew-resistant, FDA-compliant, NSF 51-compliant, UL-listed silicone sealant in colors matching components.

FINISHES:

1. Select from the manufacturer's standard color lines of "Solid, Sanded, Aspen, Pebble, Quarry, Talus and Breccia".

2. Contractor shall include cost in his bid to furnish and install two different color selections on shower wall areas to form linear stripes at no additional cost to the Owner.

INSTALLATION:

Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.

A. Provide product in the largest pieces available.
B. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
C. Exposed joints/seams shall not be allowed.
D. Reinforce field joints with solid surface strips extending a minimum of 1" on either side of seam with strip being same thickness as top.
E. Cut and finish component edges with clean, sharp returns.
F. Route radii and contours to template.
G. Anchor securely to base cabinets or other supports.
H. Carefully dress joints smooth, remove surface scratches and clean entire surface.
I. Install countertops with no more than 1/8" sag, bow or other variation from a straight line.
J. Countertop substrate shall be total 1" thickness minimum of plywood, particle board or MDF/HDF.

REPAIR:

Repair or replace damaged work which cannot be repaired to satisfaction.

CLEANING AND PROTECTION:

Keep components clean during installation.
Remove adhesives, sealants and other stains.

GENERAL:

1. Furnish materials, equipment, and labor to provide complete dampproofing and waterproofing as indicated herein.

2. Related Work in other Sections: Roofing and Flashing, Sheet Metal, Caulking and Sealant, Thermal Insulation.

MATERIALS:

1. Dampproofing for Exterior Face Brick Walls: Material shall be Prime-A-Pell 200 by Chemprobe Technologies, Inc., two coats each applied to saturation point.

2. Dampproofing for Masonry and Concrete Back-up Behind Exterior Brick: Surfaces shall receive two-coat application of Hydrocide 700-B semi-mastic asphaltic emulsion by Sonneborn Building Products Inc. Dampproofing shall be applied at rate of 30 sq. ft. per gallon, per coat. Follow manufacturer's application instructions for application.

PREPARATION, INSTALLATION:

1. Dampproofing shall be done by an organization experienced and specializing in this type of work. Applications shall be in strict accordance with the directions of material manufacturer. Use of General Contractor's common labor to apply waterproofing materials will not be permitted.

2. Inspect all surfaces to receive dampproofing and require that necessary corrections are made before proceeding with the work. Proceeding with work constitutes acceptance of surfaces.

3. It is the intention of the Specifications to require a completely dampproofed structure, with the following application specifications included to cover the types of materials, etc., to be used at various critical areas. If the General Contractor feels that he cannot deliver a water-tight building under these Specifications, it is his responsibility to report any alleged deficiencies during the bidding period.

4. Repoint all holes, cracks, and open mortar joints and allow to dry before dampproofing. Cooperate with all trades in the application of dampproofing. Apply only during favorable weather conditions.

GENERAL:

Work consists of furnishing all labor, materials, equipment, and incidentals necessary to complete all caulking work as indicated or reasonably inferred from Drawings and Specifications. Work includes caulking all exterior windows and doors; caulking at any joint at exterior to insure weathertight building free of water and wind/air leaks. Caulk at interior to achieve finished appearance.

MATERIALS:

1. Silicone base sealants shall be used throughout on the exterior. Following compounds shall be used: GE Silicone, Dow Corning 795 Silicone, or approved equal for exterior use.

2. Silicone base sealants equal to GE Sanitary Silicone for interior use.

CAULKING:

1. At locations as listed in Specifications, shown on Drawings, or required for weather proof construction. Where weather molds, staff beads, or trim do not form integral part of window frame and are removable, remove same and caulk in joint.

2. Clean joints to be caulked free of mortar and foreign material. Joint preparation, cleaning, and priming shall be in strict accordance with manufacturer's published specifications for each condition of use.

APPLICATION:

1. Generally, prime joints with a brush of a size that will reach all parts of joints to be filled with caulking compound. Butter inside edge of masonry, facing material, or surfaces of frames to embedded with a thick coat of caulking. Mix and use components in strict accordance with the manufacturer's instructions.

2. Gun Application: Use gun nozzle of proper size to fit joint. Drive material in with pressure to fill joints and to prevent forming air pockets.

3. Priming: Type of surfaces required to be sealed and application of sealer shall be in strict accordance with manufacturer's published specifications and recommendations.

6. Finishing Joints: All runs of caulking compound shall be straight and clean with smooth bevel across corner. Joints in flush surfaces shall be dressed lightly with coving tube.

COLORS:

Generally, caulking colors will be selected to match color of adjacent materials. Submit color chart of manufacturer's standard colors.

GENERAL:

1. Furnish materials, labor and equipment to provide complete wall and ceiling insulation installation as indicated herein.

2. Refer to Specification Section 0733 for Polyicynene Spray Foam Insulation located between rafters under roof deck.

INSTALLATION:

1. Installation shall be done in strict accordance with manufacturer's directions. Applications shall be done by an organization experienced and specializing in this type of work.

2. Inspect all surfaces to receive insulation and require that necessary corrections are made before proceeding with work. Proceeding with work constitutes acceptance of surfaces.

MATERIALS:

1. All interior wall batt type insulation shall be flame resistant, unfaced, laminate fiberglass insulation as manufactured by Owens-Corning or equal. Insulation shall meet flame spread rating of 25 or less with fuel and smoke developed as 50.

2. Insulation above gyp. board ceilings and wall insulation at exterior wood studs shall be formaldehyde-free blow-in loose-fill fiber glass type system equal to Johns Manville "Climate Pro".

3. Weatherization membrane shall be installed at all exterior walls equal to Dupont Tyvek Commercial Wrap. All joints shall be staggered and penetrations or openings sealed as recommended by manufacturer.

LOCATIONS AND THICKNESS:

1. Ceiling or Attic Blow-in Insulation: 9.7" minimum thickness, R-26.

2. Interior Wall Batts: All interior walls to have insulation in walls from floor to top runner of wall. Insulation to be same thickness as wall.

3. Wall Blow-in-Blanket Insulation System (BIBS) at wood studs (all exterior wood stud walls): 5-1/2" minimum thickness, R-23.

INSULATED SHEATHING BOARD AT WOOD STUDS:

Foam sheathing board at exterior walls shall be 3/4" thick, R-5.0 foil faced, closed-cell polyisocyanurate foam core, foil-faced to the exterior, equal to "R-Matte Plus-3 sheathing as manufactured by Rmax Operating, LLC. All joints shall be staggered and sealed with aluminized tape or as recommended by manufacturer.

INSULATED SHEATHING AT EXTERIOR CMU:

Foam sheathing board at exterior CMU walls shall be 1" thick x 16” x 96”, R-5.0 extruded polystyrene foam equal to Dow Styrofoam "Cavitymate" insulation board. All joints shall be staggered and sealed with aluminized tape or as recommended by the manufacturer.

GENERAL:

Furnish and install 5" thick R-20.5 open-cell polyurethane spray insulation under building roof decking surfaces, between rafters.

SUBMITTALS:

1. Product Data: Provide data on materials, describing insulation properties, surface burning characteristics, etc.

2. LEED Information: Indicate percentage of waste materials by weight diverted from landfill and recycled.

3. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special treatment.

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

QUALIFICATIONS:

Manufacturer: Companies specializing in manufacturing the products specified and in performing work in this section with minimum three (3) years documented experience.

MOCK-UP SAMPLE:

Provide mock-up of polyurethane spray insulation system.
Construct mock-up, minimum 4 feet long by 2 feet wide, including substrate construction. Locate where directed, mock-up may remain as part of the work.

ENVIRONMENTAL REQUIREMENTS:

1. Toxicity/Hazardous Materials - Outgassing/Reactivity:

    A. Formaldehyde: Products containing urea-formaldehyde will not be permitted.
    B. Chlorofluorocarbons (CFCs)/HCFCs: Products and equipment requiring or using CFCs or HCFCs during the manufacturing process will not be permitted.

DELIVERY, STORAGE, AND HANDLING:

1. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.

2. Store materials in an area protected from freezing and overheating damage and in accordance with manufacturer's instructions.

3. Protect materials during handling and application to prevent damage and contamination.

PRODUCT & MANUFACTURER:

Equal to "GacoFireStop2"spray polyurethane foam insulation with integral fire barrier as manufactured by Gaco Western, LLC, Waukesha, WI.

MATERIALS:

Polyurethane Spray Insulation: Water-blown spray applied system that cures to semi-rigid low density foam; conforming to the following:

1. Thermal Resistance (R-Value/inch): ASTM C518; 4.1 @ 1" hr/sq ft/degree F/BTU. In.
2. Air Permeance: ASTM E283; 0.014 @ 1" l/m^2/second.
3. Water Vapor Transmission: ASTM E96; 32 perms.
4. Tensile Strength: ASTM D1623; 3.29 psi
5. Bacterial or Fungal Growth: No growth; no material deterioration.
6. Flame Spread and Smoke Developed Rating: ASTM E84; 10/350

EXAMINATION:

1. Verify existing conditions before starting work and verify that substrate is free of any foreign material that will impede application.

2. Verify that other work on and within spaces to be insulated is complete prior to application and notify Architect of conditions that would adversely affect the application.

3. Beginning of installation means applicator accepts existing conditions.

PREPARATION:

1. Comply with manufacturer's written installation instructions for preparing substrates indicated to receive insulation.

2. Mask and protect adjacent surfaces from overspray or damage.

3. Remove foreign materials, dirt, grease, oil, paint, laitance, efflorescence, and other substances that will affect application.

APPLICATION:

1. Apply insulation in accordance with manufacturer’s written application instructions and to a reasonably uniform monolithic density without voids.

2. Apply to minimum cured thickness as scheduled below.

3. Seal plumbing stacks, electrical wiring and other penetrations into attic to control air leakage.

4. Where building is designed to meet the specific air tightness standards of the Energy Star Program, apply insulation as recommended by manufacturer to provide airtight construction. Apply caulking to seal joints between structural assemblies.

FIELD QUALITY CONTROL:

1. Inspect application for insulation thickness and density.

2. Do not permit subsequent work to disturb applied insulation.

GENERAL:

1. Furnish and install preformed metal roof panels, soffit/ceiling panels, flashing, sheet metal trim items, gutters, downspouts, downspout boots and all related items necessary to provide new roof where indicated. Note that gutters are required at all roof areas including tower roof.

2. Scope of Work: Refer to drawings and details for types, qualities, locations, and conditions affecting the roofing and sheet metal required by this contract. Note that all roof runoff areas, except for the tower, shall be provided with gutters and downspouts.

3. Commencing Work: This Contractor shall examine all surfaces to receive his work, then notify Architect of any conditions or scheduling problems which might affect the proper installation of his work. The commencement of work by the Roofing and Sheet Metal Contractor will otherwise be considered acceptance by him of work done by others, and of scheduling and coordination considerations proposed or adopted.

WORK INCLUDED:

Generally, work required by this contract and included under this heading shall involve the furnishing of all labor, materials, and equipment necessary to install complete the following:

1. All sloped roof surfaces, exterior soffit surfaces and Engine Room ceiling.

2. All coping and metal edging shown, specified, or required to complete the work in an attractive and workmanlike manner.

3. All sheet metal flashing and counter-flashing show, detailed, or required at all roof and water-proofing conditions.

This outline shall in no way limit or restrict the intent of this Specification to require a complete installation of work normally executed by this trade contractor. It shall be the responsibility of this trade contractor to inform himself completely of all specific work required, and to include in his proposal sufficient allowances to carry out all such work in an acceptable manner.

QUALIFICATIONS OF ROOFER:

Roofing Contractor shall be established and recognized as a roofing contractor installing materials of this type for a period of not less than five (5) years.

MATERIALS:

1. Acceptable list of Manufacturer's Roof Panel Specifications as listed below: Over all sloped roof surfaces which call for preformed metal roof panels.

A. "AEP Span" 24 gauge "Span-Lok" panels (flat) with 2" high ribs spaced at 16" o.c.
B. "Berridge Manufacturing" 24 gauge "Zee Lock" (smooth) standing seam roof panels with 2" high ribs spaced at 16" o.c..
C. "Harrison Roofing Company" formed 24 gauge panels, nail-tab standing seam roof panels with 1-1/2" high ribs spaced at 20" o.c.

2. Roof Panels shall be galvalume, one (1) piece for each roof slope direction and have integral cont. overlapping seams for locking or crimping by mechanical means during installation. Top finish coat shall be Kynar 500 in standard color as selected.

3. Gutters shall be fabricated from prefinished 24 gauge galvalume sheet metal with Kynar 500 finish or approved equal. Minimum lengths will be 20'-0" o.c. with expansion joints at 50'-0" o.c. Verify with Architect gutter profile to be used. Install gutter support straps @ 2'-0" o.c.

4. Downspouts and Elbows shall be 26 gauge sheet metal prefinished to match gutters. Downspouts will be placed to accommodate 150 square foot of roof area per inch circumference of downspout. Downspout locations shown on drawings are for bidding purposes only. Exact locations shall be determined at a later date.

5. Metal downspout protection boots shall be equal to Zurn Industries, LLC #Z192 for 3"x4" downspouts and #Z191 for 4"x5" downspouts.

6. Acceptable list of Manufacturer's Soffit/Ceiling Panel Specifications as listed below. Note that panels shall run perpendicular from building in one cont. piece (except in Engine Room, refer to Reflected Ceiling Plan N/A-9) and be mitered at all change in directions. Soffit/Ceiling Panels shall be galvalume. Top finish coat shall be Kynar 500 in standard color as selected.

   A. "AEP Span" 24 gauge "Flush Panel" one rib (smooth) with 12" exposure and 1" formed thickness.
   B. "Berridge Manufacturing Co." 24 gauge "L-Panel" one rib (smooth) with 11-5/8" panel exposure and 1" formed thickness.
   C. "Harrison Roofing Company" formed 24 gauge (smooth) with 12" exposure and 3/4" formed thickness.

7. Manufacturing Recommendations: Prior to commencing application of roofing, this Trade Contractor with a letter, over the signature of responsible representative of roofing products manufacturer, which shall acknowledge a review of the drawings, the specifications and all recommendations to roofing contractor for proper installation of roof specified to meet all warranty and, if required, bonding requirements.

8. Pre-engineered metal eave flashings, rake flashings, etc. shall be as per roof manufacturer. Field notch and hem panel end at eave 1" min. and secure. (1" expansion) rake flashing at vertical engine room wall.

WARRANTY:

All work under this Contract shall be performed by a reliable roofing company acceptable to Architect and Owner. This trade contractor shall furnish a standard five (5) year warranty on workmanship and twenty (20) year warranty covering rupture, structural failure, panel finish cracking, peeling, etc., due to normal atmospheric corrosion exposure.

SUBMITTALS AND SAMPLES:

Submit three (3) copies of manufacturer's literature for approval. Also submit actual samples of roofing panels for color selection by Architect.

GENERAL:

Furnish and install sheet metal work and flashing. Related work in other Sections: Waterproofing and Dampproofing, Roofing and Flashing.

MATERIALS:

1. Galvanized Metal: commercial grade, zinc paint grip

2. Nails, Rivets: best grade for work

3. Flashing Mastic: equal to "Sonolastic NP 11" by Sonneborn

4. Thru-wall flashing as shown on drawings shall be galvanized steel. Thickness, unless noted otherwise, shall be 26 gauge, if exposed; and 28 gauge if concealed; minimum thicknesses. When used in contact with masonry, coat flashing with a bituminous coating to prevent corrosion by wet mortar.

PRECAUTIONS:

1. Examine surfaces to receive sheet metal work. Do not proceed until defective conditions, if any, are corrected.

2. Cooperate with other trades, install work as masonry, roofing proceeds.

3. Prevent damage to roof decks, roofing, masonry, and other trades.

4. Isolate dissimilar metals by positive means to prevent electrolysis.

5. Sheet metal work not specifically noted shall be installed in accordance with best practice to obtain waterproof work.

COUNTERFLASHING:

Form in 10 ft. lengths, loose-lock and joints. Fold exposed bottom edge back 1/4" on underside for stiffness, overlap base flashing 4". Make flashing at angles continuous.

FLASHING:

Shape and install metal as indicated or required. Furnish items to be built by others to proper trade for installation.

QUALIFICATIONS:

This Contractor shall provide materials and labor to insure a watertight installation and finished product.

GENERAL:

Furnish and install F.R.P (fiberglass reinforced panel) wall panels as shown on Drawings, complete with all trim pieces and accessories.

MANUFACTURER:

Panels to be equal to Kemlite Company Sequentia Structoglas Panels. Specifications of Sequentia Structoglas are to be made a part of these Specifications. Products of other manufacturers which are comparable in design and quality may be submitted for approval.

SUBMITTALS:

Submit six (6) copies of manufacturer's brochures clearly indicating type of panel and trim or accessories to be used.

INSTALLATION:

1. Install in accordance with manufacturer's instructions. Securely anchor in place-plumb and true.

2. Protect materials from damage, store indoors and replace all damaged or defective items.

3. Install with non-staining nylon drive rivets matching panel color and silicone sealant for moisture seal as recommended by manufacturer over gypsum board type substrate as shown in Plans.

4. Provide and install all appropriate trim profiles as required for professional installation. No exposed panel edges shall be accepted as a finished product.

5. Install as shown on Plans to fit job conditions.

PANEL Material:

1. Structoglas Class A rated fiberglass reinforced, smooth surface panels and trim, white in color. Nominal thickness shall be .09” x 48” in width. Panel vertical height shall be without seams in all areas less than 12’-0” above finish floor level.

2. Certification: Panels shall meet or exceed flame spread rating of 25 or less, smoke developed 450 or less (per ASTM E-84) and meet USDA/FSIS requirements.

GENERAL:

Furnish all necessary materials, labor and equipment for the complete fabrication, installation and weatherproofing of: glass framing, vertical and horizontal mullions, transition members connecting these components, trim mouldings and facing materials, transoms, sidelights and related items.

WORK SPECIFIED ELSEWHERE:

Glass and Glazing: Division 8, Section on Glass and Glazing.

MATERIAL - ALUMINUM STOREFRONT AND DOOR FRAMES:

1. For purpose of designating type and quality of work in this Section, Drawings and Specifications are based on materials as manufactured by Kawneer. Other manufacturers will be considered upon submittal of acceptable proof of equality.

2. Manufacturer's published specifications shall become a part of these Specifications.

3. Frames shall be Trifab II 451 T (thermally broken) framing members.

4. Operable Window units scheduled as Elevation Type “A” shall be single hung 8430TL Isolock windows with a fixed transom unit mounted above.

5. Doors shall be #350 medium stile with 7/8” horizontal and vertical intermediate rails as shown on Door Elevation Drawing.

FINISH:

1. All exposed framing members shall be free of scratches and other serious surface blemishes.

2. Frame and door finish shall be Kawneer #40 dark bronze anodized.

INSTALLATION:

1. Install plumb and true without forcing in accordance with the specifications of the manufacturer.

2. Clean all aluminum and leave the work in condition satisfactory to Architect. Protect aluminum during construction.

3. Set all frames in mastic.

EXTERIOR DOOR HARDWARE:

1. Door Closers: Kawneer SAM II concealed overhead single-acting.

2. Threshold: 1/4" high anodized, verify color selection.

3. Weatherstripping: Sealair Weathering System with optional bottom weatherstrip.

4. Dor-O-Matic #1490 concealed vertical rod type exit device with Style CO-9 pull at door 48 only. Dead bolt lock (thumb-turn inside) at door 29 only.

5. Top and bottom offset pivot hinges.

GENERAL:

Furnish all necessary materials, labor and equipment for the complete fabrication, installation and weatherproofing of hollow metal doors, windows and frames in all openings as shown in Drawings. For labeled doors and frames, refer to Door Schedule.

WORK SPECIFIED ELSEWHERE:

1. Finish Hardware: Division 8.

2. Weatherstripping: Division 8.

3. Glass and Glazing: Division 8.

MATERIALS:

1. Doors and frames shall be constructed to conform to Commercial Standard CS242-62, Products Standard PS4-66, and Steel Door Institute Standard SDI-100.

2. Doors and frames shall be constructed of cold rolled steel in accordance with ASTM-A366.

FINISHES:

All doors and frames shall be thoroughly cleaned, phosphitized, and finished as standard with one coat of baked-on rust inhibiting gray prime paint, capable of passing as 120 hour salt spray test in accordance with Federal Standard 141 or ASTM Specification B117 and a 250 hour humidity test in accordance with ASTM Specification D1735.

FRAMES:

1. Frames shall be FE Series universal frames as manufactured by Republic Builders Products Corporation, McKenzie, Tennessee, or approved equal.

2. Frames shall be 16 gauge, formed to profiles as shown on Plans. Miter and weld corners full length of joints, and grind joints smooth. No screws or other fastenings shall be exposed unless from mechanical necessity.

3. Frames shall have proper reinforcement for all hardware when required. Reinforcements, drilling and tapping for mortise applied hardware shall be done at the factory. Surface applied hardware reinforcements shall be installed at the factory, all drilling and tapping shall be done in the field by others. Reinforcement for surface applied closer to be 12 gauge steel.

4. Frames shall be supplied with pressure applied rubber silencers, three (3) per strike jamb and two (2) per head for double openings. Frames shall have 9 gauge steel hinge reinforcement plates, projection welded with provisions for scheduled hinges and 14 gauge steel strike reinforcement plate, extruded and formed to the equivalent of 10 gauge, projection welded with provisions for universal ANSI A115.1 or ANSI A115.2 strike. Mortar guards of 26 gauge steel, 1" depth, shall be welded to each hinge or strike reinforcement.

5. Frames shall be rigidly attached to masonry, wood stud or steel stud construction with proper anchors of manufacturer's standard design. A minimum of six (6) anchors per opening shall be furnished loose for field installation. All frames shall have an integral or welded on sill anchor. Where metal frames are mounted to special or non-standard wall conditions, provide special anchors to suit conditions.

6. Frames scheduled to have UL "Fire Door Frame" labels shall conform to UL requirements for sizes, proper stop depth, welded in anchors, gauges and hardware reinforcements. All frames for labeled doors shall also be labeled.

DOORS:

1. Doors shall be DM Series as manufactured by Republic Builders Products Corp., McKenzie, Tennessee, or approved equal. All doors to be 1 3/4" thick.

2. Doors shall be 16 gauge. Lock edge shall be non-beveled with continuous lap seam welded and planished. Hinge edge shall be non-beveled and reinforced with a continuous 16 gauge channel projection, welded at 5" on center. Additional reinforcing plates to be provided at the hinge locations to give a total 3/16" thickness.

3. Cylindrical and mortise lock reinforcement to be box type configuration and in accordance with ANSI A115 standards.

4. Doors shall have proper reinforcement for all hardware when required. Reinforcements, drilling and tapping for mortise applied hardware shall be done at the factory. Surface applied hardware reinforcements shall be installed at the factory, all drilling and tapping shall be done in the field by others. Reinforcement for surface applied closer to be 12 gauge steel.

5. Doors shall be reinforced by laminating panels to a 3/4" cell honeycomb core completely filling the inside of the door. Doors shall have flush top and inverted bottom 16 gauge projection welded at 1-1/2" on centers.

6. Where indicated, furnish doors with 16 gauge weatherproof type louvers together with removable type bronze insect screen.

7. There glass or other panels are shown, provide fixed stops keyed to the door assembly and removable stops secured in place with countersunk oval-head machine screws. Stops shall be mitered and welded at corners. All stops to be steel.

8. Doors scheduled to have UL "Fire Door" labels shall conform to UL requirements, lite and louver sizes, and have the proper classification label. All doors for labeled frames shall be labeled.

LOCATION OF HARDWARE:

1. Unless otherwise noted or shown on Drawings, locate all hardware as recommended by manufacturer or as suggested by the Door and Hardware Institute Standards. Refer to Division 1 for Handicap Standards.

2. No finish hardware will be furnished under this Section. Hardware contractor will deliver prepaid to metal door and frame manufacturer all templates and finish hardware required by him. Manufacturer shall prepare all material at the factory for hardware application. Hardware shall be delivered directly to the building by the hardware contractor and shall be installed by the General Contractor.

SHOP DRAWINGS AND SAMPLES:

Submit for approval shop drawings showing typical construction of all items. For metal bucks and trim, the drawings shall also show the conditions at doors with various wall thicknesses and materials and a schedule listing the location in the building for each item.

INSTALLATION:

Installation shall be plumb, straight and true, rigidly secured in place and properly braced. Frames shall be set in mastic and anchored to floors through sill anchors with expansion bolts or power actuated bolts.

COMPLETION:

After installation, protect doors and frames from damage of subsequent construction and operations. Damaged doors and frames shall be replaced by Contractor.

CONTRACTOR'S RESPONSIBILITIES:

Contractor shall provide materials and placement of required items in order to eliminate barriers to the physically handicapped. General Contractor shall direct any question about the handicap requirements to the Architect. Contractor shall verify any T.A.S. (Texas Accessibility Standards) requirements and locations prior to installation.

GENERAL:

Furnish and install all window perimeter frame pieces, T-Bar grid members, glazing materials, expansion-contraction thermal foam tape, sealants, framing, flashings, and other items necessary for complete window installation as indicated on the drawings and specified herein.

MATERIAL STORAGE AND HANDLING:

1. Store material in dry place, off the ground, where temperature will not exceed 90 degrees Fahrenheit.

2. Handle material to prevent damage to finished surfaces. Do not install scratched or damaged components.

3. After installation, protect finished surfaces from damage caused by ensuing work.

MATERIALS:

1. IBP Glass Block Grid System: 6063-T6 and 6463-T6 extruded aluminum Glass Block Grid System for windows as manufactured by Innovative Building Products, Inc., 2917 W. 7th Street, Fort Worth, TX 76107, 817/332-9124.

2. Expansion-Contraction Thermal Foam tape: Adhesive backed, closed cell foam, 1/16" or 3/32" thick.

3. Sealant: TradeMate Glass Block Sealant.

4. Frame Finish: Interior and exterior shall be bronze color..

5. Glass block units: 7 3/4" x 7 3/4" x 3 1/8" thick, partially evacuated hollow units, made of clear glass as manufactured by Pittsburgh Corning, Solaris, or Weck to be selected by Architect.

FIELD CONDITIONS:

1. Verify all applicable field dimensions and adjust as necessary to accommodate window frame.

2. Examine supporting frame to which window will be attached. Correct any conditions that are not constructed according to installation instructions furnished by window manufacturer.

INSTALLATION:

1. Assemble and seal glass block grid system for window according to instructions furnished by manufacturer.

2. Apply continuous sealant bead to back of window z-bar. Place assembled glass block grid system frame into properly prepared and sized rough opening and adjust until plumb and level. Screw or nail grid system in place utilizing all pre-drilled holes in nailing flange.

3. Adhere foam tape gasket to each glass block according to instructions furnished by glass block grid system manufacturer. Carefully insert glass blocks into grid system from exterior side of window so that each block is pressed against T-Bar and foam tape does not roll back.

4. Apply sealant to completely fill channel around each glass block and wipe flush with surface. Apply sealant to exterior frame corners according to instructions furnished by grid system manufacturer.

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GUARANTEE:

1. Window manufacturer shall guarantee for a period of one year from the date of purchase that the windows will be free of defects in materials and factory workmanship, and that defective materials will be repaired or replaced immediately, after proper notification.

2. Installing contractor shall guarantee for a period of one year against faulty installation workmanship or water leakage due to on-site errors.

SUBMITTALS:

Submit assembly instructions and installation drawings as required to indicate methods on construction, location and spacing of anchorage, joinery, finishes, sizes, shape, thickness and alloy materials, glazing materials, and relationship to the adjoining work.

CLEAN-UP:

1. Clean all exposed surfaces of aluminum glass block grid system with clean, soft cloth and mild hand soap using gentle rubbing action. Do not use abrasive or solvent-type cleaners, detergent or paint removers.

2. Remove all labels from glass block and clean with soft cloth and water.

GENERAL:

Furnish and install three (3) ceiling mounted access panels as herein specified and where shown on Plans.

MATERIALS:

Ceiling access panels shall be equal to those manufactured by “JL. Industries”, Model FD Standard Panel.

1. Access frame shall be 16 gauge steel and 2" thick door shall be insulated 20 gauge with continuous hinge and universal turn ring & key lock (U).

2. Overall size of units: 22” x 30” with a ceiling opening required size of 22-3/8” x 30-3/8”

FINISH:

1. Unit shall be furnished with standard white powder coat finish.

2. Contractor shall install perimeter trim as required to terminate metal soffit/ceiling panel edges at Engine Room installation.

GENERAL:

1. Furnish labor and materials to supply all items for hardware work indicated or required by job conditions including screws, bolts, expansion shields, other devices necessary or required for proper installation.

2. Submit six (6) sets of Finish Hardware Schedule prepared by a qualified architectural hardware consultant. Schedule each item of hardware required for each door, item of equipment. List hardware number, manufacturer, manufacturer's number or symbol, and finish.

3. After approval of Schedule, furnish templates to manufacturer of metal doors and metal door frames for each item to be attached thereto, in ample time to facilitate progress of work.

MATERIALS:

1. Locks and Trim: Locks and latches shall be heavy duty types as scheduled equipped with suitable box type strike of sufficient length to protect jambs and trim against damage by latch and deadbolts. Provide levers and escutcheons.

2. Closers: Pull rack and pinion. Provide through-bolts and grommet nuts for fastening closers and closer arms to doors. Provide proper brackets and soffit plates as required by conditions of use.

3. Door Stops: Provide bumpers and door stops as required to prevent doors from striking any other part of building construction.

4. Abbreviation Legend:

I	Ives
M	Monarch
DO	Dor-O-Matic
P	Pemco
T	Trimco
F	Falcon
GJ	Glynn-Johnson

KEYING:

Master key all locks to Master Key. Furnish two (2) keys per lock. Key all doors as directed by Architect or Owner. Stamp all keys (i.e. "M.S." for Master Key) as directed.

HARDWARE TEMPLATES:

Furnish hardware to template where required and furnish proper templates of such hardware to manufacturer of materials affected.

INSTALLATION:

1. General Contractor to receive, store, and be responsible for all finish hardware. Apply hardware in accordance with the manufacturer's instructions, fit accurately, apply securely, and adjust carefully. Use care not to injure work when applying hardware. When necessary, remove and replace doors so they may have bottoms painted.

2. Unless otherwise noted or shown on Drawings, locate all hardware as recommended by manufacturer or as suggested by the Door and Hardware Institute Standards. Refer to 0190 for handicap requirements.

3. Cover door knobs and pulls with heavy cloth until painting is completed. Prior to completion of building, examine all doors, sash, and other moveable parts; adjust as required and leave hardware in good working order.

FINISHED HARDWARE SCHEDULE:

HW - 1

Doors # 1, 44 each shall have:

3	Hinges 5BB1 4.5 x 4.5 NRP 26D	I
1	Exit Device 18R LE Quanyum 630	M
1	Rim cylinder 985 626	F
1	Door closer SC80-3077HD AL	DO
1	Wall Stop WS407CVX 626 @ door 44 only	I
1	Threshold 2005AV x DW	P
1 set	Weatherstripping 319CR DW+DH	P
1	Door Bottom 345AV x DW	P
1	Kick Plate 16” x 34” KOO38 630	T

HW - 2

Doors # 30, 31, 34 each shall include:

3	Hinges 5PB1 4.5 x 4.5 26D	I
1	Passage Lever Set B101 Quanyum 626	F
1	Wall Stop WS407CVX 626	I
1 set	Gasket Seal S88D x DW + DH	P
3	Door Silencers 1229A @ doors 30, 31, 34 only	TR

HW - 3

Doors # 21, 23 (3/4 hour fire rated) each shall include:

3	Hinges 5BB1 4.5 x 4.5 NRP 26D	I
1	Passage Lever Set B101 Quanyum 626	F
1	Wall Stop WS407CVX 626	I
1 set	Gasket Seal S88D x DW + DH	P
1	Door closer SC80-3077HD AL	DO
1	Kick Plate 16” x 34” KOO38 630 @ door 21 only	T

HW - 4

Door #37 (1-1/2 hour fire rated) shall include:

3	Hinges 5BB1 4.5 x 4.5 NRP 26D	I
1	Exit Device 18R LE Quanyum 630	M
1	Rim cylinder 985 626	F
1	Door closer SC80-3077HD AL	DO
1	Wall Stop WS407CVX 626	I
1	Threshold 271A x DW	P
1 set	Weatherstripping 319CR DW+DH	P
1	Door Bottom 217AV x DW	P
1	Kick Plate 16” x 34” KOO38 630	T

HW - 5

Doors # 3, 5, 7, 9, 11, 13, 15, 17, 19, 22, 24 each shall include:

3	Hinges 5PB1 4.5 x 4.5 26D	I
1	Privacy Lock Lever Set B301 Quanyum 626	F
1	Surface Overhead Stop 454S-US32	GJ
1	Wall Stop WS407CCV 626 @ door 22	I
3	Door Silencers 1229A	TR

HW – 6

Door #32 shall include:

6	Hinges 5PB1 4.5 x 4.5 26D	I
1	Passage Lever Set B101 Quanyum 626	F
1	Head Bolt FB358 26D	I
1	Foot Bolt FB358 26D	I
2	Astragals 316AV x DH	P
2	Wall Stop WS407CVX 626	I
3	Door Silencers 1229A	TR

HW - 7

Doors # 26, 27, 28 each shall include:

3	Hinges 5PB1 4.5 x 4.5 26D	I
1	Lever Lock Set B561 Quanyum 626	F
1	Surface Overhead Stop 453S-US32	GJ
3	Door Silencers 1229A	TR

HW - 8

Door # 36 shall include:

3	Hinges 5PB1 4.5 x 4.5 26D	I
1	Passage Lever Set B101 Quanyum 626	F
3	Door Silencers 1229A	TR
1	Wall Stop WS407CCV 626	I

HW – 9

Door # 33, 35 each shall include:

3	Hinges 5PB1 4.5 x 4.5 26D	I
1	Lever Lock Set B501 Quanyum 626	F
1	Wall Stop WS407CCV 626	I
3	Door Silencers 1229A	TR

HW - 10

Doors # 29, 48 each shall include:

1	Rim Cylinder as required for aluminum door unit	

HW - 11

Doors # 38, 39, 40 (1-1/2 hour fire rated) each shall include:

3	Hinges 5BB1 4.5 x 4.5 26D	I
1	Lever Lock Set B561 Quanyum 626	F
1	Door closer SC80-3077HD AL	DO
1	Floor Stop FS438 626 @ door 38 only	I
1	Wall Stop WS407CCV 626	I
1	Threshold 217A x DW	P
1 set	Weatherstripping 319CR DW+DH	P
1	Door Bottom 217AV x DW	P

HW - 12

Doors # 2, 4, 6, 8, 10, 12, 14, 16, 18, 20 (20 min. fire rated) each shall include:

3	Hinges 5BB1 4.5 x 4.5 NRP 26D	I
1	Passage Lever Set B101 Quanyum 626	F
1	Wall Stop WS407CVX 626	I
1 set	Gasket Seal S88D x DW + DH	P
1	Door closer SC80-3077HD AL	DO

GENERAL:

This Contractor shall supply all labor, materials, equipment, and appurtenant accessories for furnishing and installing all glass and glazing. See Drawings, Schedules, etc. for items required. All ext. glass shall be installed watertight.

MATERIALS (NOT ALL ITEMS MAY BE APPLICABLE TO THIS JOB):

1. Glass shall be manufactured by one of the following manufacturers and/or an approved equal: Pittsburgh Place Glass Co., Libbey-Owens Ford, American Saint Gobain Corp., Mississippi Glass Co.

    A. Insulated Exterior Fixed: Insulated glass in fixed frames shall be 1" total thickness: outside, 1/4" thick tinted; inside, 1/4" clear. Provide safety glazing as required by Consumer Protection Act.
    B. Exterior Fixed: Glass in fixed frames shall be 1/4" total thickness. Provide safety glazing as required by Consumer Protection Act.
    C. Unless otherwise noted on Plans, Interior glass shall be 1/4" thick clear tempered safety glass throughout

2. Frameless Mirrors: No.1 quality, 1/4" float/plate glass mirror electrolytically copper plated, and guaranteed against silver spoilage for ten (10) years. See Plans for locations and sizes.

3. Engine Bay Automatic Doors:

    A. Under Standard overhead door (Base Bid) vision panels are to have 1" thick tinted, low-E safety glazing. Refer to spec. section 1034.
    B. Under Add Alternate No. 2 Bi-fold doors, vision panels shall be 1/2" thick tinted, insulated tempered Low-E safety glazing. Refer to spec. section 1040-2.
    C. Under Add Alternate No. 3, High Speed doors, vision panels shall be double pane with vertical reinforcement and Duratec synthetic glazing. refer to spec. section 1040-3

4. Single Hung Operable Windows: Install insulated glass 1" total thickness: outside, 1/4" thick tinted; inside, 1/4" thick clear. Provide safety glazing as required by Consumer Protection Act.

MANUFACTURER'S LABELS:

Labels showing strength, grade, thickness, type and quality will be required on each piece of glass. Labels must remain on glass until it has been set and inspected.

INSTALLATION:

All glass shall be bedded, secured in place as detailed or required by sash or frames. At completion of work, leave glass whole, free from cracks and rattles. See General Requirements for cleaning glass.

GENERAL:

This document contains all Manufacturer's requirements for proper design, use, and installation of Dryvit Outsulation Exterior Insulation and Finish System (EIFS) Class PB in typical applications. It is intended to be used in conjunction with Dryvit's published Outsulation System typical details, DS107 and application instructions, DS204.

REFERENCES:

1. DS107 Dryvit Outsulation System Installation Details.

2. DS131 Dryvit Expanded Polystyrene Insulation Board Spec.

3. DS135 Spec. for Outsulation System With Mechanical Fasteners.

4. DS204 Dryvit Outsulation System Application Instructions.

5. EIMA std 101.86 Standard Test Method for Resistance of Exterior Insulation Finish Systems (EIFS), Class PB to the Effects of Rapid Deformation (Impact).

SYSTEM DESCRIPTION:

1. General: Dryvit Outsulation System is an Exterior Insulation and Finish System, Class PB, consisting of an adhesive, insulation board, base coat with reinforcing mesh(es), and finish. Mechanically attached systems shall conform to Dryvit spec.DS135.

2. Methods of Installation – Field Applied: Outsulation System is applied to substrate system in place.

3. Design Requirements:
   - A. Acceptable Substances for Outsulation System shall be ext. grade gyp. sheathing meeting ASTM C 79 requirements for water-resistant core or Type X core at time of application.
   - B. Deflection of substrate systems shall not exceed L/240.
   - C. Expansion Joints:
     1) As a minimum, expansion joints shall be placed at the following locations:
     2) Where expansion joints occur in the substrate system.
     3) Where building expansion joints occur.
     4) Where the Outsulation System abuts dissimilar materials.

5) Where the substrate changes.

D. Terminations:
   1) Outsulation System shall be held back from adjoining materials a minimum of 3/4 in. for sealant application.
   2) The EPS insulation board shall be terminated a minimum of 8 in. above finished grade.
   3) Sealants shall be manufactured and supplied by others.

4. Performance Requirements:
   A. Outsulation System shall have been tested for fire performance as follows:
      1) Flame Spread – ASTM E 84. When tested individually;
         a. EPS insulation board shall have a Flame Spread index not exceeding 25 and a Smoke Developed index not exceeding 450.
         b. Adhesives and coatings shall have a Flame Spread index not exceeding 20 and a Smoke Developed index not exceeding 10.

SUBMITTALS:

1. Product Data: Contractor shall submit to Architect Manufacturer's product data sheets describing products, which will be used on this project.

2. Shop Drawings for Panelized Constructions: Panel Fabricator shall prepare and submit to Architect complete drawings, showing; wall layout, connections, details, expansion joints, and installation sequence.

3. Samples: Contractor shall submit to Architect two samples of Outsulation System for each finish, texture, and color to be used on project. Same tools and techniques proposed for actual installation shall be used. Samples shall be of sufficient size to accurately represent each color and texture to be utilized on project.

QUALITY ASSURANCE:

1. Qualifications:
   A. System Manufacturer: Shall be Dryvit Systems, Inc. or approved equal.
   B. Contractor: Shall be knowledgeable in the proper installation of Dryvit Outsulation System and shall be experienced and competent in the installation of Exterior Insulation and Finish Systems.

C. Insulation Board Manufacturer: Shall be listed by Dryvit Systems, Inc., shall be capable of producing expanded polystyrene (EPS) in accordance with current Dryvit Spec. for Insulation Board (DS131).
D. Panel Erector: Shall be experienced and competent in installation of architectural wall panel systems and shall be:
   1) Panel Fabricator, or
   2) An Erector approved by Panel Fabricator or
   3) An Erector under direct supervision of Panel Fabricator.
E. EIMA Classification:
   1) Standard
      a. Impact Range (in-lbs): (25-49)
      b. Reinforcing Mesh(es): Standard ™
      c. Test Results J (in-lbs): 4 (36)

5. Certifications:
Surface burning characteristics of EPS shall be classified by Underwriters Laboratories and be listed in U.L. Building Materials Directory as having a Flame Spread and Smoke Development rating of not greater than 25 and 450 respectively.

3. Delivery Storage and Handling:
A. All Dryvit materials shall be delivered to job site in original, unopened packages with labels intact.
B. Upon arrival, materials shall be inspected for physical damage, freezing, or overheating. Questionable materials shall not be used.
C. Materials shall be stored at the jobsite in a cool, dry location, out of direct sunlight, protected from weather and other damage. Minimum storage temperature shall be 45ºF for Demandit®, Revyvit®, and Color Prime™; 50ºF for Ameristone and 40ºF for other wet products.

PROJECT CONDITIONS:

1. Environmental Requirements:
A. Application of wet materials shall not take place during inclement weather unless appropriate protection is provided. Protect materials from inclement weather until they are dry.
B. Application of wet materials shall be at a minimum ambient temperature of (40ºF), (45ºF) or (50ºF) depending on product, and rising. These temperatures shall be maintained for a minimum of 24 hours thereafter, or until completely dry.

2. Existing Conditions: Contractor shall have access to electric power, clean water, and a clean work area at location where Dryvit materials are to be applied.

SEQUENCING AND SCHEDULING:

1. Installation of the Outsulation System shall be coordinated with other construction trades.

2. Sufficient manpower and equipment shall be employed to ensure a continuous operation, free of cold joints, scaffold lines, texture variations, etc.

LIMITED MATERIALS WARRANTY:

Dryvit Systems, Inc. shall provide a written, standard five (5) year limited warranty against defective materials.

MAINTENANCE:

1. Maintenance and repair shall follow the procedures noted in Dryvit Application Instructions DS204.

2. All Dryvit products are designed to minimize maintenance. However, as with all building products, depending on location, some cleaning may be required. See Dryvit publication DS152 on Cleaning & Recoating.

3. Sealants and flashings should be inspected on a regular basis, and repairs made as necessary.

MATERIALS:

1. Portland Cement: Shall be Type I, I-II or II, meeting ASTM C 150, white or gray in color, fresh and free of lumps.

2. Water: Shall be clean and free of foreign matter.

3. Mechanical Fasteners: Shall be Wind-Lock's Wind Devil ™ plates, or equivalent, used in conjunction with corrosion resistant fasteners appropriate for substrate system.

COMPONENTS:

1. Adhesives: Used to adhere the EPS to the substrate, shall be compatible with substrate and the EPS.
   A. Cementitious: A liquid polymer based material, which is field mixed with Portland cement for use over non wood-based substrates.
   B. Non-cementitious: A factory-mixed, fully formulated water based adhesive for use over wood-based substrates shall be ADEPS
   C. Ready mixed: Dry blend cementitious, co-polymer based product, field mixed with water for use over non wd-based substrates shall be Primus DM™ or Genesis DM™, Rapidry DM™ 35-50 or 50-75.

2. Dampproofing for Masonry Back-up Behind EIFS System: Factory mixed equal to Dryvit "Backstop" material applied as per manufacturer's instructions.

3. Insulation Board: 1-1/2" thick R-7.5 expanded polystyrene meeting Dryvit Spec. for Insulation Board DS131.

4. Base Coat: Shall be compatible with the EPS insulation board and reinforcing mesh(es).
   Cementitious: A liquid polymer based material, which is field mixed with Portland cement shall be Genesis

5. Reinforcing Meshes: Shall be a balanced open weave, glass fiber fabric treated for compatibility with other System materials and available in following weights, and shall provided indicated minimum tensile strengths: Standard Plus: (6 oz/yd²); (200 lbs/in).

6. Finishes: Shall be type, color, and texture as selected by Architect and shall be one or more of the following:
   Elastomeric DPR (Dirt Pickup Resistance): Water-based elastomeric acrylic coating with integral color and texture, and formulated with DPR chemistry:
   Weatherlastic Sandpebble: Pebble stucco texture.

7. Coatings: Shall be water based, acrylic coating with integral color and/or texture and be Revyvit: Fine sandy texture.

8. Primers and Sealers:
   Prymit: A water-based acrylic primer and adhesion promoter.

EXAMINATION:

2. Prior to installation of the Outsulation System, Contractor shall ensure that substrate is sound, dry, connections are tight, has no surface voids, projections or other conditions that may interfere with Outsulation System installation.

3. Contractor shall notify General Contractor and/or Architect of all discrepancies.

4. Prior to the installation of Outsulation System, General Contractor shall insure that all needed flashings and other waterproofing details have been completed, if such completion is required prior to the Outsulation application.

SURFACE PREPARATION:

Substrate shall be prepared as to be free of foreign materials such as oil, dust, dirt, form-release agents, efflorescence, paint, wax, water repellants, moisture, frost and any other materials that inhibit adhesion.

INSTALLATION:

1. Dryvit Outsulation System shall be installed in accordance with current application instructions.

2. Overall minimum base coat thickness shall be sufficient to fully embed the mesh. Recommended method is to apply base coat in two (2) passes.

3. Outsulation base coat surfaces in contact with sealant shall be coated with Demandit or Color Prime. Sealant shall not be applied directly to textured finishes or base coat surfaces.

PROTECTION:

Outsulation System and project shall be protected from weather and other damage until permanent protection in the form of flashings, sealants, etc. are installed.

GENERAL:

1. Scope: Furnish all labor, materials and equipment to erect and brace all surface applications of gypsum board and related drywall products.

2. Qualifications: For the purpose of designating type and quality of work in this Section, the specifications of United States Gypsum Company shall be made a part of these Specifications. All materials shall be as manufactured by U.S.G. or equal, and shall be installed in accordance with U.S.G.'s current printed directions.

3. Delivery and Storage of Materials: All materials shall be delivered in their original unopened packages and stored in an enclosed shelter providing protection from damage and exposure to the elements. Damaged or deteriorated materials shall be removed from the job site.

WORK SPECIFIED ELSEWHERE:

1. Wood Studs: Division 6, Section on Carpentry

2. Finishes: Division 9, Sections on Painting, Ceramic Tile, FRP, etc.

SAMPLES:

1. Submit three (3) copies of manufacturer's brochures, clearly marked indicating all types of gypsum board and accessories to be used, and their proposed locations.

2. If requested by the Architect, submit actual samples of each type of accessory (expansion joints, trim, etc.) to be installed

SPECIAL INSTALLATION NOTE:

All gyp. board walls shall be installed plumb to within 1/8" per 10'-0" tolerance.

INSTALLATION:

All items not specifically addressed below shall be installed in accordance with manufacturer's current printed directions.

1. Apply all wall panels vertically. Position all edges over framing members and all ends over blocking between studs. Use maximum practical lengths to minimize end joints. Fit ends and edges closely, but not forced together. Stagger joints on opposite sides of partitions, placing joints on different studs.

2. Install U.S.G. acoustical sealant at all cutouts in surfaces, and at the perimeter of all insulated and smoke gypsum board partitions.

3. Attach panels to framing supports by either nailing to wood framing members or using power-driven screws in metal framing members. Space fasteners not less than 3/8" from edges and ends of panels, and install as per manufacturer's standard specifications for each particular application.

4. Cut ends, edges, scribe or make cutouts within field of panels in a workmanlike manner. All openings shall be completely cut out. Scribing openings and knocking them out will not be acceptable.

5. Install trim at all internal and external angles formed by the intersection of either panel surfaces or other surfaces. Apply corner bead to all vertical or horizontal external corners in accordance with manufacturer's directions.

6. Attention is called to the double-layer application in certain wall conditions as shown on Plans or in partitions where a fire-rated door is scheduled. Application shall conform to manufacturer's standard specifications, with face layer applied vertically with Durabond joint compound taping spread on backside, joints staggered approximately 12" and fastened to base layer with screws.

7. Spot grout frames at all doors over 36" wide with Durabond or U.S.G. ready-mixed joint compound just before inserting wallboard into frame.

8. Refer to details for securing of blocking for fixture attachment.

9. Refer to details for single and double layer application of gypsum board. Install per manufacturer's standard specifications. All walls shall conform to screws and spacing to obtain a minimum one-hour rating.

10. Drywall Contractor shall be responsible for insuring that the specified insulation, or an approved substitute, has been installed properly prior to his installation and completion of the gypsum board walls.

11. All materials shall be installed plumb and true in a workmanlike manner. A component foreman shall be in charge of the work during the entire installation. Cooperate with other trades installing other work in or through his work.

12. At all structural columns provide U.S.G. #100 control joints in stucco, lay masonry control joints on exterior and use U.S.G. gypsum board expansion joints on interior. Verify exact location with Architect.

MATERIALS:

All items shall be supplied and installed in lengths as long as practical to minimize the number of joints. Unless specifically noted otherwise in materials listed below, all gypsum board panels shall be as follows:

1. 5/8" thick throughout at walls and ceilings.

2. 4'-0" wide

3. Tapered edges

Gypsum Panels:

1. 5/8" thick shall be FIRECODE "C"

2. 5/8" thick, Sheetrock Mold Tough, FIRECODE "C", as a base for adhesive application (3-walls each) of solid surface shower wall panels including all Bathroom walls and ceilings of Rooms 103, 106, 109, 112, 115 & 118.

3. 5/8" thick, Sheetrock Mold Tough, FIRECODE "C" in drywall sections of walls and ceilings at Rooms 128, 130, 131 and 133.

4. 5/8" thick, Sheetrock Mold Tough, FIRECODE "C" at Rooms 129 (small area above Door 37) and 132 ceilings only.

5. 5/8" thick, Sheetrock Mold Tough, FIRECODE "C" at north, west & east walls and includes all the ceiling of Kitchen 119.

Sheathing (If Shown on Plans):

1. 5/8" thick USG Firecode Core gypsum sheathing board installed under metal ceiling panels in Engine Room 129.

2. 3/4" or 1" insulated sheathing board, see Division 7, Thermal Insulation

Trim Accessories:

1. Corner Reinforcement: Dur-A-Bead Nos. 101, 103, or 104 as required

2. Metal Trim: U.S.G. metal trim No. 200-B

3. Control Joints: U.S.G. control joint No. 093

   Note: Provide adequate seal behind control joints in fire-rated partitions.

Special:

All joints on the outboard side of the sheathing board shall be taped to form an airtight seal.

GENERAL:

1. Furnish labor, materials and equipment to install floor tile over surfaces specified in other Sections.

2. Furnish with Tile Manufacturer's Association Standard Form of Master Grade Certificate, signed by contractor and manufacturer, stating grade, kind of tile and identifications marks for packages. Certification mark of Tile Council of America shall appear on each label/carton of tile.

MATERIALS:

1. Thin-Set Mortar for Floors: ANSI A108.5 and A118.1, current editions.

2. Ceramic Floor Tile: 2" x 2" glazed ceramic tile equal to Gold Rush Mosaics as manufactured by "Dal-Tile". Tile thickness shall be approximately 1/4".

3. Coordinating Tile Base: Trim all inside corners, rounded, base corner coved, exposed edges bullnosed, 6" x 8" high sanitary base, etc.

PREPARATORY WORK:

1. Examine preparatory work and see that proper provisions made for installation of tile, free from irregularities, dry clean, firm.

2. Report any deficiencies, irregularities, corrections required. Begin work only after correction of defects.

BASE TILE SPECIFICATIONS:

1. Basic specifications for tile contained in ANSI A108.5 and A108.4, current editions. Insofar as any portion is applicable to this building, it is hereby made a part of this Specification and shall be in force and effect as though written herein in full except where it may be herein modified.

2. Wall base installation to conform to Specs W223-88 and floor installation to conform to Specification F122-88 of Tile Contractor's Assoc.

GENERAL SETTING REQUIREMENTS:

1. Secure tile firmly in place with joints filled, lines straight and true. Bring finished surfaces to true level planes. Completed work shall be free from cracked or broken tiles or open joints.

2. Layout tile work so whenever possible tile shall be less than ½ full tile.

3. Form intersections and returns perfectly. Cut and drill tiles neatly without marring surfaces. Carefully grind, join edges of tiles against any trim, finish.

4. Keep tiles dry while in packages and do not allow to lie in or upon wet sawdust or similar materials. Soak tiles thoroughly in clean water before setting.

SAMPLES:

Contractor shall furnish, in duplicate, samples of each of the various kinds of tile proposed for use. Samples shall be properly labeled with the name of building, contractor, etc., and the name of tile manufacturer.

SETTING TILES:

Immediately in advance of placing setting mastic, wipe clean.
Spread mastic until surface bed is level. Place at one operation only as large an area as can be covered with tile before mastic has reached initial set.

POINTING TILE:

Grout ceramic tile with non-staining grout, force into joints, and finish flush and true. Remove surplus grouting, leave faces of tile clean.

PROTECTION:

1. It is the responsibility of Tile Contractor to protect all tile materials from other trades after installation and/or until acceptance, after which time General Contractor must assume responsibility for protecting tile work.

2. No traffic permitted on any tile floor until after setting min. of 72 hours.

FINAL CLEANING:

1. Contractor shall final clean when appropriate in the project schedule. Carefully point joints; cut out, replace defective material, repair damage, do required dressing or rubbing. Leave the installation and final product in new excellent condition.

2. Seal wall base tile and floor tile grout joints with one (1) coat of “Sealer’s Choice” by Aquamix (buff dry) according to the manufacturer's directions and specifications. Verify if required for tile selected.

SPECIAL:

At completion of project, this Contractor shall leave for Owner's use one (1) box combination of floor and wall base tiles of each size and type used.

GENERAL:

Contractor shall furnish and install Resilient (rubber) athletic flooring, adhesive and accessories required for installation, maintenance and repair as shown and scheduled on Drawings.

SUBMITTALS:

1. Provide Manufacturer's current printed data sheets on specified products (flooring, adhesives, accessories, etc.)

2. Provide shop drawings prepared for project illustrating layouts, details, dimensions and other data.

3. Provide samples for verification of such characteristics as color, texture and finish.

MAINTENANCE MATERIAL SUBMITTALS:

Provide extra stock materials for use in facility operation and maintenance. Provide amount of approximately 2% of total floor surface, of each type, color and dye lot.

QUALITY ASSURANCE:

1. Manufacturer must be certified ISO 9001 and ISO 14001.

2. Manufacturer must have experience in the manufacturing of prefabricated rubber athletic flooring and Installer must have performed installations of the same scale in the last three (3) years.

3. Installer to be recognized and approved by the rubber athletic flooring Manufacturer.

DELIVERY, STORAGE AND HANDLING:

1. Materials must be delivered in Manufacturer's original, unopened and undamaged containers with identification labels intact.

2. Store material upright on a clean, dry, flat surface protected from all possible damage, and protect from exposure to harmful weather conditions.

3. Recommended environmental condition for storage is a minimum of 55 degrees Fahrenheit (13 degrees C).

4. Material need not suffer damage during handling (i.e. edge chipping, excessive warping, etc.).

SITE CONDITIONS:

1. Maintain a stable room and subfloor temperature for a period of 48 hours prior, during and 48 hours after installation. Recommended range: 65 degrees to 86 degrees F.

2. Installation to be carried out no sooner than the specified curing time of concrete subfloor (normal density concrete curing time is approximately 28 days for development of design strength).

3. Moisture vapor emission content of the concrete slab must not exceed the tolerance of the adhesive used when tested using the anhydrous calcium chloride test as per ASTM F1869.

4. Installation of rubber athletic flooring will not commence unless all other trades in the building are completed.

WARRANTY:

1. Provide Manufacturer's current standard warranty.

2. Rubber athletic flooring is warranted to be free from manufacturing defects for a period of three (3) years from the date of shipment from the Manufacturer.

MANUFACTURERS:

Mondo America, Inc.:
North America Headquarters and Manufacturing Plant, 2655 Francis-Hughes, Laval, QC, Canada. Toll Free North America: 1-800-441-6645

DESCRIPTION:

1. MONDO SPORT IMPACT is prefabricated rubber athletic flooring, calendered and vulcanized with a base of natural and synthetic rubbers, stabilizing agents and pigmentation, as manufactured by MONDO AMERICA INC or approved equal.

2. Thicknesses: 0.394" (10mm).

3. Colors: provided in standard, solid background colors with random colored flecks dispersed throughout material.

4. Finish: sealskin.

5. Manufactured in two layers which are vulcanized together. Shore hardness of the top layer will be greater than that of the bottom layer; shore hardness of layers to be recommended by the Manufacturer and the limits specified.

6. Material shall be installed in longest proportions whenever practical: Available sizes are 6' wide and 19' to 33' long.

PERFORMANCE:

Performance of prefabricated rubber athletic flooring to conform to the following criteria:

Performance Criteria	Test Method	Result
Hardness Shore A	ASTM D2240	80/77
Critical Radiant Flux	ASTM E648, NFPA 101	0.58 W/cm2, Type I
Optical Density of Smoke	ASTM E662	< 450, Class I
Static Load Limit	ASTM F970	0.003 in.
Fungal Resistance Test	ASTM G21-90	No growth
Coefficient of Friction	ASTM D2047	> 1.2 dry, 0.67 wet
V.O.C. Compliance	ASTM D5116	Yes

Provide MONDO SPORT IMPACT prefabricated rubber athletic flooring manufactured by MONDO AMERICA INC or approved equal.

ACCESSORY PRODUCTS:

1. Provide adhesive certified by the Manufacturer: PU 105 polyurethane adhesive or EP 55 epoxy adhesive (refer to instruction manual adhesives provided by rubber athletic flooring Manufacturer).

2. Patching or leveling compound to be supplied and/or recommended/approved by rubber athletic flooring Manufacturer.

EXAMINATION:

1. Concrete or asphalt subfloors to be placed a minimum of twenty-eight (28) days prior to the installation of rubber athletic flooring.

2. Concrete or asphalt subfloors on or below grade are installed over a suitable moisture retardant membrane. Water vapor membrane complies with specification in ASTM E1745.

3. No concrete or asphalt sealers or curing compounds are applied or mixed with the subfloors.

4. Moisture and alkalinity tests must be performed. Moisture content must not exceed the capacity of the specified adhesive (verify using the anhydrous calcium chloride test as per ASTM F1869) and pH level should be in the range of 7 to 8.5.

5. Smooth, dense finish, highly compacted with a tolerance of 1/8" in a 10 ft radius. Floor Flatness (FF) and Floor Levelness (FL) numbers are not recognized.

PREPARATION:

Prepare subfloor, installation of sheet goods and installation of rubber athletic flooring shall be in accordance with Manufacturer's current printed guidelines.

REPAIRS:

Repair material must be from the same dye lot as material supplied for initial installation and to be preformed by qualified installers/technicians only.

CLEANING & PROTECTION:

1. Initial cleaning should only be performed 72 hours after the rubber athletic surface has been completely installed.

2. Maintain rubber athletic flooring according to Manufacturer's current maintenance instructions for specified product.

3. Rubber athletic flooring surface can be protected with Masonite during and after the installation, prior to acceptance by the Owner.

GENERAL:

Acoustical Sound Panels: Equal to Acoustical Solutions, Inc. "Studio 54" cleanable wall panels used for eliminating sound reflections.

PERFORMANCE REQUIREMENTS:

1. Product shall be in standard thickness of 1" with Class 1 fire rating and having an NRC rating of .85. Panel fabric color selections shall be made for the standard manufacturer's 13 - color line.

2. 2'-0" x 6'-0" size panels shall be dimensionally stable with no capability for shrinking or warping with a beveled edge detail and 6 - 7 lb. per cubic/foot density. Eight (8) total qty. located in Fitness Room 121.

3. Product shall have a resilient composition with good resistance to damage from job-site impact.

4. Product's mat face shall be able to be cleaned by vacuuming. Product shall not be susceptible to rot or mildew contamination.

5. When tested in accordance with ASTM C665.
   Acoustical Performance (Tested to ASTM C423, Type A mounting)

Thickness	Octave Band Center Frequencies, Hz						
	125	250	500	1000	2000	4000	NRC
1"	.14	.27	.80	1.11	1.14	1.14	.85

MANUFACTURER:

Studio 54 Cleanable Wall Panels, by Acoustical Solutions, Inc., 2420 Grenoble Road, Richmond, Virginia 23294, Tel: 1-800-782-5742, www.AcousticalSolutions.com.

INSTALLATION:

Install Sutdio 54 panels with Z-clip or Z-bars secured to wall with two screws each for easy removal.

CLEANING:

Clean finish surfaces of Board. Remove foreign objects from material.

GENERAL:

Furnish and install vinyl base, nosings and accessories as scheduled below including base at all toe spaces of millwork, and reducers or mouldings at all transitions or terminations of flooring materials. Specifications of Burke Mercer shall become a part of these Specifications.

SAMPLES:

1. Submit one (1) copy of manufacturer's brochure and one (1) set each of various types of base, nosings and accessories to be used, showing complete color selection.

2. Colors to be selected from line of manufacturer's standard colors.

INSTALLATION:

1. All surfaces to receive scheduled items shall be dry, clean and smooth. Remove all substances which would prevent proper adhesion or create "bow-out" or crimping.

2. Prepare all surfaces in accordance with manufacturer's recommendations. Set all items straight, true and in longest lengths available with joints tight in adhesive. Bed securely.

3. All items shall be installed in strict accordance with manufacturer's latest printed instructions only, using adhesives as recommended.

4. All items shall closely abutt all door frames, millwork, etc. with straight, neatly cut joints.

MATERIALS: (where applicable)

1. Reducer at ceramic tile to sheet vinyl or vinyl composition tile: Mercer #630, 632 or 633.

2. Reducer at termination of sheet vinyl and vinyl composition tile: Mercer #735 in continuous lengths up to 35'.

3. Transition at carpet to sheet vinyl and vinyl composition tile: Mercer #333 in 12' sections.

5. Wall base, 4" high cove base with rounded top: Mercer 1/8" gauge standard wall base in continuous lengths up to 100'.

GENERAL:

Furnish and install resilient flooring. Specifications are based on Armstrong resilient flooring. Any other product proposed as a substitute shall be proven equal or better.

MATERIALS:

1. Flooring: Armstrong "LVT" (Luxury Vinyl Tile)) 18" x 18" x 1/8" gauge Density: Sufficient to withstand static loads of 250 psi.

2. Patterns and Colors: As selected by Architect from current range manufactured by Armstrong

INSTALLATION:

1. All surfaces to receive resilient flooring finishes shall be dry, clean, smooth and free of paint, grease and other foreign materials. Cracks, expansion joints, holes, rough and uneven areas must be made smooth and level with a portland cement-based latex patching compound. Paint, varnish, etc. shall be removed from conc. floors. Paint shall be removed by wet grinding or stripping with trisodium phosphate and hot water.

2. Lay no flooring until work of other trades has been completed in space where flooring is to be installed.

3. Contractor shall provide constant temperature of at least 65 F for 48 hours prior to installation and 48 hours after installation. Store flooring in rooms at least 48 hours prior to installation.

4. Flooring shall be installed in strict accordance with manufacturer's latest printed instructions only and using adhesives recommended by flooring manufacturer.

5. Completely embed each tile in adhesion. Make joints inconspicuous and straight to line. Work each area from center in both directions, taking up variations at walls. Tile at walls shall be not less than 1/2" wide. Execute cutting and fitting as necessary for installation around pipes, conduits, corners and similar places. Roll and wright tiles as necessary to provide proper adhesion. Cut to close fit at walls.

CLEANING AND POLISHING:

1. It shall be the responsibility of the Contractor to thoroughly clean floors with a good grade of commercial floor cleaner, using standard cleaning equipment. After rinsing floor thoroughly with clear water (taking care not to flood floor), apply two thin coats of a good grade of commercial floor finish (wax). Newly installed resilient floors should not be scrubbed or thoroughly cleaned until 4-5 days after installation to allow adhesives to set properly.

2. Floor shall be protected with undyed, untreated building paper for traffic control as necessary. Immediately prior to final inspection (not less than 4-5 days after installation), clean and wax floor as recommended by manufacturer.

MAINTENANCE INSTRUCTION:

Furnish Owner with written instructions, in triplicate, for properly maintaining floors. Designate correct types of cleaners and waxes to be used.

TERMINATION STRIP:

Refer to Division 9, Vinyl Base, Nosings and Accessories.

SAMPLES:

Submit samples of patterns and colors from current range. Architect will furnish location of colors and patterns selected. Also submit samples of termination strips.

SPECIAL NOTE:

1. At no additional cost to Owner or Architect, flooring contractor shall provide and install up to four (4) different tile colors which will be used to form accent stripes and/or rectangular areas in large tile areas. Note that all these accent areas will not require cutting of tile.

2. At completion of project, this Contractor shall leave for Owner's use one (1) box combination of floor tiles of each type used.

GENERAL:

1. Strip concrete floors to remove all residue, flood with H & C Etching Solution, install finish coats of clear gloss oil based concrete sealer with approved amount of slip-resistance.

2. Refer to Room Finish Schedule for locations.

MATERIALS:

1. Material to be "H & C Clear Gloss Concrete Sealer – Oil Based on interior surfaces where specified in Room Finish Schedule.

2. Two coat application shall be installed as per manufacturer's specifications which shall become a part of these Specifications.

3. Install H & C SharkGrip Slip Resistant Additive in amount as approved.

SURFACE PREPARATION AND INSTALLATION:

1. All surfaces to receive concrete floor finishes shall be dry, clean, smooth and free of paint, grease and other foreign materials. Paint, varnish, etc. shall be removed from conc. floors. Paint shall be removed by wet grinding or stripping with trisodium phosphate and hot water.

2. Prepare all surfaces in accordance with manufacturer's specifications which includes etching floors and neutralized prior to installation of sealer.

3. The flooring shall be installed in strict accordance with manufacturer's latest printed instructions only, using adhesives recommended by the flooring manufacturer.

SPECIAL NOTE:

Before applying floor sealer, Contractor shall verify with Architect the addition of floor slip resistance material into sealer. Contractor shall prepare some floor sealer with slip resistant additive and apply on a small area of concrete where directed. This area will be used for approval of sealer and proportional mixture of slip resistant additive.

GUARANTEE:

Provide the standard manufacturer's written guarantee as it pertains to the various materials used.

GENERAL:

All materials, labor, services and incidentals necessary for completion of this section of the work. Inspect Plans, Finish Schedules, Details and Specifications for other trades. All items requiring painting or finishing will be considered part of the contract. Furnish all labor and materials to clean and prepare existing surfaces indicated to be repainted.

WORK SPECIFIED ELSEWHERE:

1. Shop coats only of paint: Structural steel, miscellaneous metals

2. Painting of Mechanical and Electrical work in Mechanical Rooms as specified in Divisions 15 &16. See Workmanship, Page 3 of this Section.

3. Factory finished items.

JOB REQUIREMENTS:

1. Number of coats and quality of finish shall be in accordance with these Specifications, which require the use of materials which will produce first quality finish if properly applied.

2. Interior Ferrous Metal's (Metal Doors and Frames): Primer coat and first painter's finish coat may be applied by either roller, brush or spray application. Note that all second or final finish coats shall be applied by spray application only.

3. Materials shall be delivered to the project site in strong, undamaged, waterproof containers with manufacturer's label intact. Materials in previously opened or unsealed containers are not acceptable.

4. Immediately upon delivery to the project site, all painter's materials shall be stored and locked in a watertight shed with floor well off the ground. Shed shall remain locked at all times except when materials are being prepared or removed for use in the project.

QUALITY:

1. Certain manufacturer's products are specified herein to simplify description of types and set qualities of finished required. Only the highest quality (top line) materials are acceptable.

2. Primers shall be as specified by manufacturer of finish paint used.

3. Turpentine, mineral spirits, linseed oil, and thinners shall be used only as recommended by the manufacturer of the specified paint material herein specified.

MANUFACTURERS:

1. Sherwin Williams Company, or approved equal (manufacturer of items named under "Finishes").

2. Other manufacturers approved are: Pittsburgh, Jones-Blair, Glidden Paint Company, Kelly-Moore, and Coronado.

SUBSTITUTIONS:

1. These substitution requirements are in addition to those given in the General or Supplementary General Conditions of the Specifications.

2. Form of substitution submittal shall have listed the specified location and paint product number along with the proposed substitute paint product type and number or name.

3. Architect reserves the right to accept or reject any material submitted and his decision shall be absolute and final.

COLORS:

Submit manufacturer's color charts in duplicate as soon as possible after the award of the contract and materials approval. Colors will be selected and will be submitted to the Contractor in scheduled form.

APPLIED SAMPLES:

Prepare samples of finishes on the job to the satisfaction of the Architect. If required, small portion of wall surface 4'-0" x 8'-0" shall be finished as a final sample. Submit one sample 12" x 24" of each type natural or stained finish on specified wood.

PAINT SUBCONTRACTOR:

Paint subcontractor shall submit two sets of color chips from paint manufacturers after color schedule has been given to Contractor.

WORKMANSHIP:

1. Perform all work during favorable weather conditions only, 50 F or above.

2. Protect the work of this Section and work of others during progress against damage and promptly repair such damage should any occur. Cover aluminum members with heavy paper and masking tape. Do not allow masking tape to touch finished surfaces.

3. If the surface to be finished cannot be put in proper condition for finishing by customary preparation methods, the painting contractor shall notify the General Contractor in writing or thereby assume responsibility for and correct any unsatisfactory finish resulting.

4. Allow exterior paints to dry 72 hours between coats and interior paints to dry 24 hours between coats. If enamel and varnishes are tacky after 24 hours, allow additional time until finish is dry.

5. Back-prime all interior wood finish trim, cabinets and millwork to be set against masonry or plaster, and all concealed surfaces.

6. Only the best workmanship is acceptable. All material shall be spread and smoothly flowed on without runs, streaks, sags, brush marks, unfinished patches or other blemishes.

7. No exterior painting shall be done in rainy, damp or frosty weather until the surface is completely dry. No interior painting or finishing shall be permitted until the building has thoroughly dried out by natural or artificial heat

8. Painter's Option: Painter may remove finish hardware prior to finishing doors or mask with heavy paper and tape. Tape shall not be stuck to hardware, but shall be used to hold paper in place. Failure to do either will require hardware to be replaced with same manufacturer and number by Paint Contractor. If left in place, plated butts shall be protected as mentioned above.

9. All work where a coat of material has been applied must be inspected and approved before application of succeeding specified coats, otherwise no credit for the coat will be given.

10. Apply coats of material in strict accordance with manufacturer's current published specifications except where requirements of the Specifications are in excess of manufacturer's requirements.

11. Paint all sight-exposed pipe and plumbing and in Mechanical Rooms, after all mechanical work and tests have been completed. This includes insulated pipes, drain pipes, electrical panels, conduits, ducts, etc. except for factory finished items. Painter is also required to paint all roof-top mechanical equipment if so desired by Architect.

12. Sand lightly between coats where shellac, varnish or enamel is used.

13. All closets shall be finished the same as the adjoining room, unless otherwise specified.

14. Interiors of all millwork (drawers, closets, cabinets) shall be finished with varnish.

15. All masonry shall be allowed to dry completely (usually 60 to 90 days) before painting.

PREPARATION OF NEW SURFACES:

1. Wood:

   A. Touch-up knots, resinous spots, etc. on both new and existing surfaces with B42W41 primer 18 hours before applying the prime coat of paint.

   B. Sand and dust before painting.

   C. Putty nail holes, cracks and blemishes after priming coat has dried. Fill nail holes flush. Concave filled holes are not acceptable.

   D. Match putty color to finish coat.

   E. Top, edging and bottom of all doors shall be finished after setting.

2. Metal:

   A. Clean greasy or oily surfaces with turpentine or mineral spirits before applying any materials.

   B. Remove rust and scale before painting and treat with rusticide.

   C. Touch-up welds, cuts and scratches, or scuff marks with metal protective primer. Primer shall match shop applied coat. Fill all dents or scratches with spot putty DFL-40 by Ditzler Color Division or approved equal, and sand level and smooth before painting.

D. All galvanized metal surfaces shall be pre-tested with proprietary acid bound resinous or crystalline zinc phosphate preparations, designed for this purpose, used in accordance with the manufacturer's directions before applying the first coat of paint.

BACK PRIMING:

One coat of Sherwin Williams Pro Mar 200 Alkyd Undercoat B49W200.

UNDERCOAT FOR ALL PAINT GRADE PLYWOOD:

1. One coat of Sherwin Williams A-100 Exterior Latex Wood Primer B42W41.

2. Apply remaining coats.

CLEAN-UP:

1. Clean all paint spots from all work and touch-up or otherwise repair any defective or damaged work.

2. Remove all surplus materials and equipment after work is completed.

GYPSUM DRYWALL PREPARATION:

1. Taping:

   A. First Coat: Butter joints between edges of boards, spot nail heads. Embed Perf-A-Tape with joint compound. Cover tape with skim coat of joint compound immediately after embedding.

   B. Second Coat: After first coat dries for minimum of 24 hours, sand and apply second coat feathering edges approximately 1 1/2" beyond first coat edges.

   C. Third Coat: After second coat dries, sand lightly and apply thin finishing coat to level finish. Feather edges minimum of 2" beyond first coat edges.

2. Accessories:

   A. Apply corner bead, Dur A Bead all metal No. 103, 1-1/4" x 1-1/4".

   B. Use metal trim Series No. 402 at ends of gypsum board against all surfaces which abut.

C. Apply Perf-A-Tape corner reinforcement to interior corners at walls and ceilings.

PAINT SCHEDULE:

1. Interior Ferrous Metals: Metal Doors and Frames:

   1 coat Sherwin Williams Kromik Metal Primer E41N1, if not primed
   2 coats Sherwin Williams Pro Mar 200 Alkyd Semi-gloss B34W200

2. Interior Wood (Natural Finish) Hardwood Millwork, Doors, Etc.

   1 coat Sherwin Williams Interior Oil Stain A48 Series (as selected)
   2 coats Sherwin Williams Pro Mar Varnish Sandial Sealer (Lightly sand between coats)

3. Interior Wood (Painted), All other Wood, Etc.:

   1 coat Sherwin Williams Pro Mar 200 Alkyd Undercoater B49W200
   1 coat Sherwin Williams Pro Mar 400 Alkyd Semi-Gloss B34W400
   1 coat Sherwin Williams Pro Mar 400 Alkyd Semi-Gloss B34W400

4. Exterior Metal (Galvanized):

   1 coat DTM Acrylic Primer/Finish B66W1
   2 coats DTM Acrylic Semi-Gloss B66W200

5. Exterior Metal (Steel Painted):

   1 coat DTM Acrylic Primer/Finish B66W1
   2 coats DTM Acrylic Semi-Gloss B66W200

6. Interior Gypsum Ceiling Board (Paint):

   1 coat Pro Mar 200 Latex Wall primer B28W200
   Prepare screw heads and joints using tape-joint system
   Lightly sand texture to receive paint
   2 coats Pro Mar 200 Latex Egg-Shell B20W200

7. Interior Gypsum Wall Board (Paint):

   1 coat Pro Mar 200 Latex Wall Primer B28W200
   Prepare screw heads and joints using tape-joint system
   Lightly sand texture to receive paint
   2 coats Pro Mar 200 Latex Egg-Shell B20W200

8. Interior Concrete Block (Paint):

   1 coat Pro Mar Interior/Exterior Block Filler B25W25
   2 coats Pro Mar 400 Alkyd Semi-Gloss B34W400

9. Interior Concrete Block in Clean Room 132 (Epoxy):

   1 coat Heavy Duty Block Filler
   2 coats Water Based Epoxy B76 Series

CAULKING:

Caulking Compound: For general caulking of interior finish items and exterior finish items (not required to be waterproof), use an elastic waterproof adhesive. Compound shall be of proper consistency to be readily worked and not be affected by vibration or long exposure to outside climatic and temperature changes. Compound shall form a thin, tough, elastic film on surface but remain permanently elastic underneath. It shall contain no acid or ingredients which will stain masonry, corrode metal, or have an injurious affect on painting. Compound shall be white or colored as required to match adjacent work.

SPECIAL NOTES:

1. When colored ceiling tile is specified, Contractor is to paint all ceiling grilles, speakers, and other such items as directed by Architect.

2. As directed, Painting Contractor shall paint wainscot and/or accent stripes in Corridors and Rooms 900 sq/ft or larger at no additional charge to the project.

3. Contractor shall paint all visible under counter components such as p-trap and supply insulation system as directed.

4. Painting Contractor shall be responsible for work including caulking all exterior windows and door frames; caulking at any material joint at exterior to insure weathertight building free of water and wind/air leaks and caulking at interior of building to achieve finished appearance.

GENERAL:

Contractor shall furnish and install (1) one flag pole as herein specified and where shown on the Drawings. Flag pole equal to those manufactured by Concord Industries, Texas Industries, or equal will be acceptable. Contractor shall install flag pole in concrete footings as recommended by manufacturer.

MATERIALS:

Concord Industries ("The Independence") Catalog p/n I 135060156 or equal:

1. Seamless 6063-T6 aluminum tubing and designed to withstand flagged winds of 85 mph. Fabricated in one piece with duranotic bronze finish. Unexposed portion of the shaft below grade shall come equipped with a heavy coat of asphaltum paint.
   * Each shaft shall be wrapped for shipment.
   * Flag pole shall be 35'-0" exposed height.

2. Ball: Constructed of spun aluminum with flush seam and gold anodized finish.

3. Truck: Cast aluminum with nylon sheave.

4. Halyards: One length #8 (1/4") polypropylene, equipped with two (2) chrome swivel snaps to secure flag. Pole counterweights, swivel snaps, etc.

5. Collar: Ornamental base of flash collar shall be cast aluminum, Type FC-11, having a minimum wall thickness of 0156". Diameter of the collar shall be 10" in duranotic bronze finish.

6. Foundation Sleeve: Fabricated from hot dip galvanized steel with a steel base plate whose square dimension is at least twice the butt diameter of the shaft. Base plate shall be securely welded to the ground spike. Ground spike shall be 3/4" diameter, not less than 18" long.

7. Flag: (1) one United States flag 4'-0" x 6'-0" in size and constructed out of 2-ply sewn polyester material.

INSTALLATION:

1. Installation shall be in strict accordance with manufacturer's directions.

2. Verify final location with Architect prior to installation.

GENERAL:

Provide and install 14'-0" x 14'-0" over-head doors where shown on Plans, complete with all mounting accessories, tracks, operators, hardware and trim.

MANUFACTURERS:

Over-head doors shall be equal to doors manufactured by Wayne Dalton. Specifications of Wayne Dalton Doors shall be made a part of these Specifications. Products of other manufacturers which are comparable in design and quality may be submitted for approval.

INSTALLATION:

1. Installation shall be done in strict accordance with manufacturer's direction.

2. Contractor shall install all necessary bracing and blocking to building structure as based on manufacturer's recommendations and requirements for proper installation and warranty.

MATERIALS:

1. Steel (insulated) overhead sectional doors - 16 gauge flush exterior equal to Model "216".

2. Each door provided with (3) three rows full vision section panels of 1/2" thick tinted, insulated, tempered low E glazing to be furnished under glass and glazing: Division 8, Section 0887. Window tint shall match remainder of building. Panel locations shall be on rows 3, 4 and 5.

3. Provide High Lift Hardware and track with 3" wide galvanized steel jambs and spring torsion system.

4. Electric Jackshaft Operations: Hoist and Jack shaft type, equal to Link Door Controls Model "J", 1/2 H.P./230 volt, single phase, U.L listed, CSA certified with approx. door speed 2/3 ft. per second. Provide master control panel for six (6) door operations, and individual control station at each door operator, and six (6) single code radio control units for control of doors from Mobile Equipment. Verify exact locations of wall mounted controls.

5. All doors are to be furnished with photo electric eye and electric edge to stop or reverse obstructed door. Supply with retracting cord reel. Delete side locking feature.

6. Door insulation shall be 1-9/16" polyurethane R-10 located in all door cavities with white backup interior panels.

7. Shiplap meeting rails and top section head rail shall both have EPDM rubber joint seals

FINISHES:

Both interior and exterior surfaces shall be factory primed and painted with two coats of baked on polyester paint (.9 mils at exterior and .65 mils at interior) in standard white color.

SUBMITTALS:

Submit four (4) sets of shop drawings and three (3) copies of manufacturer's product data.

GENERAL:

Provide and install three (3) 14'-0" x 14'-0" bi-fold apparatus doors where shown on Plans, complete with all mounting accessories, tracks, operators, hardware and trim.

MANUFACTURERS:

Four-Fold XT Doors, series FF100-600XT exterior swinging doors with interior mounted operators - 2-1/8" panel thickness x 14 gauge steel sheeting and surface mounted steel tube framework. Bi-fold apparatus doors shall be equal to doors manufactured by Door Engineering, 400 Cherry Street, Kasota, MN 56050, (800)-959-1352 or equal products by other manufacturers. Specifications of Door Engineering shall be made a part of these Specifications.

MATERIALS:

1. Steel Tube: ASTM A513 and ASTM A500/A500M

2. Steel Sheets: Steel sheets of commercial quality, complying with ASTM A1011/A1011M hot-rolled steel sheet.

3. Hardware: Manufacturer's standard components.

4. Fasteners: Zinc-coated steel.

QUALITY ASSURANCE

1. Doors shall be designed to withstand external or internal horizontal wind loads of 20 pounds minimum per square foot. Maximum allowable deflection shall not exceed 1/120 of the span. Fiber stresses in main members shall be limited to 27,000 pounds per square inch. Steel frames shall be designed in accordance with the AISC "Steel Construction Manual".

2. Door manufacturer shall have at least 10 years experience in manufacturing door type specified for emergency vehicle applications.

SUBMITTALS:

1. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

2. Product Data for each type of product specified consisting of manufacturer's technical Product Data and installation instructions for each type of door required, including data substantiating that products comply with requirements.

3. Submittal Drawings showing fabrication and installation of Four-Fold metal doors including plans, elevations, sections, details of components, hardware, operating mechanism, and attachments to the other units of Work. Include wiring diagrams for coordination with electrical trade.

4. Reference list including (5) successful installations of this type of door within the past two (2) years.

FOUR-FOLD DOORS:

1. Construction: Door framing shall be minimum 14-gauge structural steel tube with 14-gauge steel sheet on the exterior and interior faces. Sheeting shall be formed on the vertical edges with no visible welds on the interior or exterior panel faces. All frames and framing members shall be true to dimension and square in all directions, and no door shall be bowed, warped, or out of line, in the vertical or horizontal plane of the door opening by more than 1/8 inch in 20 feet. Exposed welds and welds which interfere with the installation of various parts shall be ground smooth and flush.

2. Surface Mounted Tube Frame: Supply pre-hung tube frame system constructed of minimum TS6x4x0.25, designed to anchor to masonry wall construction or weld to steel structure. All hinges, track supports and operator supports shall be factory attached.

3. Factory finish: All exposed steel shall be finished with manufacturer's standard epoxy primer and polyurethane top coat. Customer to select from Manufacturer's standard color chart.

4. Operating Hardware: Hardware shall include guide tracks and brackets, trolleys, center guides, not less than three pairs of jamb and fold hinges per opening, and all bolts, nuts, fasteners, etc. necessary for complete installation and operation. Jamb hinges shall be dual shear and have two thrust bearings and two needle bearings. Fold hinges shall be dual shear with two thrust bearings. All bearings shall be completely concealed within the hinge barrel and include grease zerks. All hinge pins shall be minimum ¾" diameter hardened steel.

5. Weatherstripping: Material shall be adjustable and readily replaceable and provide a substantially weather-tight installation. Weatherstripping at center shall be 1/16" cloth inserted neoprene and include no exposed fasteners on the exterior face of the panel. Weatherstripping at sill shall include two 1/16" cloth inserted neoprene sweeps with an aluminum retainer. The retainer shall be attached to the door with adhesive. Perimeter Weatherstripping: Provide jamb and head weatherstipping of 1/16" cloth-inserted neoprene bulb (or closed cell neoprene).

6. Vision Panels: Provide vision panels of 1" thick tempered insulated, low "E" glazing to be furnished under glass and glazing: Division 8, Section 0887

7. Door insulation shall be 2" polyiso R-11 located in all door cavities.

POWER OPERATORS:

1. Each Four-Fold door shall be operated by an overhead mounted electro-mechanical drive unit designed for high cycle operation. Operator consists of an electric motor, gear reducer, and rotating drive arm. Door shall be operated with connecting rods attached to the rotating drive arm on the operator and to control arms attached to the jamb door section and to the door lintel. Connecting rods shall be positive drive, keeping the door under firm control at all times. Connecting rods shall be fitted with spherical bearings and control arms shall be equipped with oil impregnated bronze bearings on polished shafts.

2. Operator shall be instantly reversible, open and close rapidly and start and stop gradually. Operator shall be adjustable to allow door to fully clear the opening. Operator shall automatically lock the door in the closed position. Operator shall be equipped with disengaging mechanism to convert to freewheeling mode for manual operation.

3. Operator shall include a formed hood enclosing the motor, gearboxes and limit switches.

4. Electric motor shall be of sufficient size to operate doors under normal operating conditions at no more than 75 percent of rated capacity. Motor shall be wound for three phase 120/208 VAC, 60 Hertz operation.

5. Electric Controls: Controls shall be furnished by the door manufacturer and shall be complete for each door, and built in accordance with the latest NEMA standards. Incoming electrical shall be 120/208VAC single phase.

   A. Controls shall include a programmable logic controller with digital message display or LED indicators. Controller shall include programmable close timers and programmable inputs/outputs.

   B. Motor starters shall be magnetic reversing, factory wired with overload and under voltage protection, and equipped with mechanical interlocks. All control components shall be enclosed in one enclosure with a wiring diagram placed on the inside of the cover.

   C. If incoming voltage is single phase, control panel shall include a variable frequency drive to convert voltage to 3-phase for the motor. Enclosures shall be NEMA 4 with disconnect switch.

   D. Pushbuttons (interior) for each door shall have one (1) momentary pressure three-button push-button station marked “OPEN”, “CLOSE” and “STOP”. Push button enclosure shall be NEMA 4. Limit switches shall be provided to stop the travel of the door in its fully open or fully closed position.

   E. Safety edges: Provide electric safety edges on leading edge of all doors to reverse door upon contact with obstruction.

   F. Photo eyes: Provide (1) exterior, jamb mounted, thru-beam type photo eyes, NEMA 4 rated.

   G. Presence Sensor: Provide (1) interior, overhead mounted, presence sensor.

   H. Radio controls: Provide one (1) radio receiver and (1) single button remotes per door. Remotes to open and close doors with single button. Verify actual type and options available for radio door control for either individual, bay pairs, front and back, etc. for final approval.

   I. Wiring: Door manufacturer shall supply controls/components only. Electrical contractor shall install controls and furnish / install conduits and wiring for jobsite power/control wiring.

DELIVERY, STORAGE AND HANDLING:

Store delivered materials and equipment in dry locations with adequate ventilation, free from dust and water, and so as to permit access for inspection and handling. Handle materials carefully to prevent damage.

INSTALLATION:

1. Install Four-Fold metal doors in strict accordance with the approved drawings by qualified door erection crews. All door openings shall be completely prepared by the general contractor prior to the installation of the doors. Permanent or temporary electric wiring shall be brought to the door opening before installation is started and shall be completed so as not to delay the inspection test.

2. Doors shall be set plumb, level, and square, and with all parts properly fastened and mounted. All moving parts shall be tested and adjusted and left in good operating condition.

ADJUSTING AND CLEANING:

1. Inspection of the doors and a complete operating test will be made by the installer in the presence of the General Contractor as soon as erection is complete. Any defects noted shall be corrected. After door approval in above test, General Contractor shall assume responsibility for any damage or rough handling of doors during remaining construction period until building is turned over to the Owner and final inspection is made.

2. Clean surfaces and repaint abraded or damaged finished surfaces to match factory-applied finish.

WARRANTY:

Door manufacturer shall provide a written standard limited warranty for material and workmanship.

GENERAL:

Provide and install three (3) 14'-0" x 14'-0" high speed rollup apparatus doors (east side only) where shown on Plans, complete with all mounting accessories, tracks, operators, hardware and trim. All components are factory finished.

MANUFACTURERS:

Hormann Speed-Guardian 4000U high speed rollup doors. High speed doors shall be equal to doors manufactured by Hormann High Performance Doors, Starpointe Business Park, 117 Starpointe Blvd., Burgettstown, P.A., (800)-365-3667, website: www.hormann-flexon.com or equal products by other manufacturers. Specifications of Door Engineering shall be made a part of these Specifications.

MATERIALS:

1. Guide Tracks:
   - A. Minimum 10 gauge galvanized steel guide tracks with extruded aluminum internal leading edges.
   - B. Must include synthetic side rollers to allow for precision guiding of door panel and no contact between door panels and guide tracks.
   - C. Must include non-contact circular guide, allowing door panels to rollup securely into a circular guide track without ant contact, reducing noise and wear.

2. Weatherseals: Must include full perimeter EDPM double seal with synthetic hinge thermal breaks between each panel section to provide for additional energy efficiency.

3. Door Panels:
   - A. Standard Panel Material: Secure 1 5/8" total thickness x 10" high constructed of hop-dipped galvanized steel with a urethane foam core. Finished exterior surface shall be Micrograin in white aluminum color (RAL 9006). Finished interior panel surface shall be stucco textured.
   - B. R-value of standard panel sections shall be not less than R13.6.
   - C. Vision Sections: Provide (3) continuous horizontal rows of optional vision 7" high acrylic, double pane sections with a Duratec synthetic glazing.
   - D. Emergency Operation: Via spring compression and chain hoist.

4. Drive System:
   A. 3-phase direct drive motor/ac drive of sufficient power as to raise door at rated speed.
   B. Direct drive motor is self monitoring and has a patented built in catch system, has sealed bearings and is maintenance free.
   C. Drive system is NEMA 3S (dust tight, rain tight, rain tight, sleet tight and outdoor rated).
   D. Maximum opening speed of up to 80" per second and closing speed of 18" per second.

5. Control Panel:
   A. Supply manufacturer's standard UL approved and NEMA 4 rated HFC1 hardwired control box which is a programmable 4KW drive control box. Doors with contactor boxes will not be accepted. Maximum control box dimensions of 12" wide x 16" high x 5" deep allowing for applications with limited space.
   B. Control box must include face mounted e-stop/reset buttons and power disconnect.
   C. Standard electrical power requirement is 460V or 230V, 3-phase, 60Hz (4KW).
   D. Panel shall include frequency drive with integrated soft start and soft stop buttons and power disconnect.
   E. Panel shall include an adjustable time delay and cycle counter.
   F. Panel shall include self-monitoring and self-diagnostic features an LCD to provide quick and straightforward information.
   G. Door to use encoder to regulate door travel limits. Door travel limits to be adjusted without use of tools from floor level at the control panel.

6. Counterbalance:
   A. Counterbalance shall include multiple springs, maximum 6 per side column depending on the door size to minimize wear and tear of the motor.
   B. Number 80 chain is connected to and lifts door by bottom panels, which reduces wear and tear on panels and thermal breaks.
   C. Emergency operation shall be via spring compression and chain hoist.

7. Light Curtain:
   An integral 8'-0" high light curtain including multiple thru-beam style photocells shall be included and upon an object breaking the plane of the light curtain, instantly reverse the door panel direction.

QUALITY ASSURANCE

1. Doors shall have a rating of up to 120 mph.

2. Door manufacturer shall have at least 10 years experience in manufacturing door type specified for emergency vehicle applications.

3. All components shall be factory finished.

SUBMITTALS:

1. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

2. Product Data for each type of product specified consisting of manufacturer's technical Product Data and installation instructions for each type of door required, including data substantiating that products comply with requirements.

3. Submittal Drawings showing fabrication and installation of Four-Fold metal doors including plans, elevations, sections, details of components, hardware, operating mechanism, and attachments to the other units of Work. Include wiring diagrams for coordination with electrical trade.

4. Reference list including (5) successful installations of this type of door within the past two (2) years.

DELIVERY, STORAGE AND HANDLING:

Store delivered materials and equipment in dry locations with adequate ventilation, free from dust and water, and so as to permit access for inspection and handling. Handle materials carefully to prevent damage.

INSTALLATION:

1. Install Four-Fold metal doors in strict accordance with the approved drawings by qualified door erection crews. All door openings shall be completely prepared by the general contractor prior to the installation of the doors. Permanent or temporary electric wiring shall be brought to the door opening before installation is started and shall be completed so as not to delay the inspection test.

2. Doors shall be set plumb, level, and square, and with all parts properly fastened and mounted. All moving parts shall be tested and adjusted and left in good operating condition.

ADJUSTING AND CLEANING:

1. Inspection of the doors and a complete operating test will be made by the installer in the presence of the General Contractor as soon as erection is complete. Any defects noted shall be corrected. After door approval in above test, General Contractor shall assume responsibility for any damage or rough handling of doors during remaining construction period until building is turned over to the Owner and final inspection is made.

2. Clean surfaces and repaint abraded or damaged finished surfaces to match factory-applied finish.

WARRANTY:

Motor is guaranteed against defects in materials and workmanship for a period of 5-years (excludes catch system). All other mechanical and electrical components are warrantied against defects for a period of 2-years. During this warranty period, labor costs are covered for the first year only.

GENERAL:

Furnish and install interior accessible toilet room signs.

ALLOWANCE:

Allow $200.00 for purchase and installation of all signage.

LOCATION:

Architect or Owner will provide exact size, location for mounting and color selections of all signage.

GENERAL:

1. Furnish and install cast bronze plaque.

2. Provide four (4) copies of layout to scale of plaque for final approval prior to fabrication.

MATERIALS:

1. Bronze plaque shall be 18" x 24" equal to Southwell Company.

2. Lettering shall include but is not limited to: Name of Building, Owner, City Council Members, Architect, Contractor, Date, etc.

3. Plaque shall be manufactured with:

   a. Letters: Futura style in satin finish.

   b. Background: Oxidized leatherette background texture.

   c. Border: Raised single line standard.

   d. Mounting Method: Concealed.

LOCATION:

1. Furnish and install (1) one plaque in location as directed by Architect.

2. Contractor shall provide wood blocking in wall between studs as required for mounting all corners

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GENERAL:

This Section includes the following: (24) each 25 1/4" wide x 20" deep x 79" high single, Geargrid Wall Mounted Storage System Lockers and (2) each 63" wide x 20" deep x 83" high triple Geargrid Mobile Unit Lockers as manufactured by Mid-Minnesota Wire (Geargrid Product Line), 670 SW 15th. Street, Forest Lake, MN 55025. Web site www.geargrid.com including the following:

SUBMITTALS:

1. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of locker.

2. Shop Drawings: Submit manufacturers shop drawings for each individual run of lockers.

3. Samples: Submit manufacturers standard color samples.

4. Owner's Manual & Warranty: Provide maintenance manual at project closeout. Submit manufacturer's standard warranty.

QUALITY ASSURANCE:

1. Uniformity and Single Manufacturer Requirements: Provide each type of metal locker as produced by a single manufacturer, including necessary mounting accessories, fittings,and fastenings.

2. Installers Qualifications: Lockers to be installed by an experienced agent of the manufacturer.

DELIVERY, STORAGE, AND HANDLING:

1. Packing and Shipping: Do not deliver metal lockers until building is enclosed and ready for locker installation.

2. Storage and Protection: Protect materials from damage during delivery, handling, storage and installation.

WARRANTY:

Locker manufacturer shall warrant the lockers for five years use of the original purchaser from date of shipment. Warranty shall include all defects in material and workmanship, excluding finish, vandalism and improper installation.

FABRICATION:

1. Locker Construction: Units shall be welded at all applicable joints. Forming of metal shall be completed by standard cold forming operations. Use of fasteners will only be required to allow for knockdown shipping, securing units to mounting surface and on applicable accessories.

2. Vertical Dividers: Outer frames shall be 1.25" O.D. x 16 gauge wall thickness ASTM A513 steel tubing. Inner grid shall be .25" dia. ASTM 510 cold drawn steel wire resistance welded to a 3" square pattern.

3. Back Panels: Grid shall be .25: dia. ASTM 510 cold drawn steel wire resistance welded to a 3" square pattern.

4. Shelves: (1) top and (1) bottom constructed from .25" dia. ASTM 510 cold drawn steel wire resistance welded and formed. Top shelf includes a 20 gauge steel bracket to accept a 2" x 16" name placard.

5. Apparel Hooks: (3) per opening constructed from 25" dia. ASTM 510 cold drawn steel wire resistance welded and formed.

6. Finish: Complete locker unit to be thoroughly cleaned, phosphatized and sealed. Finish being baked pure TGIC polyester powder coat. Color of lockers shall be chosen from manufacturer's standard colors.

LOCKER ACCESSORIES:

1. Horizontal Hang Bar: Tube shall be 1.25" O.D. x 16 gauge 304 stainless steel tubing. Brackets that attached to side mesh shall be powder coating steel.

2. Coat Drying Hanger: .25" dia. 304 stainless steel wire cold formed and resistance welded with black vinyl coating on hook end.

3. Glove Drying Hanger: .25" dia. 304 stainless steel wire cold formed and resistance welded with black vinyl coating on hook end.

INSTALLATION & CLEANING:

1. Provide fasteners and anchorage devises to install lockers provided under this section. General Contractor shall be responsible for installation of all required internal wood blocking in wall for proper locker installation.

2. Clean interior and exposed exterior surfaces, removing debris, dust, dirt, and foreign substances on exposed surfaces.

3. Touch up scratches and abrasions to match original finish.

4. Polish stainless steel and non-ferrous metal surfaces.

5. Replace locker units that cannot be restored to factory-finished appearance.

6. Use only materials and procedures recommended or furnished by locker manufacturer.

GENERAL:

1. Furnish and install accessories in toilet rooms and elsewhere as required, complete with anchorage.

2. Submit four (4) sets of shop drawings and manufacturer's brochures.

3. Handicap locations shall be followed in mounting accessories in Toilet Room 118. Verify these with Architect prior to installing.

MATERIALS:

The following items shall be manufactured by Bobrick Washroom Accessories or equal. Mount each item in or on wall in an approved manner, where shown on Plans, and as specified below. Items not specifically located on Plans shall be mounted as directed by Architect.

Bathrooms #103, 106, 109, 112 and 115:

1 each	Surface mounted toilet paper dispenser #B-6857
1 each	Surface mounted paper towel dispenser #B-2620
1 each	24" long towel bar #B-6747
1 each	Counter mounted waste chute #B-532
1 each	Door mounted utility hook #B-6707

Toilet Room #118:

1 each	Surface mounted toilet paper dispenser #B-6857
1 each	Recessed paper towel/waste receptacle #B-3803
1 each	Wall mounted utility hook #B-6707
1 each	1-1/2" grab bar 36" long #B-6806x36
1 each	1-1/2" grab bar 42" long #B-6806x42
1 each	24" x 36" framed mirror #B-165 2436

GENERAL:

Furnish and install 6 ft. high shower doors with side panels as shown on Plans and as described below.

MATERIALS:

1. Door and Panel Combination: Equal to “Basco Shower Enclosures” Infinity Model No. 1813 furnished with chrome colored aluminum 76 1/8" high framework and rain pattern obscure 1/4" tempered safety glass & continuous hinge.

2. Unit shall consist of 24" wide door (in lieu of standard 32") with a 12" wide fixed sidelight.

3. Anchorage to solid surfacing walls and seal shall be per manufacturer's specification.

4. All glazing materials for KD units must conform to ANSI Z97.1 and CPSC Standard 16 CFC 1201 Category I and II.

GENERAL:

1. Furnish and install complete with anchorage.

2. Submit four (4) sets of shop drawings of fire extinguished cabinets and accessories, clearly indicating fire extinguisher and cabinet to be supplied.

FIRE EXTINGUISHERS AND CABINETS:

Furnish Larsen's Manufacturing Co., or equal fire extinguishers and cabinets as described below. Quantity and location as shown on Plans.

1. Kitchen hand-held extinguisher shall be Model #WC-6L, 6 liter capacity, rated "AK". Cabinet located in 6" nominal or thicker walls shall be Model G2712-RL, semi-recessed 2-1/2".

2. Typical fire extinguisher all other areas shall be Model #MP5, 5lb. capacity, rated "ABC". Cabinets located in 6" nominal or thicker walls shall be Model #G2409-R1, and cabinets located in 4" nominal thick walls shall be Model #G2409-R5.

3. All cabinets shall have a texture acrylic Plexiglas door with white horizontal lettering and a black background. Trim shall be steel and painted to match adjacent wall color.

INSTALLATION:

1. All fire extinguishers are to be fully charged and labeled at final acceptance of building.

2. Install according to manufacturers directions.

3. Doors to work properly, no loose hinges or catches.

4. All items to be clean, without scratches or damage, and in perfect working order at final acceptance.

5. Mount fire extinguisher cabinets 48" from finish floor to centerline of cabinet.

GENERAL:

Stainless Steel Contractor shall be responsible for coordinating all trades for a complete installation of all kitchen countertops, clean room tables, sinks, receiving equipment at job site, and inspecting for damage. Stainless Steel Contractor will also store, protect in place, and anchor equipment. Refer to Drawings Sheets A-9 for Clean Room stainless steel L-shaped table Details U & Z and Details G, H J and K for stainless steel Kitchen countertops.

WORK INCLUDED IN THIS SECTION:

1. Assemble equipment shipped "knocked down" at job site. This includes furnishing material and labor for field welding or field fabrication of any equipment.

2. Rough-in drawings to be furnished to General Contractor.

3. Equipment shall be erected at site in full compliance with current code, restrictions and regulations of this City of San Angelo.

4. Furnish competent foreman or supervisor at job site to counsel and advise other contractors in regard to installation and connections by various trades.

5. All plumbing material, trim, fittings, p-traps, and labor necessary for connecting equipment to plumbing services.

BIDDING REQUIREMENTS:

1. Delivery of Equipment: Equipment suppliers shall deliver all equipment to job site with all transportation charges paid by supplier.

2. Acceptance: Acceptance of equipment shall be at approval of Owner, after demonstration that equipment is satisfactorily installed. Equipment shall perform to manufacturer's specifications and ratings.

3. Guarantee and Warranty: Supplier shall deliver to Owner copies of all guarantees & warranties.

SHOP DRAWINGS AND ROUGH-IN DRAWINGS:

Prior to purchase of any material or equipment, submit for approval, shop drawings and complete brochures of manufacturer's drawings and/or data of equipment to be furnished under this contract. Include dimensioned rough-in Drawings showing size and location of all services required.

SANITARY CONSTRUCTION:

All fabricated equipment is to be constructed in strict compliance with standards of National Sanitation Foundation Bulletin on food service equipment entitled "Standard No.2," currently in use, in full compliance with Public Health Regulations of the State of Texas and this city. All fabricated equipment shall have seal of approval of National Sanitation Foundation.

INSTALLATION:

Stainless Steel Contractor shall include connections for all services necessary, except those specified to be furnished by others. Stainless Steel Contractor shall furnish all special trim, as required.

MATERIALS AND EQUIPMENT:

1. Quality of Workmanship: Quality of workmanship of equipment shall be consistent with best quality of metal fixture work produced in their respective trades in heavy duty food service equipment.

2. Qualification of Bidders: All fabricated equipment such as tables, sinks, countertops, etc., described in the following specifications by other than name or catalog numbers, is to be manufactured by fabricator who has the plant personnel, and engineering facilities to properly design, detail, and manufacture high quality equipment.

3. Gauges: All gauges shall be United States Standard.

4. Stainless Steel: Stainless steel used in construction of this equipment to be type No. 302 stainless steel. Exposed surfaces of stainless steel shall be polished to No. 4 of No. 180 grit finish. (No. 100 grind is not acceptable.) Fractures or mill reject sheets that are not uniform in color finish shall not be used in this equipment. Sheet colors, finish, whether mill finished or shop finished, shall be uniform throughout, have uniform finish, uniform grain on each item. All items shall be constructed of same type of stainless steel.

Where manufacturing process disturbs original finish of sheet, it shall be reground and repolished to its original finish. All grain of metal to be in one direction, as much as possible.

5. Galvanized sheet metal shall be copper bearing tight-coat, galvanized steel sheets, equal to Armco or Toncan. All sheets to re-roll for smoothness. All galvanized sheets shall be used in largest sheet possible, with as few joints as possible.

6. Stainless steel welds shall be arc welded using stainless steel electrodes. Welds shall be free of pits, flaws, discoloration, cleaned to remove flux, other impurities. Welds shall be ground smooth, polished to original finish of metal, with grain uniform to grain of original sheet. Where grinding, polishing has destroyed grain, restore, blend to obliterate all traces of welding. Acetylene welding or silver solder will not be acceptable. All welds, whether concealed or not, on unpolished surfaces, shall be background to surface of original metal to remove all impurities from welds. Solder is not permissible unless specifically specified and approved.

7. Galvanized welds shall be arc welded, using galvanized metal electrodes. Welds shall be free of pits, flaws, discoloration, cleaned to remove flux, other impurities. Welds shall be ground smooth, sandblasted to make metal porous. Then metallized with pure molten zinc, sprayed at 1,200 ºF to thickness of not less than .004". Aluminum lacquer will be accepted as substitute of metal if it is free of warpage and coating is smooth, and bloom uniform, suitable for kitchen use.

8. Clean Room Metal Table & Kitchen Regular Countertops: Fabricated metal table tops shall be of 16 gauge stainless steel unless otherwise specified on item specifications, with all shop seams, corners welded, ground smooth and polished.

9. Kitchen Island Countertop: Fabricated metal island table top shall be of 14 gauge stainless steel unless otherwise specified on item specifications, with all shop seams, corners welded, ground smooth and polished.

10. All open base tables shall be reinforced with 1-1/2" x 1-1/2" x 3/16" galvanized channels. Cross members shall be placed at each pair of legs. (1) runner, running lengthwise, shall be provided on tops up to 30" wide.

11. All tables shall be reinforced so that there will not be any noticeable deflection. All reinforcements shall be stud welded to underside of top. No rivets or bolts shall be used through top.

12. Field joints shall be provided in top where necessary, located for practical construction, consistent with sizes convenient for shipping, accessibility to building. See Section entitled "Field Joints" for description.

13. All tops shall have rolled edge 1-1/2" wide x 1" high in bull nose roll except at island counter or where adjacent to walls or other pieces of equipment. Wall side shall be turned up to 10", back 2" unless otherwise specified. Ends of splash closed, free corners of tops shall be spherical.

14. Where tops are adjacent to other fixtures they shall be flanged straight down 1-3/4" or fitted with backsplash as specified above, whichever is called for in item specifications. Table tops shall overhang the cabinet base section on working side not less than 1" to prevent spillage from dripping into poorly closed drawers, doors, or bins below. All raw edges shall be ground smooth to eliminate any burrs, to prevent any possibility of cutting or snagging.

15. Fixtures fitting against wall or between bodies shall be set in 1-1/2" from wall line, tops to extend back to wall line, permitting adjustments to wall irregularities. Vertical trim strip of same material as body is to be provided at each end of fixture to close gap between back edge of body and wall or end of body shall extend 1-1/2" to wall line.

16. Fixtures shall be constructed with legs as specified. All galvanized interior panels shall be finished with aluminum or bronze.

17. Where plumbing supply piping passes through shelves on open base table, shelves shall be neatly punched or die-stamped for piping. Stainless Steel Contractor shall note location of such pipe chases, or stamped pipe openings, on his plan and/or detail drawings. These shall be of sufficient size to accommodate all necessary risers so that additional holes need not be cut in field.

18. Open Base Tables or Frames: Open base table shall be constructed with 1-5/8" diameter 14 gauge wall thickness galvanized steel tubular legs fully welded together with cross rails of same material. Legs shall be fitted at top with 2-1/4" diameter flange tapered gusseted fittings. This fitting shall fit over top of leg shank, be provided with countersunk oval head set screw.

19. Legs shall have rolled taper at the bottom, be equipped with stainless steel foot adjuster, having pressed machine collar securely fitted, secured in tubing. Foot shall be bullet shaped, having minimum of 1-1/2" adjustment without exposing threads. Base of foot shall be machined or drawn to provide approximately one (1) square inch of bearing surface. Fitting tolerance on leg or gusseted flange at top of leg shall not exceed .01". Top fitting shall be galvanized. Foot fitting at bottom shall be of stainless steel and be solid or fully sealed. Foot or legs shall be vermin proof, designed as specified to eliminate accumulation of moisture when cleaning. At top of legs there shall be 1-1/4" x 1-1/4" x 3/16" cross brace at legs; 1-1/4" x 1-1/4" x 3/16" longitudinal angles between legs, these in turn welded to metal top tables or lagged to wood top table. All joints between leg, cross braces shall be welded, ground smooth. Entire framework shall be treated for grease removal, painted in accordance with item "Painting" under this Section.

20. Under Shelves for Open Base Tables: Shall be supplied in following type: galvanized solid fixed metal shelf of 14 gauge galvanized steel. Shelf made in removable sections with turned down edges on two sides which overlap pipe cross rails where they abut same.

21. Feet, Mountings: All pipe legs, whether painted, galvanized or stainless steel, shall be fitted with sanitary die-stamped stainless steel bullet shaped feet, fully enclosed, with slightly round bottom to protect floor. Top of feet fitted with make threaded system shall fit into end of pipe legs hereinabove specified, to provide total adjustment of 2-1/2". Stem shall be extra long so threads are not exposed. Bottom of pipe leg shall be finished off smoothly, overlap stem to provide sanitary fittings to prevent accumulation of grease or other debris at this joint. Cabinet type fixtures shall be mounted on 6" high die-stamped sanitary two-piece stainless steel feet not less than 3" in diameter. Bottom adjusting member shall telescope up into inside of upper member. It shall be fitted with male threaded stem, have an adjustment of 12-1/2" on 6" high leg. Upper part shall be stamped in neat design with flared inverted shoulder, welded to stainless steel base plate designed for anchoring to channel braces below cabinet type fixtures. Foot shall be bullet shaped. All feet shall have one-piece die-stamped closed bottom to insure sanitation.

22. All wall mounted backsplashes shall be 24" high constructed of 18 gauge stainless steel

23. Clean Room double compartment sink shall be 16 gauge 20" x 20" x 8" deep built-in stainless steel. Where sink body, table top proper are welded that shall be minimum of ½" radius. 10" high counter backsplash shall be punched for sink faucets as furnished by Plumbing Contractor.

24. Kitchen Sink Inset into Stainless Steel Countertops: Table top proper shall be cut for installation holes for Plumbing Contractor furnished drop-in double compartment sink.

25. Drainboards: Shall be constructed of one piece 14 gauge stainless steel, unless otherwise specified, welded integral to sinks. Exposed or free edges of drainboards shall be flanged up to 4" with die-formed sanitary rolled edge to match sink, with all outside corners spherical. Rear side of drainboards shall have 10" high backsplash to match sinks. Entire vertical, horizontal corners of drainboards shall be rounded with same material as drain board on 5/8" radius. No solder filleting acceptable. Drainboards shall be welded to sinks to form one piece unit without visible evidence of welding. Drainboards shall be pitched ½" to sink, supported at front be 1" o.d. stainless steel tubing welded to drain board, sink. Drainboards over 36" long shall be mounted upon 1-1/2" galvanized steel tubular legs, cross rails, constructed as called for under "Open Base Tables, Frames."

26. Field Joints: Field joints located for practical construction, consistent with sizes convenient for shipping, accessibility into building. All field joints in tops careful sheared to be tightly butted, drawn together to leave hairline joint, constructed as follows: Two (2) channels shall be 1-1/2" x 1" x ½", of same gauge as top and shall be welded to underside of top of material as called for in specifications. One shall set back from edge, other shall extend beyond edge to form flat surface for meeting piece. Underside of top that overlaps one channel shall be provided with stud bolts on 2-1/2" centers, top surface of channel shall be perforated to receive same. Abutting vertical members of channels shall be perforated and provided with 5/16" bolts on 4" centers. When bolts in channel and stud bolts are drawn tightly, both vertical, horizontal tension shall be provided to hold to secure, level. Joints shall be made watertight with a mastic sealer.

27. Die-formed end caps of same material as table top shall be applied to exterior of turned-up edge on sink drainboards, or other fixtures with raised rims to conceal ends.

28. Painting: All fixtures, unless made of stainless steel, shall be finished in sprayed hammertone gray enamel.

29. Fitting at Walls: Equipment fitting against walls shall be provided with stainless steel trim bar or angle where there is more than ¼" gap between wall and fixtures.

FIELD MEASUREMENTS:

Stainless Steel Contractor shall check all measurements at building, be responsible for same and coordinate with Plumbing Contractor.

GUARANTEE:

Stainless Steel Contractor shall guarantee all fixtures against defects in workmanship, material for one (1) year from date of acceptance of building. Guarantee shall cover replacements of such defective material, including transportation and labor, but it shall not cover any cost whatsoever for replacement of parts or work made necessary by Owner's carelessness or misuse of equipment.

GENERAL:

Owner furnished equipment delivered to the site consisting of range/ovens, main side by side Kitchen refrigerator, pantry refrigerators, clothes washer and dryer shall be installed by General Contractor. Related Contractor shall be responsible for coordinating all trades for a complete and expeditious installation of this equipment.

Mechanical, Plumbing, and Electrical required for this equipment is the responsibility of the Mechanical, Plumbing, and Electrical Subcontractor.

GENERAL:

Furnish all carpet, accessories, labor, materials and equipment necessary for complete installation of carpet tiles.

MANUFACTURERS:

Carpet specifications are based on Shaw Contract Group, Angela Adams Collection 38 oz. commercial 2' x 2' carpet tiles. Specifications of Shaw Contract Group shall be made a part of these Specifications. Carpet tiles of other manufacturers which totally meet or exceed these specifications may be submitted as an alternate.

SUBMITTALS:

1. Submit samples of carpet for approval and color selection.

2. Submit four (4) copies of carpet tile specifications clearly indicating carpet construction and flammability test results.

INSTALLATION:

1. Preparation: Floor shall be smooth, clean and dry. Clean with detergent and rinse thoroughly. Fill holes and depressions with latex cement patching material. Grind high spots or roughness with carborundum stone. Remove doors from hinges and all movable furnishings and equipment during installation.

2. All carpet tiles shall be laid in random ¼ turn direction, parallel or perpendicular to the axis of the building.

3. Carpeting shall be completed in a workmanlike manner with installation of the highest degree.

4. Finally, all items such as room temperatures to maintain preparation of surfaces, installation, etc., not specifically addressed herein shall be as recommended by manufacturer.

CARPET ACCESSORIES:

1. Adhesives: Contractor shall provide all adhesives required, of type recommended by carpet manufacturer.

2. Edging: Contractor shall install reducers and transition strips at all exposed edges of carpet as specified in Section 0972.

3. Tools: Carpet shears, knives, notched trowels, rollers, etc., as required for proper installation.

CARPET TILE FLOORING:

Flooring carpet tile pattern shall consists of four (4) different carpets tiles. These 24" x 24" tiles are Jimi Tile, Casco Tile, Portland Tile and Haven Tile.

Pile Construction:	Multilevel Pattern Loop
Dye Method	Solution Dyed
Fiber Product	100% eco solution q ® premium branded nylon
Face Weight	38 oz.
Gauge:	1/12
Stitches per Inch:	12.0
Finished Pile Height:	.194
Primary Backing:	Synthetic
Secondary Backing	ecoworx
Density:	7,052 ozs./yd3

Flammability Test Results:

ASTM E-648 flooring radiant panel class 1, ASTM E-662 NBS smoke chamber less than 450

Warranties:

Backing:	Lifetime
Fiber:	Lifetime

GENERAL:

Provide and install 1" window blinds at all windows except vision windows and transoms located in doors if listed below. Install at both buildings complete with all mounting accessories.

MATERIALS:

1. Window blinds shall be equal to Levolor “Rivera One” 1" wide 6 gauge aluminum slat blinds, light master slats, transparent tilt wand, hold down brackets and intermediate brackets where required.

2. Color for all blinds and components shall be from standard colors as selected.

INSTALLATION:

1. Contractor shall be responsible for verifying exact dimensions of window frames and installation required.

2. Blinds shall be installed inside of jamb with a maximum of 1/4" clearance from each side.

3. Contractor shall verify which side of window frame to install blinds.

SIZE:

1. Refer to Plans for window dimensions.

2. Window blinds to fit within window frames wherever possible.

3. Window blinds to stop at top or bottom of porcelain-faced panels. (where applicable)

LOCATIONS:

At Windows Types C, D, E and F

CIVIL SITE WORK SPECIFICATIONS

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END OF SECTION

SECTION 01 42 19

REFERENCE STANDARDS

PART 1 GENERAL

1.01 Reference Specifications

A. Standard Specifications and Standard Construction Details

1. In addition, all materials, labor, testing, and incidentals necessary to complete the project shall be in accordance with the standards adopted by:

CITY OF SAN ANGELO, TEXAS

TOM GREEN, COUNTY

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
CHAPTER 217

1.02 Conflict Resolution

A. Where a conflict between either reference standards and these Bleyl Engineering specifications occurs, follow the more stringent as directed by the ENGINEER.

END OF SECTION

SECTION 31 11 00

CLEARING AND GRUBBING

PART 1 GENERAL

1.01 Scope

A. This item consists of clearing the ground of all trees, brush, rubbish, and all other objectionable material, and of grubbing the areas designated for clearing, outfall ditch rights-of-way or other easements within the limits of the project specified.

PART 2 PRODUCTS (not used)

PART 3 EXECUTION

3.01 Area Designated for Clearing

A. The area designated for clearing shall be cleared of stumps, brush, logs, rubbish, trees and shrubs, except such trees and shrubs and certain areas designated by the ENGINEER for preservation shall be carefully protected from abuse, marring or damage during construction operations.

3.02 Equipment Parking

A. Continual parking and/or servicing of equipment under the branches of trees designated for preservation will not be permitted.

3.03 Saving of Trees

A. Trees and shrubs designated for preservation, that must be pruned, shall be trimmed as directed by the ENGINEER and all exposed cuts over 2 inches in diameter shall be treated with an approved material.

3.04 Depth of Removal

A. On areas required for roadway, channel, or utility excavation, all stumps, roots, etc. shall be removed to a depth of approximately two feet below the lower elevation of the excavation.

B. On areas required for embankment construction, all stumps, roots, etc. shall be removed to a depth of approximately two feet below the existing ground surface.

3.05 Holes, Burn Pits, Etc.

A. All holes, burn pits and the like remaining after clearing and grubbing shall be backfilled and compacted to ninety percent of Standard Proctor Density (ASTM Method D698) at a moisture content of between optimum and plus 3 percent of optimum as directed by the ENGINEER and the entire area bladed to prevent ponding of water and to provide drainage; except in areas to be immediately excavated, the ENGINEER may direct that the holes not be backfilled. On areas required for borrow sites and material sources, stumps, roots, etc., shall be removed to the complete extent necessary to prevent such objectionable matter becoming mixed with the material to be used in construction.

3.06 Disposal of Materials

A. All cleared and grubbed materials shall be disposed of off-site as directed by the Contract. CONTRACTOR shall be responsible for obtaining all necessary disposal permits. The CONTRACTOR shall not bury any refuse on the property.

3.07 Limit of Operation

A. No clearing or grubbing shall be done outside the right-of-way/site boundary.

B. Any clearing done outside the right-of-way limits, for any purpose, shall be done at the CONTRACTOR's expense and it shall be the CONTRACTOR's responsibility to negotiate and secure the permission of the property OWNER for such operation. The CONTRACTOR shall provide sufficient evidence to the OWNER, that such permission has been obtained.

3.09 Site Drainage

A. The CONTRACTOR shall maintain adequate site drainage throughout the contract period.

B. Swales and the like shall be constructed to prevent ponding of water and to allow access throughout the project. There shall be no extra pay for swale construction. Include in price bid for the respective item of work.

3.10 Repair to Damaged Trees

A. Any trees not designated to be cleared and are damaged by clearing operations shall be repaired as directed by the ENGINEER. All broken limbs shall be removed by trimming and all exposed area coated with an approved material. There shall be no extra pay for tree repair.

PART 4 MEASUREMENT AND PAYMENT

A. Separate payment shall not be made.

END OF SECTION

SECTION 31 14 13

SOIL STRIPPING AND STOCKPILING

PART 1 GENERAL

Within the limits indicated, or in areas where existing grade is altered, strip existing topsoil and vegetation to approximately 6 inches depth and stock-pile in designated areas or haul off and dispose of in a legal manner, as directed by the ENGINEER. This shall include the removal of all grasses and the like and other debris.

PART 2 CONSTRUCTION METHODS

Topsoil and grasses shall be removed to a depth of approximately 6 inches and stock-piled or hauled off and disposed of in a legal manner, as directed by the ENGINEER. All other unsatisfactory material shall be excavated, removed off the right of way and placed in designated spoil banks or shall otherwise be disposed of as directed and in such a manner as not to create an unsightly or objectionable condition.

PART 3 MEASUREMENT & PAYMENT

Separate Payment shall not be made. Include cost of stripping in associated bid items.

END OF SECTION

SECTION 31 22 16

SITE PREPARATION

PART 1 SCOPE

This section governs furnishing necessary materials, equipment, and labor required to excavate, place fill material and final grade for all designated areas within the project site as shown on the DRAWINGS or described herein.

PART 2 RELATED WORK

SECTION 31 11 00 - Clearing and Grubbing

PART 3 SITE FILLING AND GRUBBING

A. Prior to placing any fill material, all stripping and/or clearing and grubbing operations shall have been completed on the designated areas. The surface of the ground, including plowed loosened ground or surface roughened by small washes shall be restored to approximately its original slope by blading or other methods and where indicated on the plans or required by the ENGINEER.

B. Unless otherwise indicated on the plans, the surface of the ground which is to receive fill shall be loosened by scarifying or plowing to a depth of not less than 4 inches. The loosened material shall be recompacted with the new fill material as hereinafter specified, and shall be placed in layers not exceeding 8 inches in depth. Trees, stumps, roots, vegetation or other unsuitable materials shall be removed and shall not be placed in the fill areas.

C. All fill material shall be placed in layers that are approximately parallel to the final grade of the lot area. All fill shall be placed to the elevation shown on the plans or as directed by the ENGINEER. Completed areas shall correspond to the general shape of the typical sections shown on the plans and each section of the fill areas shall correspond to the detailed section slopes established by the ENGINEER.

D. The layers shall not exceed 6 inches in depth where pneumatic tire rolling is to be used and shall not exceed 8 inches in depth for rolling with other types of rollers. The type of equipment to be used for compaction shall be approved by the ENGINEER before fill placement.

E. Layers of fill material may be formed by utilizing equipment which will spread the material as it is dumped, or they may be formed by being spread by blading or other acceptable methods, from piles or windrows dumped from excavating or hauling equipment in such amounts that the material is evenly distributed.

F. Each layer of fill shall be uniform as to material and moisture content before compaction. Where layers of unlike materials abut each other, the material shall be mixed to prevent abrupt changes in the soil. No material placed in the fill area by dumping in a pile or windrow shall be incorporated in a layer in that position, but all such piles or windrows shall be moved by blading or similar methods. Clods or lumps of material shall be broken and then fill material mixed by blading, harrowing, discing, or similar methods to the end that a uniform material is secured in each layer. Water required for sprinkling to bring the material to the moisture content necessary for maximum compaction shall be evenly applied and it shall be the responsibility of the CONTRACTOR to secure a uniform moisture content throughout the layer by such methods as may be necessary. In order to facilitate uniform wetting of the fill material, the CONTRACTOR may apply water at the material source if the sequence

and methods used produce the required results. Such procedures shall be subject to the approval of the ENGINEER.

G. Each layer shall be compacted to a minimum of 95% of maximum density determined by AASHTO Method T-99, at a moisture content of between optimum and plus 3 percent of optimum. Soils shall not be compacted at less that the optimum moisture content.

H. Prior to placement of fill material on each lot, one (1) density test shall be performed on the existing lot surface. After each layer of fill material is placed and compacted, a minimum of one (1) density test shall be performed for each layer. The OWNER may elect to perform additional density testing at random locations to insure compliance with these specifications.

I. Should any density test fail, the CONTRACTOR at his expense will remove the fill material, re-lay, compact and test in accordance with these specifications.

J. The area of compacted fill shall be evenly graded per the plans. In no event shall the finished area contain depressions or elevations, unless specified in the plans.

PART 4 MEASUREMENT AND PAYMENT

Site preparation will be measured and paid for at the lump sum price designated in the Proposal. Payment shall be full compensation for furnishing all labor, materials, permits, supervision, equipment, supplies and the like necessary to complete all items of work specified herein.

END OF SECTION

SECTION 31 23 16

EXCAVATION AND FILL

PART 1 GENERAL

A. Scope

This section covers furnishing of materials, equipment, tools, labor, superintendence, incidentals and the performance of all operations required to complete fill and backfill, shoring, bracing, dewatering of excavation, trenching, grading and preparation of pavement subgrade, with grading and preparation of unpaved areas and other earthwork operations necessary to complete all construction and grading as indicated on the contract drawings and specified herein.

PART 2 PRODUCTS

A. Bank Sand

Ordinary bank sand with not more than 25% passing a 200 sieve and plasticity index not exceeding 12, when tested by standard laboratory methods. Bank sand shall be reasonably clean, and free of clay and clay lumps, loam, shale, organic matter, rubbish and other deleterious material, and shall meet the approval of the ENGINEER.

B. Excavated Material

Suitable materials from excavation operations may be used for fill and backfill except as otherwise specified. Objectionable material that may be encountered such as silt, muck, topsoil, organic material, or other unsuitable material shall be rejected.

PART 3 EXECUTION

A. Subgrade Preparation

1. Ground surfaces underlying concrete pavement, compacted fill, or compacted sand fill shall be scarified to a minimum depth of six (6) inches and shaped and compacted as specified for the layer of fill.

2. In fill areas, the fill shall be placed in layers not exceeding 8 inches in depth and compacted and shaped in accordance with typical sections shown on the plans.

B. Fill and Backfill

1. Complete all fill and backfill to lines and grades as shown on contract drawings or as elsewhere specified. Methods and materials used to obtain desired density are the responsibility of the CONTRACTOR. Use backfill material free from vegetation, lumps or other objectionable material. Uniform density shall be obtained over entire area and depth of fill or backfill.

2. Perform backfilling operations in presence of Engineer or his authorized representative unless otherwise authorized.

C. Shoring and Bracing

Provide shoring and bracing as required to properly and safely complete the work as shown on the contract drawings, including the erection of temporary or permanent shoring as necessary to control groundwater conditions and to preclude sliding or caving of walls, and to protect workmen. Remove shoring, bracing, and sheeting as excavations are backfilled unless determined by the Engineer that all or part will remain in place.

D. Dewatering

Use drainage ditches, pumps, and well points to control groundwater and surface water. Dewatering methods used shall be subject to approval of the ENGINEER.

E. Trenching

Excavate for pipe trenches by open-cut methods and per local authority specifications and details. Maintain vertical sides of trench when practical. Excavate trench to adequate width to provide working space and to permit thorough tamping of backfill around pipe. Grade bottom of trench to six inches below bottom of pipe at flow lines shown on contract drawings to provide uniform bearing of firm soil along entire length of pipe, reshape and compact as required. Provide bell holes where required for making proper connections at joints.

F. Concrete Pavement

After the subgrade has been prepared and has been accepted by the ENGINEER, concrete pavement shall be constructed to the lines and grades as shown on the plans. The concrete and placement shall conform to the per local authority's specifications and details.

G. Site Grading

Fill or excavate to elevations shown on the contract drawings. Fill for site grading shall be spread and compacted in uniform layers not exceeding eight (8) inches thickness, loose measure. The CONTRACTOR shall uniformly grade the entire project site to provide a pleasing appearance and shall shape and grade the site to conform to the proposed grade and/or sections shown on the drawings, and as directed by the ENGINEER. In any case, the CONTRACTOR shall grade the site to provide positive drainage away from buildings and toward streets and drainage facilities. The finished appearance shall be reasonably smooth, abrupt changes in slope will not be acceptable. The degree of finish for grading slopes shall be that ordinarily obtainable from either blade-grader operations, or by hand-shovel operations, as the CONTRACTOR may elect, subject to the approval of the Engineer.

H. Cement Stabilized Sand Backfill

1. Mixing

Use not less than 1.5 sacks of cement per ton of mixture. Use amount of water required to provide mix suitable for mechanical hand tamping. Mix in approved mixer. Stamp tickets at plant with time of loading. Material not placed within 1-1/2 hours after loading or material which has obtained an initial set will be rejected and

removed from the site. In computing volume from weight, use the weight of sand at 102 pounds per cubic foot.

2. Placing

Place material at optimum moisture content in layers not exceeding 8 inches loose measure. Compact with mechanical tampers.

I. Disposal of Excess and Unsuitable Material

Remove all excess and unsuitable material from the project site. Such material to become property of CONTRACTOR.

J. Site Condition and Clean-up

The Contractor shall keep the site and structures free from accumulations of waste materials, debris, etc. caused by the work or his employees. The Contractor shall "police" the site after each day's operation and remove any and all objectionable debris from the site.

Upon completion of the project and before requesting final inspection, the site and his work shall be "broom clean" or its equivalent.

PART 4 MEASUREMENT AND PAYMENT

No separate payment shall be made for materials furnished or work performed. Include cost of same in Lump Sum amount for which this work is an integral part.

END OF SECTION

SECTION 31 50 10

TRENCH SAFETY SYSTEMS

PART 1 GENERAL

1.01 Scope

A. This section provides for furnishing, installing, and maintaining trench safety systems that meet the minimum of OSHA 29 CFR Safety and Health Regulations, Part 1926, Subpart P. The sections that are incorporated into these specifications by reference include, but are not limited to, 29 CFR Sections 1926.650 through 29 CFR 1926.652 and Appendices.

B. Legislation enacted by the Texas Legislature regarding Trench Safety Systems is hereby incorporated into these specifications by reference. CONTRACTOR shall comply with the requirements of Texas Health and Safety Code Ann., §756.021 (Vernon 1991) and any subsequent amendments.

1.02 Related Sections (not used)

1.03 Related Information

A. Soil Borings

1. Soil borings or other geotechnical information for the design of the utilities or structure may be included with the specifications. If soil borings are included, they are for CONTRACTOR information only, and do not replace any geotechnical explorations required by State or Federal regulations.

1.04 Quality Assurance

A. Trench safety system shall meet the current standards established by the Occupational Safety and Health Administration (OSHA) Safety and Health Regulations, Part 1926, Subpart P. - Excavations, Trenching and Shoring.

B. The ENGINEER's Field Representative will inform the CONTRACTOR, OWNER, and/or OSHA should the Representative observe actions not in accordance with OSHA regulations. Any construction not in accordance with OSHA regulations may not be eligible for payment, and any delays in construction to bring the project within OSHA regulations will not be the responsibility of the OWNER or ENGINEER.

1.05 Definitions

A. A trench shall be defined as a narrow excavation (in relation to its depth) made below the surface of the ground. In general, the depth is greater than the width, but the width of the trench (measured at the bottom) is not greater than 15 feet.

B. The trench safety systems requirements apply to larger open excavation if the erection of structures or other installations limits the space between the excavation slope and the installation to dimensions equivalent to a trench as defined.

C. Trench Safety Systems include but are not limited to sloping, sheeting, trench boxes or trench shields, sheet piling, cribbing, bracing, or shoring.

D. Dewatering, or diversion of water to provide adequate drainage is covered elsewhere in these specifications and is not subject to payment through Trench Safety Systems.

PART 2 PRODUCTS (not used)

PART 3 EXECUTION

3.01 Submittals

A. CONTRACTOR shall submit a safety program specifically for the construction, installation and maintenance of trench excavation or structural excavation. Design the trench safety program in accordance with OSHA 29 CFR regulation governing the presence and activities of individuals working in and around trench excavations.

B. Submittals and shop drawings which contain deviations from OSHA standards or contain special designs shall be sealed by a Professional ENGINEER registered in the State of Texas. Cost for Professional ENGINEER's design shall be paid by CONTRACTOR.

C. Review of the safety program by the ENGINEER will only be in regard to compliance with these specifications and will not constitute approval by the ENGINEER nor will the review relieve the CONTRACTOR of obligations under State and Federal trench safety laws.

3.02 Indemnification

A. CONTRACTOR shall indemnify and hold harmless the OWNER and ENGINEER, its employees and agents, from any and all damages, costs (including, without limitation, legal fees, court costs, and the cost of investigation), judgments or claims by anyone for injury or death of persons resulting from the collapse or failure of trenches or structural excavations covered under this Contract.

B. CONTRACTOR acknowledges and agrees that this indemnity provision provides indemnity for the OWNER and ENGINEER in case the OWNER or ENGINEER is negligent either by act or omission in providing for trench safety, including, but not limited to, safety program and design reviews, inspections, failures to issue stop orders, and the hiring of the CONTRACTOR.

3.03 Installation

A. Provide, install and maintain trench safety system in accordance with provisions of OHSA 29 CFR.

B. Specially designed trench safety system shall be installed in accordance with the trench safety drawings produced for the locations and conditions identified on the Shop Drawings and Submittals.

C. A competent person, as identified in the CONTRACTOR's Trench Safety Program, shall verify that trench boxes and other pre-manufactured systems are certified for actual installation conditions and are in a properly maintained condition.

3.04 Inspection

A. CONTRACTOR, or qualified consultant retained independently by CONTRACTOR, shall make daily inspections of the trench safety system to ensure that the installed system and operations meet OSHA 29 CFR, State of Texas regulations, and other personnel protection regulation requirements.

B. If evidence of possible cave-ins or slides is apparent, CONTRACTOR shall immediately stop work in the trench and move personnel to safe locations until the necessary precautions have been taken by CONTRACTOR to safeguard personnel entering the trench.

C. Maintain a permanent record of daily inspections.

3.05 Field Quality Control

A. CONTRACTOR shall verify specific applicability of the selected or specially designed trench safety system to each field condition encountered on the project.

B. Should field conditions change during the progress of the work, CONTRACTOR shall revise the trench safety system accordingly.

PART 4 MEASUREMENT AND PAYMENT

A. Measurement and payment for trench safety system used on utility excavation shall be included in the linear foot unit bid item for which it is required.

B. Measurement and payment for special shoring requirements use in trench excavations, if included in the unit price bid schedule, is per square foot of the vertical face of the special shoring installed.

C. Separate payment for trench safety system for structural excavation will not be made. Include cost of shoring in the cost of the structure.

END OF SECTION

STRUCTURAL SPECIFICATIONS

STRUCTURAL SPECIFICATIONS
FIRE STATION #4
CITY OF SAN ANGELO
SAN ANGELO, TEXAS

WILLIAM T. McCLANAHAN, P.E.
Texas Professional Engineer License # 30247
Firm Registration Number F-337

SECTION 00210 - SOIL INVESTIGATION DATA

PART 1 GENERAL

1.01 INVESTIGATION

A. Soil and subsurface investigations were conducted at the site, the results of which are to be found in the report issued by EHT Engineering dated October 2,2015, for this specific site.

B. A copy of the report may be observed at the office of the Engineer.

1.02 INTERPRETATION

A. Contractor is urged to examine report and site, and determine the character of materials and conditions to be encountered.

B. Soil investigation data is provided for information and convenience of Contractor only. Owner and Architect disclaim any responsibility for accuracy, true location and extent of investigation prepared by others. They further disclaim any responsibility for interpretation of data by Contractor.

C. Soil investigation data is not part of the Contract Documents.

END OF SECTION

SECTON 01151 – UNIT PRICES

PART 1 GENERAL

1.01 SUBMITTALS

A. Supply unit prices for items listed hereinafter, for inclusion in Contract guaranteed to apply throughout entire project as basis for additions to or deduction from Contract on allied work in connection with this Work.

B. Unit price to be total cost or credit to Owner; adjustment to Contract shall be made by Change Order on basis of net accumulative change for each work category.

1.02 UNIT PRICES REQUIRED

A. Drilled Pier Depth:

1. Base Bid on design depths indicated.

2. In case of pier designs which indicate a straight shaft, then the pier depth shall be based on the length of the straight portion to the top of the slab at each pier location to bottom of pier shaft in the case of full length straight shaft piers. Adjustment for depth of bearing penetration and distance from existing grade to top of pier and finish floor will be made by Architect.

3. Furnish unit prices for each linear foot of pier, the cost shall include shaft drilling, labor and the in-place cost of concrete and reinforcing for each size of pier listed.

4. Should bearings at levels indicated be found to be insufficient, Architect may order excavations carried to other bearing elevations. Such work is classed additional work and cost thereof will be determined by unit prices.

5. Should proper bearing be found at less depth than indicated, Architect may order reduction of depth of excavation. Allow credit for work omitted on basis of unit prices in bid.

6. Adjustments to Contract will be made by Change Order on basis of accumulative net change for all piers of each size.

B. Drilled Pier Casing: Provide unit price for the addition of drilled pier casings. Price should be indicated for eighteen, twenty-four and thirty inch (18”, 24” and 30”) diameter piers.

SECTION 01410 - TESTING LABORATORY SERVICES

PART 1 GENERAL

1.01 GENERAL

A. Owner shall employ and pay for services of an independent Testing Laboratory to perform specified services and testing.
   1. Employment of laboratory shall in no way relieve Contractor's obligations to perform Work of Contract.
   2. Laboratory for this project is to be Construction Services,4613 Fusselman Dr., San Angelo, Texas.

B. Related Requirements Specified Elsewhere:
   1. Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities: Conditions of the Contract.
   2. Individual specifications sections reference herein.

C. Where terms "Inspector" and "Testing Laboratory" are used, they mean and refer respectively to an officially designated and accredited inspector of testing laboratory.

1.02 QUALIFICATION OF LABORATORY

A. Meet "Recommended Requirements for Independent Laboratory Qualification", published by American Council of Independent Laboratories.

B. Meet basic requirements of ASTM E329, "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction".

C. Authorized to operate in State in which Project is located.

D. Testing Equipment:
   1. Calibrated as reasonable intervals by devices of accuracy traceable to either:
      a. National Bureau of Standards.
      b. Accepted values of natural physical constants.

1.03 LABORATORY DUTIES

A. Cooperate with Architect and Contractor; provide qualified personnel after due notice.

B. Perform specified inspections, sampling and testing of materials and methods of construction:
   1. Comply with specified standards.
   2. Ascertain compliance of materials with requirements of Contract Documents.

C. Promptly notify Architect and Contractor of observed irregularities or deficiencies of work or products.

D. Promptly submit written report of each test and inspection; one copy each to Architect, Structural Engineer, Owner, Contractor, and one copy to Record Documents File. Each report shall include:
   1. Date issued.
   2. Project title and number.
   3. Testing laboratory name, address and telephone number.
   4. Name and signature of laboratory inspector.
   5. Date and time of sampling or inspection.
   6. Record of temperature and weather conditions.
   7. Date of test
   8. Identification of product and specification section.
   9. Location of sample or test in Project.
   10. Type of inspection or test.
   11. Results of tests and compliance or non-compliance with Contract Documents.
   12. Interpretation of test results, when requested by Architect.

E. Perform additional tests as required by Architect.

1.04 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

A. Laboratory is not authorized to:
   1. Release, revoke, alter or enlarge on requirement of Contract Documents.
   2. Approve or accept any portion of work.
   3. Perform any duties of Contractor.

1.05 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with laboratory personnel; provide access to Work, and to Manufacturer's Operations.

B. Secure and deliver to laboratory adequate quantities of representative samples of materials proposed to be used, and which require testing.

C. Furnish copies of products test reports as required.

D. Furnish incidental labor and facilities:
   1. To provide access to Work to be tested.
   2. To obtain and handle samples at site or at source of the product to be tested.
   3. To facilitate inspections and tests.
   4. For storage and curing of test samples.

E. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.
   1. Items indicated to be inspected or tested shall not be constructed until a laboratory representative is present at the site.
   2. Make arrangements with laboratory and pay for additional samples and tests required for Contractor's convenience.

1.06 SPECIFIC TESTS, INSPECTIONS AND METHODS REQUIRED

A. Testing of Earthwork (Section 02220):
   1. Select Fill: Perform tests on proposed select fill materials and subgrade prior to use to determine existing conditions and compliance with specified requirements.
   2. Establish moisture density relationship for soil type.
   3. Sub-Grade Density testing:
      a. Establish moisture-density relationship for soil type.
      b. Perform field in-place density relationship as follows:
         (1) Building subgrade: Test subgrade at eleven (11) locations as indicated on Foundation Plan.
   4. Testing of Select Fill in place:
      a. Perform field in-place density test at eleven (11) locations indicated on Foundation Plan per lift of select fill.

B. Observation of Pier Drilling (Section 02362):
   1. The Owner will pay the fee for the services of an independent testing lab to perform the following:
      a. Determine the proper bearing elevation for all piers, based on the soil investigation data.
      b. Observe all pier drilling operations on a full time basis.
      c. Record and report all observations and pier depths to Owners, Architect and Structural Engineer.

C. Control and Testing of Concrete:
   1. Mix Design, Trial Mixes and Advance Tests:
      a. Design concrete mixes for each type concrete specified in accordance with ACI 318.
      b. For each concrete mix type required, make 2 trial mixes using aggregate proposed.

c. Make advance tests of trial mixes with proposed materials. Test four cylinders in accordance with ASTM C-39 (2 at 7 days and 2 at 28 days). Do not place concrete on project until laboratory reports and breaks on confirmation cylinders indicate that proposed mixes will develop required strength.
d. Check mix designs and revise if necessary wherever changes are made in aggregates or in surface water content of aggregate or workability or concrete. Slump shall be minimum to produce workable mix. Laboratory will prescribe maximum quantity of water.

2. Test Cylinders: During progress of Work, make test cylinders for each different mix placed in any one day. For every concrete placement of 100 cubic yards or fraction thereof over 10 cubic yards, make three compression test cylinders of samples taken during pour. Test cylinders in accordance with ASTM C-39 (1 at 7 days and 2 at 28 days). Make additional sets of cylinders for concrete placements from 100 yards to 200 yards and third set for pours exceeding 200 yards.
3. Slump Tests: Make slump tests on each load of concrete placed on this project. Laboratory shall immediately inform Contractor when slump exceeds limits specified, and inform the concrete truck driver not to place concrete.

END OF SECTION

SECTION 02100 - CLEARING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Removal and disposal of all obstructions from the site, such as, but not limited to buildings, concrete drives, trees, shrubs, concrete slabs on grade, abandoned utility pipes or conduits, curbs and gutters, etc.

B. Install all barricades, fences, planking, bridges, bracing, shoring, lights, warning signs, guards, etc., as required for the protection of the public, street, sidewalks, adjoining property and workmen.

C. Pumping, bailing and draining of all surface or seepage water form the site.

D. Removal of trees.

1.02 RELATED WORK

A. Section 02210 - Site Grading.

B. Section 02215 - Excavation.

1.03 REGULATORY REQUIREMENTS

A. Conform to City codes for disposal of debris.

B. The Contractor shall be required to notify utility companies and the city water department when working in areas where utility lines might be encountered. The Contractor will be held responsible for all damage done to utility and water lines as a result of work done under this contract.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 CLEARING

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

B. Remove trees and shrubs within marked areas. Grub out stumps and roots.

C. Clear undergrowth and deadwood, without disturbing subsoil.

D. Remove tree stumps and roots to ensure that the tree is dead and will not affect the foundations in the future.

3.02 PROTECTION

A. Protect plant growth and features remaining as final landscaping.

B. Protect benchmarks and existing work from damage or displacement.

C. Maintain designated site access for vehicle and pedestrian traffic.

D. Coordinate tree removal with the electrical service company to avoid damage to existing service lines.

3.03 REMOVAL

A. Clean up all debris caused by the work of this Section, keeping the premises, streets, and adjacent property clean and neat at all time. After all work has been completed, patch any street and/or curb damaged by the work of this Contract in conformity with City requirements.

END OF SECTION

SECTION 02215 - EXCAVATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Building excavation.

B. Shoring excavation.

1.02 RELATED WORK

A. Section 01410 - Testing Laboratory Services.

B. Section 02210 - Site Grading: Topsoil removal from site surface and re-use as common fill.

C. Section 02220 - Backfilling.

1.03 PROTECTION

A. Protect trees, shrubs, lawns, and other features remaining as a portion of final landscaping.

B. Protect benchmarks, existing structures, fences, sidewalks, paving and curbs from equipment and vehicular traffic.

C. Protect above and below grade utilities which are to remain.

D. Protect excavations by shoring, bracing, sheet piling, underpinning, or other materials required to prevent cave-in or loose soil from falling into excavation.

E. Notify Architect/Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

F. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.

G. Grade excavation top perimeter to prevent surface water run-off into excavation.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum. Coordinate with Section 01050.

B. Identify known underground utilities. Stake and flag locations.

C. Identify and flag surface and aerial utilities.

D. Notify utility company to remove and relocate utilities.

E. Maintain and protect existing utilities remaining which pass through work area.

3.02 EXCAVATION

A. Excavate subsoil required for building foundation, construction operations, and other work. Evacuate to elevations indicated on the Foundation Plan. Level excavation at lowest point.

B. Hand trim excavation and leave free of loose matter.

C. Remove lumped subsoil, boulders, and rock.

D. Correct unauthorized excavation at no cost to Owner.

E. Fill over-excavated areas under structure bearing surfaces in accordance with direction by Architect/Engineer.

3.03 FIELD QUALITY CONTROL

A. Provide for visual inspection of bearing surfaces.

END OF SECTION

SECTION 02220 - BACKFILLING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Building perimeter backfilling to subgrade elevations.

B. Site backfilling.

C. Fill under building foundations, floor slab, equipment pads and adjacent walk areas.

D. Compaction requirements.

1.02 RELATED WORK

A. Section 01410 - Testing Laboratory Services: Compaction requirements of backfill.

B. Section 02215 - Excavation.

1.03 TESTS

A. Tests and analysis of subgrade and fill materials will be performed in accordance with ASTM D1557 and with Section 01410.

1.04 REFERENCES

A. ASTM C136 - Sieve Analysis of Fine and Coarse Aggregates.

B. ASTM D1557 - Tests for Moisture - Density Relationship of Soils using 10 lb. (4.5 kg) Rammer in eighteen inch (18”) (457 mm) Drop.

C. Texas SDHPT, Latest Edition, Standard Specifications for Construction of Highways, Streets and Bridges, referred to in text as SDHPT.

D. American Association of State Highways and Transportation Officials, referred to as AASHTO.

1.05 SAMPLES

A. Submit Samples in accordance with Section 01410.

B. Submit sample of each type of fill to testing laboratory, in air-tight containers.

PART 2 PRODUCTS

2.01 MATERIALS

A. Select Fill Surface Course: Limestone crusher screenings with approved gradation. Compact to 95%maximum density (ASTM D1557) at or near the optimum moisture content. Do not deviate from optimum moisture content more than 3.0% above or 1.5% below optimum. Surface course is to be six inches (6”) minimum thickness.

B. Select Fill from Subgrade to Surface Course: Crushed limestone conforming to TxDot Item 247 Grade 2. Compact select fill to 95% maximum density at optimum moisture. Do not deviate from optimum moisture content more than 3.0% above or 1.5% below optimum.

C. Non-Select fill, or Common Fill: On-site excavated materials free of rocks, roots, debris, waste, frozen material, vegetable and other deleterious matter.

D. New Top Soil: Natural, fertile, friable soil, sand loam, representative of local productive soil and 90 percent free of clay lumps, subsoil or other foreign matter larger than two inch (2") diameter; not frozen or muddy, and free of grass, weeds, grass roots and seeds. Acidity range pH 5-7, not less than three percent organic matter as determined by loss on ignition of moisture free samples dried at 100 degrees Centigrade; not more than fifteen (15) percent by volume passing the No. 4 sieve and 60 percent by volume passing the No. 200 sieve; clay content between 5 and 25 percent of material passing the No. 4 sieve.

E. Existing Topsoil: Existing topsoil may be used in cases in which the existing topsoil meets the specifications for New Topsoil and which occurs in sufficient quantities to meet specified depths.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify areas to be backfilled are free of debris, snow, ice, or water, and ground surfaces are not frozen. Establish and maintain elevations.

3.02 PREPARATION

A. Compact subgrade surfaces to density requirements for backfill material.

B. Cut out soft areas of subgrade not readily capable of being compacted. Backfill with select fill and compact to density.

C. Protect all utilities.

3.03 BACKFILLING

A. Backfill areas to contours and elevations. Use unfrozen materials.

B. Backfill systematically, as early as possible, to allow maximum time for natural settlement.

C. Place and compact select fill and common fill materials in continuous layers not exceeding eight inches (8”) loose depth.

D. Employ a placement method so as not to disturb or damage utilities in trenches.

E. Maintain optimum moisture content of backfill materials to attain required compaction density.

F. Slope grade away from building minimum four inches (4”) in ten feet (10’-0”), unless noted otherwise.

G. Make changes in grade gradual. Blend slopes into level areas.

H. Remove surplus backfill materials from site.

I. Leave stockpile areas completely free of excess fill materials.

J. Select fill occurs beneath building slabs. Compacted select fill shall extend from compacted subgrade to bottom of concrete slab. Select fill pad is to be minimum thickness indicated on Drawings.

K. Non-select Fill or Common Fill shall be utilized to bring fill areas outside building lines to bottom of select fill or topsoil. Compact common fill to 90% maximum density at optimum moisture according to ASTM D698.

L. Place topsoil in six inch (6") minimum thickness where indicated on Site Plan or disturbed by construction. Compact to 90% maximum density at optimum moisture according to ASTM D698 and finish grade to elevations indicated.

END OF SECTION

SECTION 02362 - DRILLED PIER FOUNDATIONS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Bored end bearing cast-in-place concrete piers with reinforcing steel.

1.02 RELATED WORK

A. Section 00220 - Soil Investigation Data: Soil report.

B. Section 01151 - Unit Prices.

C. Section 01410 - Testing Laboratory Services. Owner shall employ the services of Construction Services Laboratory to supervise the drilling and construction of all pier foundations.

D. Section 02220 - Excavation: Excavation to specified level and/or designated bearing elevation.

E. Section 03200 - Concrete Reinforcing: Specifications for reinforcing.

F. Section 03300 - Cast-in-Place Concrete: Specifications for concrete.

1.03 PROJECT RECORD DOCUMENTS

A. Submit three (3) copies of project records and drawings in accordance with Section 01720.

B. Accurately record pier locations as established on the drawings, using grid lines and references. Record pier diameter, size, bearing elevations, penetration depth and condition of bottom of excavation. Record the size, number and length of rebar placed. Plumb within tolerance. Size and depth of casing used if necessary.

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete Materials and Mix: Specified in Section 03300 using Type I cement, 1-1/2" max. aggregate size, 3000 psi 28 day strength, six inch (6") inch maximum slump.

B. Reinforcement: Specified in Section 03200.

C. Steel Casing: Of sufficient strength, diameter, length and construction to meet construction requirements as to safety and prevention of caving of soil and water penetration. Provide unit prices for casing. Casing of piers is to be considered as additional work not included in the Base Proposal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Pier drilling equipment is to be a minimum of Texoma 800 with thirty feet (30’-0”) drilling capability.

B. Drill concentric pier shafts.

C. Clean pier bearing surface utilizing drilling equipment to expose a bearing surface free of loose material. Provide for the protection of workmen when in excavation according to OSHA requirements. Pier bearing shall be free of standing water, foreign matter, or loose material.

D. Allow inspection of pier shafts prior to reinforcing steel and concrete placement. Prevent foreign matter from falling into pier hole.

E. Place reinforcing steel in accordance with Section 03200.

F. Place concrete within four (4) hours after pier hole is begun and in accordance with Section 03300. Use equipment designed for vertical placement of concrete. Vibrate concrete full depth of pier.

G. Provide dowels for connection plinth and grade beams.

H. Place concrete through a temporary casing if an inflow of subsurface water occurs. Place concrete to height sufficient to effect seal.

3.02 TESTING LABORATORY SERVICES

A. Perform concrete testing in accordance with Section 01410. Special attention shall be given to the requirement for full time inspection paid by the Owner.

B. Provide testing laboratory personnel to observe the construction of all piers in accordance with Section 01410 and Section 03300.

3.03 TOLERANCES

A. Maximum: 1" in 10' from vertical for plumb piers.

B. Top: Maximum 2 inches from location indicated.

3.04 PRECAUTIONS

A. Employ drilling contractors who have adequate equipment to perform the required work. Submit drilling equipment descriptions to Engineer before beginning drilling operations.

B. Make certain the drilling contractor is aware of the project requirements, unit prices, and the need to properly staff the work to meet the construction schedule.

C. Make certain the drilling contractor is aware of all active underground utility lines.

D. Where overhead power lines exist, observe proper clearances required by utility company.

E. Workmen are not to enter the pier excavations.

END OF SECTION

SECTION 03001 - FORMWORK

PART 1 GENERAL

1.01 WORK INCLUDED

A. Construction, bracing, alignment of forms.

PART 2 PRODUCTS

2.01 MATERIALS

A. Wood forms for unexposed concrete surfaces shall be built from No. 2 Common Southern Yellow Pine Lumber or other materials of equal qualifications of sufficient thickness to be capable of sustaining the loads to be imposed thereon, dressed to uniformly smooth contact surfaces, and so constructed to be readily removable and coated with form oil.

B. Wood forms for exposed concrete surfaces shall be constructed of Commercial Standard Douglas Fir, moisture-resistant, concrete form plywood, not less than five ply, and at least 9/16" thick, with one smooth face, or shall be formed with linings of one of the following types sealed with form sealer:
   1. Plywood: Commercial Standard Douglas Fir, concrete-form, exterior, three ply, not less than 1/4 inch having one smooth face, or
   2. Fiberboard: Treated, hardpressed fiberboard having a low degree of water absorption, not less than 3/16” thick, with one smooth side.

C. Form ties on exposed concrete surfaces shall be manufactured to allow a positive breakback of not less than one inch inside the concrete surface. Ties shall be equipped with plastic cones not less than 3/8” diameter and one inch long which will completely cover the holes and prevent leakage of any mortar. Form ties for unexposed surfaces shall be bolts, rods or patented devices having a minimum tensile strength of 3,000 lbs. when fully assembled. Ties shall be adjustable in length and free of lugs, cones, washers or other features which would leave a hole larger than 7/8" in diameter, or depressions back of the exposed surface of the concrete. Ties shall be of such construction that, when the forms are removed, there will be no metal remaining within one inch of the finished surface of the concrete. All exposed corners of interior walls, columns and beams shall be formed with VINYLEX Radius Concrete Former No. RFN-1 inch. Contact Slaughter Industries.

D. Form oil shall be a non-staining, paraffin-base oil having a specific gravity of between eight-tenths (0.8) and nine-tenths (0.9).

E. Moisture Barrier: W.R. Meadows “Vapor-Mat” 15 mil or Stego Wrap 15 mil.

F. Void Forms: Trapezoidal forms as manufactured by Sure Void.

PART 3 EXECUTION

3.01 FORMWORK

A. The design and engineering of formwork, as well as its construction, shall be the responsibility of the Contractor. Formwork shall be designed for the loads and lateral pressures outlined in Part 3, Section 02 of "Recommended Practice for Concrete Formwork" (ACI 347), and wind loads specified by Building Codes.

B. Requirements for facing materials are described in Finishing of Formed Surfaces. The maximum deflection of facing materials reflected in concrete surfaces exposed to view shall be 1/240 of the span between structural members. Place 1" radius P.V.C. moldings in corners of column, beam and wall forms where concrete will be exposed to view.

C. Where necessary to maintain specified tolerances, camber formwork to compensate for anticipated deflections in formwork due to weight and pressure of fresh concrete and due construction loads.

D. Provide temporary openings at bases of wall forms and at other points where necessary to facilitate cleaning and observation, immediately before concrete is deposited.

E. Form accessories to be partially or wholly embedded in concrete, such as ties and hangers, shall be a commercially manufactured type. Wire is not acceptable.

F. Moisture barrier is to be placed on level select fill pad. Tape joints and tears.

G. Void forms are to be placed in beam excavations and encased top and sides with grout a minimum of two weeks before concrete for beam is placed. Void forms that are subject to free water are to be removed.

3.02 PREPARATION OF FORM SURFACES

A. Forms shall be sufficiently tight to prevent leakage of grout or cement paste. Board forms having joints opened by shrinkage of the wood shall be swelled until closed by wetting before concrete is placed.

B. Edge forms and screeds: Set edge forms and intermediate screed strips accurately to produce designed elevations and contours in finished surfaces. Align the concrete surfaces to the contours of screed strips by the use of strike-off templates.

3.03 REMOVAL OF FORMS

A. Formwork for walls, sides of beams and other parts not supporting weight of concrete may be removed as soon as concrete has hardened sufficiently to resist damage from removal operations but not before concrete is 48 hours old.

B. Removal Strength: When formwork removal is based on concrete reaching its specified strength (or a specified percentage thereof) at an early date, concrete shall be presumed to have reached this strength when test cylinders, field cured under most unfavorable conditions prevailing for any portion of concrete represented, have reached required strength. Except for field curing and age at test, cylinders shall be molded and tested as specified.

3.04 CLEAN UP

A. Upon completion of the work, remove equipment, protective coverings and any rubbish from the premises. Leave area in a clean and perfect condition.

END OF SECTION

SECTION 03150 - EXPANSION JOINTS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Expansion joint fillers, sealers, and board caps to be used for exposed poured-in-place concrete slabs on fill.

PART 2 PRODUCTS

2.01 MATERIALS

A. Poured Joint Sealer: Sikaflex 2 part polyurethane sealant, or approved equal.

B. Premolded Filler: Cane fibre asphalt impregnated conforming to ASTM D1851.

C. Expansion Board Cap: Equal to #941 1/2" x 1/2" by Greenstreak Plastic Products Co., St. Louis, Mo., (800) 325-9504.

D. Dowels: Smooth bars, diameter indicated on Drawings, 2'-0" long, with plastic cap, one end allowing 1-1/2" expansion.

PART 3 EXECUTION

3.01 EXPANSION JOINTS

A. Expansion joints shall consist of premolded asphalt impregnated cane fibre filler strips, without sealer. Install premolded filler strips at proper levels in relation to finished concrete. Install dowels at 12" spacing centered in slab. Neatly finish edges of exposed concrete slabs along expansion joints with a slightly rounded edging tool. Reinforcement or other embedded metal items bonded to the concrete shall not be permitted to extend continuously through any expansion joint, unless otherwise noted on drawings. Mask areas adjacent to joints to provide straight edges of sealant. Install expansion board caps at all expansion points.

B. Jointing: Joints shall be located as detailed and indicated on the contract drawings. Space expansion joints in exterior surfaces as indicated. Space dummy tool cross joints or saw cut joints as indicated.

3.02 CLEAN UP

A. Upon completion of the work, remove equipment, protective coverings and any rubbish from the premises. Leave area in a clean and undamaged condition.

END OF SECTION

SECTION 03200 - REINFORCING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Reinforcing steel and accessories.

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete accessories including bar supports, chairs, spacers, etc. shall be cold-drawn wire fabricated in accordance with the requirements of ACI SP66-04 with heights as required. Bar supports for concrete resting on earth shall be Individual High Chairs No. HCP with welded plates on bottom, as manufactured by Hohmann & Barnard, Inc.

B. Reinforcing: All reinforcing steel shall be of domestic manufacture. Vertical column bars shall be of weldable quality. Submit mill test reports as evidence.

C. Bars shall be new deformed steel conforming to the requirements of ASTM 615, Grades 60. Grade 40 permitted only where designated on drawings.

D. Welded wire mesh shall conform to ASTM A185 and A82. Furnish in flat sheets.

PART 3 EXECUTION

3.01 REINFORCEMENT

A. Reinforcing Bars: Support and wire together to prevent displacement by construction loads or placing of concrete. On ground, forms, and where necessary, use supporting chairs. Over formwork, furnish concrete, metal, plastic, or other approved bar chairs and spacers. Where concrete surfaces will be exposed to the weather in finished structure or where rust would impair architectural finishes, portions of all accessories in contact with formwork shall be galvanized or made of plastic. Do not weld reinforcing.

B. Lap wire mesh one full mesh on ends and at side joints. Tie as required.

C. Splices: Submit shop drawings showing splices not shown on the contract drawings for approval to the Engineer.

3.02 CLEAN UP

A. Upon completion of the work, remove equipment and any rubbish from the premises. Leave area in a clean and undamaged condition.

END OF SECTION

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 RELATED WORK

A. Drilled Pier Foundations, Section 02362.

B. Formwork, Section 03001.

C. Expansion Joints, Section 03150.

D. Reinforcing Steel and Accessories, Section 03200.

E. Finishing and Curing Concrete, Section 03350.

1.02 WORK INCLUDED

A. Concrete for slabs, walls, beams, footings, walks, curbs and gutters.

B. Concrete mix designs and testing.

C. Admixtures for concrete.

D. Shop drawings.

E. Field testing concrete.

F. Installing concrete.

1.03 SHOP DRAWINGS

A. Submit shop drawings on reinforcing steel, embedded items, and construction joints. Approval of shop drawings shall cover general locations, spacings and details of design. Shop drawings for reinforcing steel shall indicate bending diagrams; assembly diagrams; splicing and laps of rods; shapes; dimensions and details of bar reinforcing and accessories. Scaled dimensions from structural drawings shall not be used in determining the lengths of reinforcing rods. Allow fourteen (14) working days in engineer's office for shop drawing review.

PART 2 PRODUCTS

2.01 CONCRETE QUALITY

A. All concrete quality shall be in accordance with A.C.I. 318-02, Chapter 4.

B. Water Reducing Concrete Admixture: Pozzilith 300 R. High-range water reducing admixtures will not be utilized.

C. Air Entrainment: 5% air entrainment add to all exterior concrete paving, walks, steps, curbs and gutters, and walls. Master Builders "MB-VR".

D. Cement: ASTM C150. Flyash is not an acceptable cement substitute.

E. Aggregates: Fine and course ASTM C33.

F. Water for mixing and curing concrete: Shall be city water.

2.02 CONCRETE MIX DESIGNS

A. The Owner will engage and pay for the services of a recognized independent testing agency to design the concrete mixes. Furnish reports of mix designs to the offices of the Owner, Architect, Structural Engineer and General Contractor.

2.03 TESTING OF CONCRETE

A. Testing of concrete shall be done by a recognized independent testing agency selected and paid by the Contractor subject to the approval of the Architect.

B. General: Routine testing of materials and of resulting concrete for compliance with technical requirements of the contract documents shall be the duty of the testing agency.

C. Testing Services: Test the proposed concrete materials for compliance with the Specifications. Conduct strength tests of concrete in accordance with ACI 318-02, Chapter 4. Report all test results in writing to the offices of the Owner, Architect, Structural Engineer, and General Contractor on same day tests are made. All test reports shall state if tests do or do not comply with project specifications.

2.04 CONSTRUCTION JOINTS

A. Joints not shown on drawings shall be so made and located to least impair the strength of the structure and must be approved by the Architect. In general, joints shall be located near the middle of interior spans of slabs and beams. Joints shall be perpendicular to the main

reinforcement. See notes on drawings for unscheduled construction joints.

B. All reinforcing steel shall be continuous across joints. Longitudinal keys at least 1-1/2" deep shall be provided in all joints in beams. Surfaces of concrete at joints shall be thoroughly cleaned and all laitance removed and the surface coated with an approved bonding agent just prior to placing concrete.

2.05 EMBEDDED ITEMS

A. Place sleeves, inserts, stair nosings, anchors, and embedded items for mechanical, electrical, and other trades prior to concreting. Give ample notice and opportunity to all trades whose work is related to concrete or must be supported by it, to introduce and/or furnish embedded items before concrete is placed. Accurately position expansion joint materials and embedded items and support against displacement. Fill voids in inserts with readily removable material to prevent the entry of concrete into voids.

2.06 CONCRETE STRENGTHS

A. The Contractor shall employ and pay for the services of an independent testing agency to design the concrete mixes in conjunction with the work of his contract. All concrete shall comply with ACI 318-02 Code, proportioned according to ACI 318-02, Chapter 4, and as noted on the Drawings.

B. Concrete, unless otherwise indicated on the Structural Drawings, shall have a twenty-eight (28) day compressive strength of 4000 psi and shall contain a minimum of five and one-half (5 1/2) sacks of cement per cubic yard of mix. Concrete for drilled piers shall have a twenty-eight (28) day compressive strength of 3000 psi and shall contain a minimum of five (5) sacks of cement per cubic yard of mix.

C. Mix and deliver all concrete in conformity with the requirements for Ready-Mixed Concrete ASTM C94. Concrete ingredients proportioned by weight. Addition of water to mix shall be controlled by a Testing Laboratory representative.

PART 3 EXECUTION

3.01 PLACING CONCRETE

A. Notify the Architect and Contractor's testing agency at least seventy-two (72) hours in advance, excluding Saturday and Sunday, before

placing concrete. Dumping of waste concrete on site shall not be permitted.

B. Preparation before placing: Remove hardened concrete and foreign materials from inner surfaces of conveying equipment. Form work shall have been completed. Remove ice and excess water. Secure reinforcement in place. Install expansion joint materials, anchors and other embedded items.

C. Conveying: Handle concrete from mixer to place of final deposit as rapidly as practicable by methods which will prevent separation or loss of ingredients and in a manner which will assure that required quality of concrete is obtained. Conveying equipment shall be of size and design to insure a continuous flow of concrete at delivery end. Truck mixers, agitators and non-agitating units and their manner of operation shall conform to the applicable requirements of ASTM C94. Aluminum chutes or pipes for conveying concrete will not be permitted.

D. Depositing Concrete:
   1. General: Deposit concrete continuously or in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, locate construction joints at points as provided for on the drawings or as approved. Maintain placing at such a rate that the concrete which is being integrated with fresh concrete is still plastic. Concrete which has partially hardened or has been contaminated by foreign materials shall not be deposited. Remove temporary spreaders in forms when the concrete placing has reached an elevation rendering their service unnecessary. They may remain embedded in the concrete only if made of metal or concrete, and if prior approval has been obtained.
   2. Segregation: Deposit concrete as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. Do not subject concrete to any procedure which will cause segregation. Dropping concrete vertically more than five (5) feet (max. free fall distance) without an enclosed chute (tremie) will not be permitted.
   3. Consolidation: Where a surface mortar is to be the basis of the finish, work the coarse aggregate back from the forms with a suitable tool to bring a full surface of mortar against forms, without formation of excessive surface voids. Consolidate all concrete by vibration, spading, rodding, or forking, in order that the concrete is thoroughly worked around the reinforcement, around embedded items and into corners of forms, eliminating all air or stone pockets which may cause honeycombing, pitting, or planes or

weakness. Mechanical vibrators shall have a minimum frequency of 7000 revolutions per minute and shall be operated by competent workmen. Over vibrating and use of vibrators to transport concrete within forms shall not be allowed.

4. Weather conditions: Unless adequate protection is provided and/or approval is obtained, concrete shall not placed during rain. Rain water shall not be allowed to increase the mixing water, or to damage the surface finish. When the mean daily temperature falls below 40°F., the minimum temperature of concrete as placed shall be 50°F. Concrete deposited in hot weather shall have a placing temperature less than 90°F.

3.02 REPAIR OF SURFACE DEFECTS

A. Removal: After forms have been removed, remove any concrete which is not formed as shown in drawings or which is not of alignment of level beyond required tolerances, or which shows defective surfaces which cannot be properly repaired or patched.

B. Repairing and patching: Immediately patch all tie holes and all repairable defective areas after form removal. Remove all honeycombed and defective concrete to sound concrete, but in no case to a depth of less than 1". Dampen area to be patched and an area at least 6" wide surrounding same to prevent absorption of water from patching mortar. Mix and brush into defective surfaces a bond of neat Portland Cement and water, and some fine and passing a No. 30 mesh sieve.

C. Make patching mixture of the same material and of approximately same portions as used for concrete, except omit coarse aggregate. Mortar shall consist of not more than one part cement to two and one-half parts sand by damp loose volume. Substitute white Portland Cement for a part of the gray Portland Cement on exposed concrete in order to produce a color matching color of the surrounding concrete, as determined by a trail patch.

D. After surface water has evaporated from areas to be patched, bond coat shall be well brushed into surfaces. When the bond coat begins to lose water sheen, apply premixed patching mortar. Thoroughly consolidate mortar into place and strike off to leave patches slightly higher than surrounding surface. To permit initial shrinkage leave patches undisturbed for at least one hour before finally finishing. Keep patched areas damp for seven (7) days. Metal tools shall not be used in finishing a patch in the formed wall which will be exposed.

E. Tie holes: After being cleaned and thoroughly dampened, tie holes shall be filled solid with patching mortar.

3.03 CLEAN UP

A. Upon completion of the work, remove forms, equipment, protection coverings any rubbish from the premises. Leave concrete surfaces and area in a clean and undamaged condition.

END OF SECTION

SECTION 03350 - FINISHING AND CURING CONCRETE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Finishing, curing and protecting concrete surfaces.

1.02 RELATED WORK

A. Section 03001, Formwork.

B. Section 03300, Cast-In-Place Concrete.

PART 2 PRODUCTS

2.01 MATERIALS

A. Membrane Curing Compound (for Membrane Curing): W. R. Meadows CS-309-1315 or equal to be used on surfaces to receive membrane cure.

B. Absorptive Mats (for Water Curing): Burlap-polyethylene, minimum 8 oz./sq. yd. Bonded to prevent separation during handling, placement curing.

C. Polyethylene Film: 6 mils thick, clear.

D. Water: Potable.

PART 3 EXECUTION

3.01 FINISHING CONCRETE SLAB SURFACES, PADS, STAIRS, DRIVES, WALKS,CURBS, AND GUTTERS

A. General: The dusting of wearing surfaces with dry materials WILL NOT BE PERMITTED. In preparation of finishing, strike slabs off true by double screeding to required levels at or below elevations or grades of finished slabs as indicated on drawings. Slabs shall be level. Maximum deviation in any one area shall be plus or minus 1/8" from elevations indicated on the Drawings. If leveling is required to bring floor to the required tolerance, this shall be accomplished by grinding down the high spots and filling the low spots using a approved concrete adhesive and concrete patching compound in accordance with the manufacturer's recommendations. Application of water to the concrete surface is not allowed during troweling.

B. Finishes:
   1. Trowel Finish: All interior concrete floor slabs, including exposed concrete floors, surfaces under carpet and resilient coverings and bases for mechanical equipment shall receive a trowel finish. Finish concrete slabs by tamping the concrete with special tools to force the coarse aggregate away from surfaces and then screed and float with straightedges to bring surfaces to required finish levels. While the concrete is still green but sufficiently hardened to bear a man's weight without deep imprint, wood-float to true planes with no coarse aggregate visible. Use sufficient pressure on wood floats to bring moisture to the surface. Then hand trowel to produce smooth impervious surfaces for the purpose of burnishing.
   2. Final troweling shall produce a ringing sound from the trowel. Should this condition not be obtained in the original finish, high spots shall be ground down and low spots filled only in floor surfaces with coverings. Exposed concrete surfaces that are deficient shall be removed and replaced.
   3. Wood float finish: Slabs under ceramic tile, shall receive a wood float finish. Finish concrete by tamping the concrete with special tools to force the coarse aggregate away from the surface. Then screed and float with straightedges to bring surfaces to the required finish levels shown on drawings. While the concrete is still green but sufficiently hardened to bear a man's weight without deep imprint, wood float to true planes with no course aggregate visible. Use sufficient pressure on wood floats to bring the moisture to surface. Prior to final set of concrete, again wood float to a tight finish with a texture approved by the Architect.
   4. Brush finish: Exterior concrete porches and walks, and areaway slabs shall receive a brushed finish. Finish concrete slabs by tamping concrete with a special tool to force course aggregate away from surface and then screed and float with straightedges to bring surface to required finish level shown on drawings. Edge and cross joint surfaces. As soon as surface of concrete is sufficiently hardened to bear a man's weight without deep imprint, wood float to a true plane with no coarse aggregate visible. After troweling, again edge and cross joint surfaces. Then brush with a soft fiber brush to produce uniformly straited surfaces.
   5. Curbs and gutters: Shall receive a fine brush finish. Finish curb and flow lines with the use of a steel "S" shaped trowel to the contour of curb and gutter. Then cross brush curbs and gutters.

3.02 CURING

A. General: Protect freshly deposited concrete from rain, premature drying, excessively hot or cold temperatures and maintain without drying at a relatively constant temperature for the period of time necessary for the

hydration of cement and proper hardening of concrete. Initial curing shall immediately follow finishing operations.

B. Duration of curing: Continue the final curing until the cumulative number of days or fractions thereof, not necessarily consecutive, during which temperature of the air in contact with the concrete is above 50°F. has totaled seven days.

C. Water Curing of Interior Concrete Slabs:
   1. Ponding: Maintain 100% documented coverage of water over slabs continuously for seven (7) days.
   2. Spraying: Spray water over interior building slabs and maintain wet for seven (7) days.
   3. Absorptive Mat: Saturate burlap and place burlap-side down over building beams and walls, lapping ends and sides minimum 6 inch, and maintain in place for seven (7) days.
   4. Polyethylene Film: Spread polyethylene film over interior or exterior slabs lapping edges and sides a minimum of 6 inches, maintain in place with pressure sensitive tape and plywood for seven (7) days. Provide a water source beneath the polyethylene film.

D. Membrane Curing for Exterior Concrete Slabs:
   1. Apply membrane to all areas.
   2. Curing exterior concrete, stair, porch, walk, curb and gutter surfaces: Immediately after finishing concrete surfaces, and the free surface moisture has disappeared, uniformly coat exposed surfaces with curing compound. Concrete shall not be allowed to dry out before application of membrane. If any drying has occurred, moisten surface of concrete with a fine spray of water. Apply curing compound to surfaces by means of a spraying machine as soon as free water has disappeared. Apply curing with an overlapping coverage of not more than 400 square feet per gallon for each coat. Apply second coat in a direction approximately at right angles to direction of first coat. Compound shall form a uniform, continuous, cohesive film that will not check, crack, or peel and that will be free from pinholes and other discontinuities.

3.03 PROTECTION

A. Cold weather: When the mean daily temperature of the atmosphere is less than 40°F., maintain temperature of concrete between 50°F. and 70°F. for required curing period.

B. Hot weather: When necessary, make adequate arrangements for installation of windbreak, shading, fog spraying, sprinkling, ponding, or wet covering or light cover in advance of placement to maintain required

temperature and moisture conditions without injury due to concentration of heat. Concrete temperature shall not exceed 90°F.

C. Excessive temperature changes: Changes in temperature of the concrete shall be as uniform as possible and shall not exceed 5°F. in any one hour or 50°F. in any 24 hour period.

D. Whenever formwork is removed during the curing period, the exposed concrete shall be cured by one of the approved methods.

3.04 RUBBED FINISH

A. Locations: Exposed concrete beam surfaces.

B. Rubbed finish: Finish concrete surfaces in the following manner. Do all necessary patching immediately after forms have been removed. Wet surfaces and rub with a carborundum brick until a uniform color and texture are produced. No cement, grout or slush shall be used other than cement past drawn form green concrete itself by rubbing process. Rub immediately after removal of forms and patching before concrete has completely hardened.

C. Patching: Areas to be patched shall be approved by the Architect and shall not exceed two square feet for each 1000 square feet of surface area, and shall be widely dispersed. Patches shall be indistinguishable from surrounding areas. Before commencing any patching, the Contractor shall confirm patching procedures with the Architect and establish by trail mixes the formula for patching of finish.

D. Mix: Mix all patching concrete with one volume of Portland Cement one and one-half to two volumes of sand and one and one-half to two volumes of gravel or crushed stone, 3/8". Use no more than 5 gallons of water per sack of cement. Machine mix concrete not less than 2 minutes.

E. Application: Clean surfaces to receive patching. Apply a thick slurry of Portland Cement to structural concrete. Spread patching and screed and rod to true, uniform level and/or uniform sloped surfaces. Float surfaces to work finer particles of sand and cement to top. Trowel finish as specified.

3.05 CLEAN UP

A. Upon completion of the work, remove forms, protective coverings and any rubbish from the premises. Leave concrete surfaces in a clean and perfect condition.

END OF SECTION

SECTION 05120 - STRUCTURAL STEEL

PART 1 GENERAL

1.01 WORK INCLUDED

A. The fabrication, delivery and erection of all items of structural steel complete including:
   1. Anchors, bolts and miscellaneous fasteners.
   2. Shop painting and field touch-up painting.
   3. Furnishing to other trades anchorage portions and templates for items or work included in this Section.
   4. Furnish and install all hangers, sleeves, rods, bars, plates, bolts, nuts, screws, anchors, brackets, welds, lugs, etc., as may be required to complete the work of the Section and to join the work of other trades.
   5. Do all bracing, blocking, cutting, fitting, drilling, tapping, etc., as may be required to complete the work of this Section and to join the work of the trades.
   6. Shop Drawings.
   7. Grouting of base and bearing plates.
   8. Laboratory and field inspection.

1.02 RELATED WORK

A. Section 05500 - Miscellaneous Metals.

B. Section 09900 - Painting.

1.03 REFERENCES

A. Unless otherwise indicated the AISC Specifications for The Design, Fabrication and Erection of Structural Steel for Buildings, latest edition, with supplements, and CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES as adopted by AISC, latest edition, shall govern the work. Welding shall be in accordance with American Welding Society Standard Code D1.1, latest edition.

B. Design: Design of structural steel members and connections for any portion of the structure not indicated on the contract drawings, shall be indicated on the shop drawings by the fabricator.

C. Substitutions: Substitutions of sections, or modifications of details, or both, and the reasons therefore, shall be submitted with the shop drawings for approval.

D. The Contractor shall be responsible for all errors of detailing, fabrication, and for the correct fitting of members. Any details not indicated on the contract drawings shall be completed by the fabricator and indicated on the shop drawings.

E. Verify conditions in the field by measurements as required for work fabricated to fit job conditions. Before starting work, examine adjoining work on which items may in any way be dependent for perfect fit. Report any defects in writing to the Architect prior to starting of work.

F. Templates: Shall be furnished by the Contractor.

G. Qualification of Welders: Before assigning any welder to work covered by this Section of the Specifications, the names of the welders to be employed on the work together with certification that each of these welders have passed qualification tests using procedures covered in the American Welding Society Standard D1.1, latest edition should be available to the Architect upon request. Welders shall have passed the qualification test within the preceding 12 month period.

1.04 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 01340.

B. Indicate profiles, sizes, spacing, and locations of structural members, connections, attachments, fasteners, combers, and erection plans.

C. Indicate welded connections using standard AWS welding symbols. Indicate net weld lengths.

D. Furnish mill test reports on all steel furnished on this project. Certification of materials as being same as described by mill test report is required of the Testing Laboratory.

1.05 INSPECTION

A. Testing and inspection in conjunction with structural steel shall be conducted by the testing agency employed and paid by the Owner. Reports of all tests and inspection shall be forwarded to Owner, Architect, Engineer, and the Contractor. Reports of tests shall state whether or not tests and inspection conform with contract requirements. The testing laboratory shall inspect all connections and report condition of completed structure.

PART 2 PRODUCTS

2.01 MATERIALS

A. All materials shall be of domestic manufacture and shall conform to the respective specifications (latest revision) and other requirements specified below:
   1. Bolts and Nuts: Bolts and nuts, other than those with self-locking screw threads, shall be the American National coarse-thread series.
   2. Unfinished Bolts and Nuts: Unfinished bolts and nuts shall conform to ASTM Standard A-307 and shall be the regular hexagon-bolt types. Use for anchor bolts and connection of structural steel to concrete where shown on Drawings.
   3. Anchor Bolts: ASTM A-307, Grade A or High Strength as noted on the Drawings.
   4. High Strength Bolts: ASTM A-325 (all connections).
   5. Steel: Shall conform to ASTM A-992, 50 ksi yield.
   6. Tube Columns: Shall conform to ASTM A500, Grade C.
   7. Welding Electrodes: Electrodes and welding rods shall be Low Hydrogen Shielded arc types (E70 Series) and shall show good welding qualities in flat, vertical and overhead positions.
   8. Paint: Tnemec 10-99.
   9. Grout: Master Builders No. LL-713 non shrink, non stain, pre-mix grout or approved equal.
   10. Cold-rolled Purlins: ASTM A-572.

2.02 SHOP DRAWINGS

A. Shop Drawings shall include all shop and erection details, cuts, copes, connections, holes, bolts, and welds in structural steel. Indicate all welds, both shop and field, by standard welding symbols in the American Welding Society Standard Code for Arc and Gas Welding in Building Construction. Drawings shall show the size, length, type of each weld and paint.

PART 3 EXECUTION

3.01 FABRICATION

A. Fabricate and assemble materials in shop to greatest extent possible. Shearing, flame cutting, and chipping shall be done carefully and accurately.

B. Connections:
   1. Connections not indicated on the contract drawings shall be made to conform with the AISC Specification for the "Design Fabrication and Erection of Structural Steel for Buildings". Shop connections shall be

bolted or welded or bolted with ASTM A 325 bolts after obtaining approval from the Architect.

2. Include supplementary parts necessary to complete each item, though work is not definitely shown or specified. Furnish to the appropriate trades all anchors, socket or fastenings required for securing work to other construction.

C. Holes: Cut, drill, or punch at right angles to surface of metal. Do not make or enlarge by burning. Holes shall be clean-cut without torn or ragged edges. Provide holes in members to permit connecting work of other trades as indicated on approved shop drawings.

D. Compression Joints: Depending upon contact bearing, shall have bearing surfaces truly faced. Remaining joints shall be butt or dressed straight and true.

E. Bolting: Drive bolts accurately into holes without damaging threads. Protect bolt heads from damage during driving. Bolt heads and nuts shall rest squarely against metal. High strength bolting shall conform to AISC Specifications for "Structural Joints Using ASTM A-325 Bolts".

F. Workmanship: Insofar as possible fit and shop assemble members, ready for erection. Execute work in accordance with details shown on contract drawings and approved shop drawings. Accurately and tightly fit jointings and intersections of metals with adequate fastenings. Tack welding will not be permitted on exposed surfaces. Grind exposed welds smooth. Provide holes and connections for the work of other trades.

3.02 PAINTING

A. Structural steel shall be given a shop coat of material specified by dipping, spraying or brushing. Final dry film thickness shall be not less than 1.5 mils. After erection, touch up abraded and unpainted surfaces. Remove mud and other firmly attached and objectionable foreign materials before general field touch-up painting is done.

3.03 ERECTION

A. General: Make field connections by bolting or welding as noted on drawings.

B. Anchor bolts and anchors: Locate properly and build into connecting work.

C. Field assembly: Shall conform to the AISC Specifications listed in References.

1. As the erection progresses securely bolt steel members to take care of all dead loads, wind and erection stresses. Provide and maintain adequate temporary bracing during all erection procedures until work is permanently connected and installed, including grouting. Wherever piles of material, erection equipment or other loads are carried during erection, make proper provisions to take care of stresses resulting from same.
2. No members shall be spliced without prior approval of the Architect. No cutting of sections, flanges, webs or angles shall be done without the approval of the Architect. Grind exposed welds smooth and flush.

3.04 GROUTING STRUCTURAL STEEL

A. Chip away defective concrete and laitance, leaving surfaces of concrete reasonably rough but level. Remove oil, grease, dirt and loose material from bottoms of plates and bolts. Mix grout in strict conformity with manufacturer's directions. Place grout from one side only to avoid entrapping air. Move flexible steel strapping back and forth through grout to help flow of grout into place. After grout has hardened, cut back unconfined edges of grout and slope at 45 degree angle with plates.

3.05 CLEAN UP

A. Clean up all debris caused by work of this section, keeping the premises clean and neat at all times.

END OF SECTION

SECTION 06100 - ROUGH CARPENTRY

PART 1 GENERAL

1.01 QUALITY ASSURANCE

A. Lumber Grading Rules and Wood Species in accordance with PS 20.

B. Grade Marks:
   1. Identify lumber and plywood by official grade mark.
   2. Lumber:
      a. Grade mark to contain symbol of grading agency certified by Board of Review, American Lumber Standards Committee, mill number of name, grade of lumber, species or species grouping or combination designation, rules under which graded where applicable and condition of seasoning at time of manufacture.
      b. S - GRN: Unseasoned.
      c. S - Dry: 19% maximum moisture content.
      d. MC-15 or KD: 15% maximum moisture content.
      e. Dense.
   3. Softwood Plywood: Conform to PS-1.
   4. Pressure Treated Materials: Conform to AWPA Standards.
   5. Fire Retardant Treated Materials: Bear U.L. label FR-S.

1.02 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Store materials minimum 6" above ground on framework or blocking and cover with protective waterproof covering providing for adequate air circulation.

B. Do not store seasoned or treated materials in damp location.

C. Protect edges of sheet materials from damage to corners.

PART 2 PRODUCTS

2.01 MATERIALS

A. Lumber:
   1. Dimensions indicated are nominal; actual dimensions to conform to PS 20.
   2. Surfacing: Surfaced four sides (S4S) unless noted otherwise.
   3. End Jointed Lumber: Structural purposes interchangeable with sawn lumber; glued joints of load bearing lumber in accordance with PS 36.

4. Framing Lumber
   (a) General framing: No. 1 Southern Yellow Pine.
   (b) Bracing, blocking and general purposes: Economy Grade.

B. Plywood: Exterior Grade.

C. Pressure Treated Products: In accordance with AWPA Standard C2 for above ground application.

D. Fire-retardant treated products:
   1. Lumber: AWPA Standard C-20.
   2. Plywood: AWPA Standard C-27.

E. Hardware:
   1. Bolts: FS FF-B-575.
   2. Nuts: FS FF-N-836.
   3. Expansion shields and lag screws and bolts: FS FF-B-561.
   4. Wood Screws: FS FF-S-111.
   5. Nails: FS FF-N-105.

PART 3 EXECUTION

3.01 INSTALLATION

A. Framing:
   1. Accurately saw-cut lumber to seat square on bearings. Fit closely into proper location, true to line and grade, plumb and level.
   2. Frame, anchor, tie and brace members to develop strength and rigidity required for purpose for which they are to be used. Do not stress members in excess of design strength.
   3. Secure members permanently in position with proper fastenings to render parts rigid.
   4. Provide scaffolding and temporary enclosures, partitions, stairs and protective covers as required.

B. Blocking and Furring:
   1. Provide wood blocking, nailers, ground, furring, etc. as required for securing work of other trades.
   2. Shape, install and secure work properly to receive, engage or support other work.

C. Pressure treated products: Provide where wood comes in contact with concrete, masonry or roofing. After erection, field treat cuts and holes with swabbing of concentrated solution of same preservative as originally applied in accordance with AWPA Standard M4.

D. Hardware:
   1. Furnish and install nails, screws, bolts, anchors, washers, clips, shields and other rough hardware necessary to complete work.
   2. Bore holes for bolts true to line and of same diameter as bolts. Drive bolts into place with a tight fit; provide plates or washers where bolt heads or nuts are in contact with wood.

E. Plywood Installation:
   1. Edge nailing of plywood roof deck and sheathing is to be 10D at 4” on center.
   2. Nailing of plywood diaphragm panels is to be four inch (4”) on center all supports and blocking. All edges of plywood sheets are to be supported on studs or blocking.
   3. Nailing of plywood roof deck and sheathing at interior supports is to be 10D at 6” on center.
   4. Nailing of plywood floor deck at interior supports is to be 16D at 6” on center.
   5. Provide 1/8” space at sides and ends of all plywood sheets. Utilize spacer clips at sides of sheets.

END OF SECTION

SECTION 06180 – GLUE LAMINATED STRUCTURAL UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glue laminated wood beams.

B. Preservative treatment of wood.

C. Connecting bolts.

1.02 RELATED SECTIONS

A. Section 05120: Prefabricated steel structural supports.

B. Section 06112 – Framing and Sheathing: Roof sheathing.

C. Section 09900 – Painting: Field finishing.

1.03 REFERENCES

A. AITC (American Institute of Timber Construction).

B. ALSC (American Lumber Standards Committee).

C. ANSI A190 1 – Structural Glued Laminated Timber.

D. APA/EWS – American Plywood Association – Engineered Wood Systems.

E. ASTM A36/A36M – Structural Steel.

F. ASTM A167 – Stainless and Heat Resisting Chromium Nickel Steel Plate, Sheet, and Strip.

G. ASTM D2559 – Adhesives for Structural Laminated Wood Products for Use Under Exterior (Wet Use) Exposure Conditions.

H. AWPA (American Wood Preservers Association).

I. AWS D1.1 – Structural Welding Code.

1.04 DESIGN REQUIREMENT

A. Design and laminated members to AITC 117 Standard.

1.05 SUBMITTALS FOR REVIEW

A. Section 01300 – Submittals: Procedures for submittals.

B. Product Data: Provide technical data on wood preservative materials, application technique and resultant performance information.

C. Shop Drawings: Indicate framing system, sizes and spacing of members, loads and cambers, bearing and anchor details, bridging and bracing, and framed openings.

1.06 SUBMITTALS FOR INFORMATION

A. Section 01300 – Submittals: Procedures for submittals.

B. Submit design calculations.

1.07 QUALITY ASSURANCE

A. Manufacturer/Fabricator: Company specializing in manufacture of glue laminated structural units with three (3) years experience, and certified by AITC in accordance with ANSI A190.1.

B. Erector: Company specializing in erection of this Work with five years experience.

C. Design structural members under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Texas.

D. Perform welding Work in accordance with AWS D1.1.

1.08 DELIVERY, STORAGE, AND PROTECTION

A. Section 01600 – Material and Equipment: Transport, handle, store, and protect products.

B. Protect members to AITC requirements for individually wrapped.

C. Leave individual wrapping in place until finishing occurs.

PART 2 PRODUCTS

2.01 MATERIALS

A. Lumber: Southern Yellow Pine or Douglas Fir lumber with 12 percent maximum moisture content before fabrication. Design for the following values:
   1. Bending (Fb): 2,400 psi.
   2. Tension Parallel to Grain (Ft): 1,100 psi.
   3. Compression Parallel to Grain (Fc): 1,650 psi.
   4. Compression Perpendicular to Grain Bottom (Fc1): 1,700 psi.
   5. Compression Perpendicular to Grain Top (Fc1): 1,700 psi.
   6. Horizontal Shear (Fv): 200 psi.
   7. Modulus of Elasticity (E): 1,800,000 psi.

B. Steel Connections and Brackets: ASTM A36 weldable quality, primer components.

C. Submit Simpson beam to column and beam to beam connections where not otherwise indicated.

D. Hardware: ASTM A325, structural quality steel, prime components.

E. Anchor Bolts: ASTM A325 steel.

F. Laminating Adhesive: AITC A190.1 for wet conditions of service.

G. Wood Sealer: As recommended by manufacturer.

H. Metal Primer: Tnemec 10-99.

2.02 WOOD TREATMENT

A. Wood Preservation (Pressure Treatment): AWPA Treatment C2 using water borne preservative with 0.40 percent retainage.

B. Shop treat wood materials in accordance with manufacturer’s instructions.

2.03 FABRICATION

A. Fabricate glue laminated structural members in accordance with AITC Architectural grade.

B. Verify dimensions and site conditions prior to fabrication.

C. Cut and fit members accurately to length to achieve tight joint fit.

D. Fabricate member with camber built in.

E. Do not splice or join members in locations other than those indicated without permission.

F. Fabricate steel hardware and connections with joints neatly fitted, welded, and ground smooth.

G. After end trimming, seal with penetrating sealer in accordance with AITC requirements.

H. Field Finishing of Members: Specified in Section 09900.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that supports are ready to receive units.

B. Verify sufficient end bearing area.

3.02 PREPARATION

A. Coordinate placement of support items.

3.03 ERECTION

A. Lift members using protection straps to prevent visible damage.

B. Set structural members level and plumb, in correct positions or sloped where indicated.

C. Provide temporary bracing and anchorage to hold members in place until permanently secured.

D. Fit members together accurately without trimming, cutting, or other unauthorized modification.

E. Swab and seal the interior wood surfaces of field drilled holes in members with primer.

3.04 TOLERANCES

A. Framing Members: ½ inch ± maximum from true position.

END OF SECTION

SECTION 06192 – FABRICATED WOOD TRUSSES

PART 1 GENERAL

1.01 WORK INCLUDES:

A. Fabricate, supply and erect wood trusses and plywood web, wood flanges, I section wood joists.

B. Steel connectors and gussets, primed.

C. Lateral support trusses, and truss joists.

1.02 RELATED WORK

A. Section 06100 – Rough Carpentry, wood blocking, curbing, and miscellaneous framing.

1.03 QUALITY ASSURANCE

A. Lumber used in the manufacture of trusses, grade stamp clearly visible, indicating conformance with NFPA.

1.04 REFERENCES

A. MIL-V-13518(1) – Wood Preservative: Tetrachlorophenol and Pentachlorophenol, Surface Sealing Compound.

B. PS 1 – Construction and Industrial Plywood.

C. PS 20 – American Softwood Lumber Standard.

D. NFPA National Forest Products Association – National Design Specification for Stress Grade Lumber and Its Fastening.

E. ASTM A90 – Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.

F. ASTM A36 – Structural Steel.

1.05 SHOP DRAWINGS

A. Submit shop drawings prior to fabrication in accordance with Section 01340. Shop drawings shall submit design calculations for all trusses.

B. Indicate truss and truss joist framing plants; species and grades of lumber used; design loading and allowable stress increase; force analysis of each member; pitch, span and spacing of trusses; gauge thickness, nominal sizes and locations of connectors at joists; bearing and anchorage details; framed openings; permanent bracing and bridging.

C. Shop drawings to bear seal of Professional Engineer, registered in Texas.

D. Submit manufacturer's instructions on lateral bracing.

PART 2 PRODUCTS

2.01 MATERIALS

A. Wood Chords and Webs: PS 20, graded to NFPA rules, Southern Pine No. 1 Structural grade, maximum moisture content of 15% or as approved by Engineer. LVL members where indicated are to have design bending stress of 2650 psi and modulus of elasticity of 1,900,000 psi.

B. Plates: 20 gauge galvanized sheet steel, minimum yield strength of 33 ksi, minimum ultimate tensile strength of 48 ksi, 1.25 oz. zinc coating: ASTM A90.

C. Primer: Standard with manufacturer.

D. Wood Preservative: Pentachlorophenol water repellant type.

E. Lateral Support: Recommended by truss manufacturer's engineer.

2.02 FABRICATION

A. Ensure members are accurately cut to length, angle and true to line to ensure tight joints.

B. Shop apply primer to connectors and gussets. Allow to dry thoroughly before installing.

PART 3 EXECUTION

3.01 ERECTION

A. Set and secure wood trusses level, plumb, and in correct locations. Set truss joists as shown on Drawings.

B. Provide temporary bracing and anchorage to hold trusses in place until permanently secured.

C. Ensure truss ends have sufficient bearing area.

D. Install permanent bracing and bridging prior to application of leads.

E. Cutting and altering of members is not permitted.

END OF SECTION

M.P.E.
SPECIFICATIONS

PLUMBING, MECHANICAL & ELECTRICAL SPECIFICATIONS

SECTION	TITLE
15000	GENERAL PROVISIONS FOR MECHANICAL
15010	SUBMITTALS AND SHOP DRAWINGS
15100	SITE UTILITIES
15110	NATURAL GAS SYSTEMS
15140	HANGERS AND SUPPORTS
15190	MECHANICAL IDENTIFICATION
15260	PIPING INSULATION
15270	DUCT INSULATION
15300	FIRE PROTECTION SYSTEMS
15310	FIRE PROTECTION PIPING
15410	PUMBING PIPING
15430	PLUMBING SPECIALTIES
15440	PLUMBING FIXTURES
15800	HVAC GENERAL PROVISIONS
15840	DUCTWORK
15850	HEATING, VENTILATION AND AIR CONDITIONING EQUIPMENT
15990	TESTING, ADJUSTING AND BALANCING
16000	GENERAL PROVISIONS FOR ELECTRICAL
16010	SUBMITTALS AND SHOP DRAWINGS
16110	CONDUIT
16120	BUILDING WIRE AND CABLE
16130	BOXES
16140	WIRING DEVICES
16160	CIRCUIT AND MOTOR DISCONNECTS
16170	GROUNDING AND BONDING
16190	SUPPORTING DEVICES
16195	ELECTRICAL IDENTIFICATION
16420	UTILITY SERVICE ENTRANCE
16470	PANELBOARDS
16510	LUMINAIRES
16720	FIRE ALARM SYSTEM
16780	COMMUNICATIONS AND COMPUTER SYSTEMS
16785	COSA SYSTEMS WIRING STANDARDS

2009 INTERNATIONAL ENERGY CONSERVATION CODE CERTIFICATES

February 10, 2017

Paul Wilkerson, PE Texas # 50732
Power Systems
Firm #F-6257

SECTION 15000 GENERAL PROVISIONS FOR MECHANICAL

1 PART 1 - GENERAL

1.1 SPECIAL NOTE

A. The Architectural and Structural Plans and Specifications, including the supplements issued thereto, Information to Bidders, and other pertinent documents issued by the Owner, are a part of these specifications and the accompanying mechanical and electrical plans, and shall be complied with in every respect. All the above is included herewith, will be issued separately or is on file at the Owner's office, and shall be examined by all bidders. Failure to comply shall not relieve the Contractor of responsibility or be used as a basis for additional compensation due to omission of drawings. Where the Supplementary General Conditions conflict with the General Conditions, the Supplementary General Conditions shall govern.

B. All work covered by this division of the specifications shall be accomplished in accordance with all applicable provisions of the contract documents and any addenda or directive which may be issued.

C. The mechanical contractor shall familiarize himself with the General Provisions for Electrical, Section 16000, and comply with those requirements which affect his work.

1.2 CHECKING DOCUMENTS

A. The drawings and the specifications are numbered consecutively. The Contractor shall check the drawings and specifications thoroughly and shall notify the Owner of any discrepancies or omissions of sheets or pages. Upon notification, the Owner will promptly provide the Contractor with any missing portions of the drawings or specifications. No discrepancies or omissions of sheets or pages of the contract documents will relieve the Contractor of his duty to provide all work required by the complete contract documents.

1.3 QUALITY ASSURANCE:

A. All plumbing work shall be in accordance with the requirements of the International Plumbing Code, 2009 Edition.

B. All mechanical work shall be in accordance with the requirements of the International Mechanical Code, 2009 Edition.

C. Buy American Act: Only domestic construction materials will be used by the Contractor, Subcontractors, materialmen, and suppliers in the performance of this contract.

D. Equipment Vibration Tolerance:

1. After air balance work is completed and permanent drive sheaves are in place, perform field mechanical balancing and adjustments required to meet the specified vibration tolerance.

E. Products Criteria:

1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 3 years. See other specification sections for any exceptions.

2. Equipment Service: Products shall be supported by a service organization which maintains an adequate inventory of repair parts and is located within a one hundred mile radius of the site.

3. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.

4. Assembled Units: Manufacturers of equipment assemblies, which use components made by others, assume, complete responsibility for the final assembled product.

5. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.

F. Manufacturer's Recommendations: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Architect prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

1.4 LAWS, CODES AND ORDINANCES

A. All work shall be executed in strict accordance with all local, state and national codes, ordinances and regulations governing the particular class of work involved, as interpreted by the inspecting authority. The Contractor shall be responsible for the final execution of the work under this heading to suit those requirements. Where these specifications and the accompanying drawings conflict with these requirements, the Contractor shall report the matter to the Owner, shall prepare any supplemental drawings required illustrating how the work may be installed so as to comply and, on approval, make the changes at no cost to the Owner. On completion of the various portions of the work the installation shall be tested by the constituted authorities, approved and,

on completion of the work, the Contractor shall obtain and deliver to the Owner a final certificate of acceptance.

1.5 TERMINOLOGY

A. Whenever the words “furnish”, “provide”, “furnish and install,” “provide and install”, and/or similar phrases occur, it is the intent that the materials and equipment described be furnished, installed and connected under this Division of the Specifications, complete for operation unless specifically noted to the contrary.

B. Where a material is described in detail, listed by catalogue number or otherwise called for, it shall be the Contractor’s responsibility to furnish and install the material.

C. The use of the word “shall” conveys a mandatory condition to the contract.

D. “This section” always refers to the section in which the statement occurs.

E. “The project” includes all work in progress during the construction period.

F. “Concealed” areas are those areas which cannot be seen by the building occupants from the floor with all building components in place.

G. “Exposed” areas are all areas which are exposed to view by the building occupants including mechanical rooms.

H. In describing the various items of equipment, in general, each item will be described singularly, even though there may be a multiplicity of identical or similar items.

1.6 ENGINEER’S STATUS DURING CONSTRUCTION:

A. The work, from its commencement to its completion, shall be under the exclusive charge and control of the Contractor, and all risks in connection therewith shall be borne by the Contractor.

B. The Engineer’s efforts during periodic site visits will be directed toward assisting the Architect in providing assurance for the Owner that the completed project will conform to the requirements of the contract documents, but the Engineers will not be responsible for the Contractor’s failure to perform the work in accordance with contract documents.

C. The Engineer will make recommendations to the Architect regarding disapproval or rejection of work which, in his opinion, is defective, i.e.; is unsatisfactory, faulty or defective, or does not conform to the requirements of the contract documents. Failure on the part of the Engineer to recommend disapproval of or rejection of work, methods, or

acts or omissions of any kind shall never at any time be deemed to constitute acceptance or approval of the same.

1.7 GENERAL

A. In general, the lines and ducts to be installed by the various trades under these specifications shall be run as indicated, as specified herein, as required by particular conditions at the site, and as required to conform to the generally accepted standards as to complete the work in a neat and satisfactorily workable manner. The following is a general outline concerning the running of various lines and ducts and is to be excepted where the drawings or conditions at the building necessitate deviating from these standards.

B. All piping, conduit and ductwork for the mechanical and electrical trades shall be concealed in chases in finished areas, except as indicated on the drawings. Horizontal lines run in areas that have ceilings shall be run concealed in those ceilings, unless otherwise specifically indicated or directed.

C. Piping, ductwork, conduits and raceways may be run exposed in machinery and equipment spaces, where serving as connections to motors and equipment items in finished rooms where exposed connections are required, and elsewhere as indicated on the drawings or required.

D. All conduits in any space where they are exposed shall run parallel with the building walls. They shall enter the concealed areas perpendicular with the walls, ceilings or floors. Fittings shall be used where necessary to comply with this requirement.

E. The Contractor shall thoroughly acquaint himself with the details of the construction and finishes before submitting his bid as no allowances will be made because of the Contractor's unfamiliarity with these details. Place all inserts in masonry walls while they are under construction. All concealed lines shall be installed as required by the pace of the general construction to precede that general construction.

F. The mechanical and electrical plans do not give exact details as to elevations of lines and ducts, exact location, etc., and do not show all the offsets, control lines, pilot lines and other installation details. The Contractor shall carefully lay out his work at the site to conform to the architectural and structural conditions, to provide proper grading of lines, to avoid all obstruction, to conform to details of installation supplied by the manufacturers of the equipment to be installed, and thereby to provide an integrated, satisfactorily operating installation. Each Contractor shall verify that each item of mechanical equipment, each electrical panel, light fixture, and device, each grille or ceiling outlet, and each other item of work furnished by him shall fit into the available space before ordering same. Any required changes due to the Contractor's failure to verify that each item of his equipment will fit into

the available space shall be made by the Contractor furnishing the equipment, all at no additional cost to the Owner.

G. The routing of piping, ductwork, conduits, etc., indicated on the drawings is approximate and where light fixtures or other items of work are to be recessed in ceiling, piping, ductwork, conduits, etc., shall be routed around the light fixtures or other items of work where there is not sufficient space for same to be routed above such item of work with the recessed item properly installed. Any required changes due to the Contractor's failure to properly coordinate his work with recessed items shall be made by the Contractor installing such piping, ductwork, conduits, etc., all at no additional cost to the Owner.

H. The electrical plans show diagrammatically the locations of the various electrical outlets and apparatus and the method of circuiting and controlling them. Exact locations of these outlets and apparatus shall be determined by reference to the general plans and to all detail drawings, equipment drawings, roughing-in drawings, etc., by measurements at the building, and in cooperation with other sections, and in all cases shall be subject to the approval of the Owner. The Owner reserves the right to make any reasonable change in location of any outlet or apparatus before installation (within 10 feet of location shown on drawings) or after installation if an obvious conflict exists, without additional cost to the Owner.

I. The Contractor shall submit working scale drawings of all his apparatus and equipment which in any way varies from these specifications and plans, which shall be checked by the Owner before the work is started, and interferences with the structural conditions shall be corrected by the Contractor before the work proceeds.

J. Order of precedence shall be observed in laying out the pipe, ductwork, material, and conduit in order to fit the material into the space above the ceiling and in the chases and walls. The following order shall govern:

1. Items affecting the visual appearance of the inside of the building such as lighting fixtures, diffusers, grilles, outlets, panelboards, etc. Coordinate all items to avoid conflicts at the site.

2. Large ducts and pipes with critical clearances.

3. Conduit, water lines, and other lines whose routing is not critical and whose function would not be impaired by bends and offsets.

K. Piping, ducts, and conduits serving outlets on items of equipment shall be run in the most appropriate manner. Where the equipment has built-in chases, the lines shall be contained therein. Where the equipment is of the open type, the lines shall be run as close as possible to the underside of the top and in a neat and inconspicuous manner. All piping, ductwork, conduits and all other items of work supported from the structure above shall be installed as high as physically possible (not just

as convenient) considering all work required to be installed in the available space. If any such work is installed lower than it could have been installed, the Contractor shall furnish all labor, equipment, and materials to remove same and reinstall the work as high as possible, all at no additional cost to the Owner.

L. Adequate provisions shall be provided for the replacement of all filters.

M. In addition to insulation called for elsewhere in the specifications, all piping and equipment subject to condensation and/or whose normal operating surface temperature is below 70 degrees F or above 110 degrees F shall be insulated. All piping subject to condensation and/or whose operating temperature is below 70 degrees F shall be insulated same as specified elsewhere in the specifications for chilled water or refrigerant suction line piping. All piping with operating surface temperature above 110 degrees F shall be insulated same as specified elsewhere in the specifications for domestic hot water or steam piping. All insulation shall be provided by the particular Contractor who installs the particular equipment or piping system. All equipment shall be insulated and finished in a manner suitable for the conditions and as approved by the Engineers. Armaflex insulations shall not be permitted in breathing air spaces.

N. Exceptions and inconsistencies in plans and specifications shall be brought to the Owner's attention before the contract is signed. Otherwise, the Contractor shall be responsible for any and all changes and additions that may be necessary to accommodate his particular apparatus, material, or equipment.

O. The Contractor shall distinctly understand that the work described herein and shown on the accompanying drawings shall result in a finished and working job, and any item required to accomplish this intent shall be included whether specifically mentioned or not.

P. Each bidder shall examine the plans and specifications for the General Construction. If these documents show any item requiring work under Division 15 or 16 and that work is not indicated on the respective "M", "P" or "E" drawings, he shall notify the Owner in sufficient time to clarify before bidding. If no notification is received, the Contractor is assumed to require no clarification, and shall install the work as indicated on the General Plans in accordance with the specifications.

1.8 DIMENSIONS

A. Before ordering any material or doing any work, the Contractor shall verify all dimensions, including elevations, and shall be responsible for the correctness of the same. No extra charge or compensation will be allowed on account of differences between actual dimensions and measurements indicated on the drawings. Any difference which may be found shall be submitted to the Owner for consideration before proceeding with the work.

1.9 INSPECTION OF SITE

A. The accompanying plans do not indicate completely the existing mechanical and electrical installations. The bidders for the work under these sections of the specifications shall inspect the existing installations and thoroughly acquaint themselves with conditions to met and the work to be accomplished in removing and codifying the existing work, and in installing the new work in the present building and underground serving to and from that structure. Failure to comply with this shall not constitute grounds for any additional payments in connection with removing or modifying any part of the existing installations and/or installing any new work.

1.10 ELECTRICAL WIRING

A. All electric wiring of every character, both for power supply, for pilot and control, for temperature control, for communications, etc. will be done under Division 16 of these specifications. The Contractor for each section shall erect all his motors in place ready for connections. The Contractor, under Division 16, shall mount all the starters and controls, furnishing the supporting structures and any required outlet boxes.

B. Every electrical current consuming device furnished as a part of this project, or furnished by the Owner and installed in this project, shall be completely wired up under Division 16. Verification of exact location, method of connection, number and size of wires required, voltage requirements, and phase requirements is the responsibility of the Contractor under Division 16. If conflicts occur between the drawings and the actual requirements, actual requirements shall govern.

1.11 MOTORS AND CONTROLS

A. All motors furnished under any of the several sections of these specifications shall be of recognized manufacture, of adequate capacity for the loads involved and wound for the current characteristics shown on the electrical drawings. All motors shall conform to the standards of manufacture and performance of the National Electrical Manufacturer's Association as shown in their latest publications. They shall further be listed by Underwriters Laboratories.

B. Unless otherwise noted, the Contractor under Division 16 shall furnish each motor with a starter and all controls of the types specified or required. The starters shall be of the totally enclosed type, of capacity rating within the required limits of the motors which they are to serve, shall be suitable for the motor current characteristics and shall provide thermal overload protection. All starters shall be of standard manufacture and performance as defined by the National Electrical Manufacturers' Association. They further shall be listed by Underwriters Laboratories. Provide overload protection in each phase wire.

C. All motors larger than 1/3 horsepower shall be of a type that the power consumed is in approximate direct proportion to the load on the motor. At 50% of rated brake horsepower, the power consumed shall be approximately 50% of the power consumed at full load.

1.12 TESTING

A. The Contractor under each division shall at his own expense perform the various tests as specified and required by the Owner and as required by the State and local authorities. The Contractor shall furnish all fuel and materials necessary for making test.

1.13 PAINTING

A. Painting for Divisions 15 and 16 shall be as follows:

1. If the factory finish on any apparatus or equipment is marred, it shall be touched up and then given one coat of half-flat-half-enamel, followed by a coat of machinery enamel of a color to match the original. Paint factory prime surfaces.

1.14 SEALING AROUND PIPES, CONDUITS, DUCTS, ETC.

A. The Contractor installing pipes, conduits, ducts, etc. shall seal all spaces between pipes and/or sleeves where they pierce walls, partitions or floors with Dow Corning No. 2000 fire resistant caulk. The packing shall effect a complete fire and/or air seal where pipes, conduits, ducts, etc., pierce walls, floors or partitions.

1.15 MECHANICAL COORDINATION DRAWINGS:

A. Prepare and submit a set of coordination drawings showing major elements, components, and systems of mechanical equipment and materials in relationship with other building components. Prepare drawings to an accurate scale of 1/4"=1'-0" or larger. Indicate the locations of all equipment and materials, including clearances for installing and maintaining insulation, servicing and maintaining equipment, valve stem movement, and similar requirements. Indicate movement and positioning of large equipment into the building during construction.

B. Prepare floor plans, reflected ceiling plans, elevations, sections, and details to conclusively coordinate and integrate all installations. Indicate locations where space is limited, and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:

1. Mechanical equipment room layouts;

2. Specific equipment installations, including:

a. Pumps and air handling units
b. Temperature control panels
c. Work in pipe spaces, chases, trenches, and tunnels
d. Exterior wall penetrations
e. Ceiling plenums which contain piping, ductwork, or equipment in congested arrangement
f. Installations in mechanical riser shafts, at typical sections and crucial offsets and junctures
g. Pipe expansion loops
h. Numbered valve location diagrams
i. Manifold piping for multiple equipment units

C. It shall be incumbent upon the Contractor to prepare special drawings as called for elsewhere herein or as directed by the Owner to coordinate the work under each section, to illustrate changes in his work, to facilitate its concealment in finished spaces to avoid obstructions or to illustrate the adaptability of any item of equipment which he proposes to use.

D. These drawings shall be used in the field for the actual installation of the work. Unless otherwise directed, they shall not be submitted for approval but three copies shall be provided to the Owner for his information.

1.16 ROUGH-IN AND MAKE FINAL CONNECTION FOR EQUIPMENT

A. The shop drawings for all equipment are hereby made a part of these specifications. The Contractor under each section of the specifications shall rough-in for the exact item to be furnished on the job, whether in another section of the specifications or by the Owner. The Contractor shall refer to all drawings and other sections of the specifications for the scope of work involved for the new equipment, and by actual site examination determine the scope of the required equipment connections for the Owner furnished equipment.

B. Should any of the equipment furnished require connections of a nature different from that shown on the drawings, report the matter to the Owner and finally connect as directed by the Owner.

C. Should any shop drawings not be available for equipment furnished under other contracts or by the Owner, the Contractor under each section of these specifications shall bid the work as detailed on the drawings.

D. Minor differences in the equipment furnished and that indicated on the drawings will not constitute grounds for additional payment to the Contractor.

2 PART 2 PRODUCTS

2.1 MARKING OF PIPE

A. The Contractor shall mark all accessible piping systems. The identification of a piping system shall be made by a positive identification

of the material content of the system by lettered legend, giving the name of the content in full or abbreviated form. This mark shall be conspicuously placed at frequent intervals on straight runs, close to all valves, at changes of direction and where pipes pass through walls, floors or ceilings. Arrows shall be used to indicate direction of flow.

B. Markers shall be placed on piping at each connection to an item of equipment, and on each drop to an outlet. Markers shall be placed on each run of piping at intervals not exceeding 50 feet where exposed in a room and 25 feet when installed above removable ceilings, except that no exposed line shall enter a room without being identified therein. Marker on lines above removable ceilings shall be applied on the undersides of the lines and in other areas shall be applied to be most visible.

C. Markers shall conform completely with “The Scheme for Identification of Piping Systems (ANSI A131 1981). Markers shall have ANSI specified color coded background, color of legend and legend letter size.

D. Markers shall be equal to Seton Set Pipe Markers.

2.2 IDENTIFICATION AND LABELING

A. The Contractor shall make it possible for the personnel operating and maintaining the equipment and systems in this project to readily identify the various pieces of equipment, valves, piping, etc., by marking them. All items of equipment such as fans, pumps, etc., shall be clearly marked using engraved nameplates as hereinafter specified. The item of equipment shall indicate the same number as shown on the drawings.

B. Interior Equipment: All items of mechanical and electrical equipment shall be identified by the attachment of engraved nameplates constructed from laminated phenolic plastic, at least 1/16” thick, 3-ply, with black surfaces and white core. Engraving shall be condensed gothic, at least 1/2” high, appropriately spaced. Nomenclature on the label shall include the name of the item, its mark number, area, space, or equipment served, and other pertinent information.

C. Exterior (Outdoor) Equipment: Brass nameplates, with engraved black filled letters, not less than 3/16-inch high riveted or bolted to the equipment.

D. Valves:

1. Tags for isolation (shut-off) valves concealed in interstitial space, above ceilings or in chases: Engraved black filled numbers and letters not less than 1/2 inch high for number designation, and not less than 1/4-inch for service designation on 19 gage 1-1/2 inches round brass disc, attached with brass “S” hook or brass chain.

3 PART 3 EXECUTION

3.1 PIPE AND EQUIPMENT SUPPORTS:

A. Where hanger spacing does not correspond with joist or rib spacing, use structural steel channels secured directly to joist and rib structure that will correspond to the required hanger spacing, and then suspend the equipment and piping from the channels. Drill or burn holes in structural steel only with the prior approval of the Architect.

B. Use chain, wire or strap hangers; wood for blocking stays and bracing; hangers suspended from piping above will not be permitted. Replace or thoroughly clean and red lead paint products that are rusty.

C. Use hanger rods that are straight and vertical. Turnbuckles for vertical adjustments may be omitted where limited space prevents use. Provide a minimum of 1/2-inch clearance between pipe or pipe covering and adjacent work.

3.2 OPERATING INSTRUCTIONS

A. The Contractor for each section of the work hereunder shall, in cooperation with the representatives of the manufacturers of the various equipment items, carefully instruct the Owner's representatives in the proper operation of each item of equipment and of each system. During the balancing and adjusting of systems, the Owner's representative shall be made familiar with all procedures.

3.3 OPERATING MANUALS

A. Prepare and submit 3 copies of the operating manuals bound in hard covers. Three weeks prior to completion of the work, the Owner will check the manuals and any additional material necessary to complete the manuals shall be furnished and inserted by the Contractor.

B. Manuals shall contain the following data:

1. Catalogue data of all equipment.
2. Shop drawings of all equipment.
3. Wiring diagrams.
4. Recommended maintenance schedule for equipment.
5. Parts list for all items.
6. Name and address of each vendor.

C. In addition to the information required by Division 1 for Maintenance Data, include the following information.

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.

2. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping, shut-down, and emergency instructions; and summer and winter operating instructions.

3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.

4. Servicing instructions and lubrication charts and schedules.

3.4 GUARANTEE

A. Unless a longer guarantee is hereinafter called for, all work, material and equipment items shall be guaranteed for a period of one year after acceptance by the Owner. All defects in labor and materials occurring during this period, as determined by the Owner, shall be repaired and/or replaced to the complete satisfaction of the Owner. Guarantee shall be in writing and in triplicate.

3.5 COMPLETION REQUIREMENTS

A. Before acceptance and final payment the Contractor must complete the following requirements:

1. Submit Test and Balance Report.
2. Perform final inspection and make all corrections necessary.
3. Submit maintenance manuals, certificate of owner instruction, equipment warranties and receipt for loose items.

END OF SECTION

SECTION 15010 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

1 PART 1 - GENERAL

1.1 DESCRIPTION

A. Related Work Specified Elsewhere:

1. Construction Schedules: Section 01310.

2. Project Record Documents: Section 01711.

1.2 SUBMITTALS

A. Shop and Installation Drawings, Product Data and Samples as required.

B. Prepare and submit, with construction schedule, a separate schedule listing dates when shop drawings, product data and any requested samples will be needed for each product.

1.3 GENERAL

A. Requests for material substitutions must be received and approved prior to submission of shop drawings, said submittals and/or samples; reviewed by architect or engineer does not constitute acceptance of materials other than those originally specified.

1.4 SHOP DRAWINGS

A. Original drawings, which illustrate portion of the work: Showing equipment, layout, setting or installation details. Deviation from Contract Drawings shall be marked in RED with an explanation of reason for change

B. Prepared by a qualified detailer.

C. Identify details by reference to sheet and detail number shown on contract drawings.

D. Reference specification section and paragraph number(s) represented on the submitted drawings.

E. Minimum Sheet Size: 8½" x 11".

1.5 PRODUCT DATA

A. Manufacturer's standard schematic drawings:

1. 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 each copy to identify pertinent materials, products or models.

2. Show dimensions and clearance required.

3. Shop performance characteristics and capacities.

4. Show wiring diagrams and controls.

C. Complete catalogs will not be acceptable. Manufacturer's regular catalog sheets will be acceptable if they completely indicate specification requirements. When manufacturer's catalog sheets are submitted, completely line out material not directly connected with subject.

1. Assemble in indexed brochure, catalog sheets of submittals containing more than five (5) different items or equipment.

D. Reference specification section and paragraph number represented on data submitted.

1.6 CONTRACTORIS RESPONSIBILITIES

A. Review shop drawings, product data and samples prior to submission and certify with signature of reviewer

B. Verify:

1. Field measurements.

2. Field construction criteria.

3. Catalog numbers and similar data.

4. Quantities

C. Coordinate each submittal with requirements of work and of contract documents.

D. Contractor's responsibility for errors, omissions and deviations in submittals from requirements of contractor documents is not relieved by architect's review of submittals, unless architect gives written acceptance of specific deviations.

1. Notify architect in writing of deviations at the time of submittal.

E. Begin no work which requires submittals until return of submittals with architect's stamp and initials or signature indicating review.

F. After architect's / engineer's review, distribute copies.

1.7 SUBMISSION REQUIREMENTS

A. Schedule submissions at least 15 days before dates reviewed submittals will be needed.

B. Submit a minimum of 5 copies of all submittals.

C. Accompany submittals with transmittal in duplicate, containing:

1. Date.

2. Project title and number.

3. Contractor's name and address.

4. The number of each shop drawings, product data and samples submitted.

5. Notification of deviations from contract documents.

6. Other pertinent data.

D. Submittals shall include:

1. Date and revision date.

2. Project title and number.

3. The names of:

a. Architect.

b. Contractor.

c. Subcontractor.

d. Supplier.

e. Manufacturer.

f. 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.

8. Applicable standards, such as ASTM or Federal Specifications numbers.

9. A blank space, 3" x 3" for the architect's stamp.

10. Identification of deviations from contract documents in red ink include justification for deviation.

11. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of field measurements and compliance with contract documents.

Failure to comply with the above requirements shall be grounds for rejection of submittal.

1.8 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 architect.

3. Product Data and Samples: Submit new data and samples as required for initial submittal.

1.9 DISTRIBUTION OF SUBMITTALS AFTER REVIEW

A. Distribute copies of Shop Drawings and Product Data which carry architect's stamp to:

1. Contractor's file.

2. Job-site file.

3. Record document's file.

4. Other prime contractors.

5. Subcontractor.

6. Supplier.

7. Fabricator.

B. Distribute samples as directed.

1.10 ARCHITECT'S / ENGINEER"S RESPONSIBILITIES

A. Review submittals with reasonable promptness.

B. Review for:

1. Design concept of project.

2. Information given in contract documents.

3. Architect or Engineer is not responsible for verification of quantities.

C. Review of separate items does not constitute review of an assembly in which item functions.

D. Affix stamp and initials or signature certifying the review of submittals.

E. Return submittals to contractor for distribution.

END OF SECTION

SECTION 15100 SITE UTILITIES

1 PART 1 GENERAL

1.1 NOTE

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

1.2 SUBMITTALS

A. Submit manufacturer's data on all materials.

1.3 SCOPE

A. Perform all layout, trenching, excavation, backfill, shoring and similar work and provide and install all materials and appurtenances necessary for the installation and final connection of all utilities.

1.4 EXISTING UTILITIES

A. Prior to beginning work, manually locate and stake all utility lines existing at the site. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.

B. The Contractor shall not rely solely on the scale drawings in determining the scope of the work.

C. The drawings are not certified surveys and are not guaranteed for accuracy of location or elevation of existing lines or completeness. Before bidding, each bidder shall be personal examination of the project satisfy himself as to the existing conditions which prevail.

D. Reasonable differences in actual jobsite dimensions and the drawings shall not be considered justification for a change in the contract sum.

2 PART 2 PRODUCTS

2.1 MATERIALS

A. All piping materials for every purpose shall be furnished and installed as hereinafter specified.

B. All pipe and fittings shall be new and unused unless specifically indicated otherwise.

C. Underground steel piping shall be factory coated pipe "X-Tru-Coat" or epoxy coated pipe with fittings wrapped with a double thickness of 3M Scotch "51" vinyl tape over pipe and fittings.

2.2 SANITARY SEWER

A. PVC Plastic Pipe and Fittings: ASTM D3034 type PSM with a maximum SDR of 35 with elastomeric joints complying with ASTM D3212.

2.3 WATER LINES

A. PVC Piping:
1. Lines 1-1/2" and smaller shall be Schedule 80, ASTM D1785 with tapered ends, with solvent weld fittings.

2. Lines 2" and larger shall be ASTM D2241, SDR 26 with tapered ends, with elastomeric gasket bell and socket fittings conforming to requirements of AWWA C900, IPS dimensions only. Reaction blocking shall conform to NFPA 24.

2.4 GAS LINES

A. Plastic Gas Piping: Polyethylene, Type III, Grade 3, (PE 3406-3408), resin conforming to ASTM D1248-7A, pipe construction conforming to ASTM D2513 (SDR 11).

B. Mechanical Joints: Where steel lines connect to plastic lines 2" and smaller in size, use Continental Style 5 extra heavy duty malleable iron couplings with stiffeners.

C. Flanges: Where steel lines valves or accessories connect to plastic lines 2-1/2" and larger, use polyethylene and steel flat face flanges with full face gaskets.

D. Casing: Encase plastic lines under streets in schedule 40 galvanized steel pipe extending 36" beyond paving.

E. Service Risers: Wayne Manufacturing compression service riser with anode and built-in stiffener.

2.5 EXTERIOR CLEANOUTS

A. Provide and install cleanouts in exterior sewer lines where shown or as required by ordinance but not greater than 80 ft. apart. Cleanouts shall consist of a concrete encased special fitting with sewer pipes extending therefrom upward, terminating in a concrete slab. A brass countersunk cleanout ferrule shall be set on this slab in such manner as to be flush with finished grade and to provide access, through its cover, to the cleanout. Cleanouts shall be the same size as the sewer, up to 6" in size, and 4" on 6" and larger sizes.

2.6 GATE VALVES IN EXTERIOR WATER LINES

A. Buried Valves: Buried valves shall meet the requirements of AWWA standard C500-61. Design working pressure shall be 175 psi and the valves shall be double disc gate valves with non-rising stems. Valves

shall have mechanical joint ends except where flanged ends are shown on the drawings. Valve stems shall be furnished with O-ring seals. All valves shall open by turning counter clockwise.

B. Valve Boxes: Cast iron valve boxes shall be furnished for each underground valve. 6" cast iron pipe sections shall be used for box extensions where required. Each box shall have a cast iron cover and shall have a flange type base, approximately 4" larger in diameter than the outside diameter of the barrel and provided with a locking device as shown on the drawings. Anchor valve boxes with a flush 18"x18"x8" reinforced concrete collar.

C. Extension Stems: Extension stems shall be provided for all buried valves where the top of the operating nut is 36" or more below finished grade. Top of the extension stems shall be not more than 18" below finished grade.

D. Collar: Provide a protective concrete collar, square, dimension equal to valve cover frame plus 12" and no less than 8" thickness. Use 3,000 PSI concrete with reinforcing. Set top of cover flush with finish paving and 1" above finish grade level.

3 PART 3 EXECUTION

3.1 LAYOUT OF UTILITY LINES

A. Before starting excavation Contractor shall:

1. Uncover and determine the elevation at beginning and end terminals of each line.

2. Compute and verify depth of all lines and grade of sewer lines and submit figures in writing.

3. Stake route of each line.

4. Arrange utility connections with authorities.

5. Locate and identify any conflicting underground structures and adjust grade or routing to accommodate installation of the lines.

3.2 LAYING PIPE

A. Lay pipe to the lines and profiles required by conditions at the site and the drawings. Keep pipe trenches free of water and dry during the bedding, laying and jointing operations. Install fittings and valves at the required locations, with joints centered and with valve stems vertical. Handle pipe carefully to avoid damage to dimensioned ends. Remove pipe with damaged ends which cannot be suitably repaired. Keep interior of piping and accessories clean.

B. Proximity of Water and Sewer Lines: Unless otherwise required by drawings, lay parallel water lines and sewer lines in separate trenches at least 5 feet apart. Insofar as possible place water line at a higher elevation than the sewer. Where water lines and sewer lines cross each other, the water line shall be at least 3 feet above the sewer, or if this is not possible, amount of clearance between the lines may be reduced to 12" out to out clearance provided the sewer line is cast iron for at least 10 feet on each side of the water line.

3.3 EXCAVATION FOR OUTSIDE UTILITIES

A. The Contractor shall perform any excavations of every description and of whatever substances encountered, to the depths indicated on the drawings and/or required for the installation of his work.

B. Trench Width: The minimum width of the trench shall be the outside diameter of the pipe plus 12" and the maximum width shall be the outside diameter of the pipe plus 18". The trenching equipment shall be maintained on a sufficiently level road bed to provide substantially vertical trench walls from bottom of trench to the top of the trench.

C. Trench Excavation: The trench shall be excavated to the depth required so as to provide a uniform and continuous bearing and support for the pipe on solid and undisturbed ground. There shall be no classification of or extra payment for excavated materials, and all materials encountered shall be excavated as required.

D. Bury: Nonmetallic pipe shall be buried with 36" minimum cover, metallic pipe shall have minimum 24" cover.

E. Bracing and Sheeting: Open-cut trenches shall be sheeted and braced as required by OSHA and the Sate of Texas Open Trench Act as may be necessary for the safety of the workmen or protection of property. This provision shall be strictly enforced for all trenches greater than 5 feet in depth.

F. Barricades and Safety Provisions: To protect persons for injury and to avoid property damage, adequate barricades, construction signs, warning lights and guards as required shall be placed and maintained during progress of the construction work. All material, piles, equipment, pipe, and open trenches that may serve as hazards to vehicular or pedestrian traffic shall be protected by barricades or fences and warning lights.

3.4 BACKFILLING

A. The trenches shall not be backfilled until all required tests are performed and until the utilities systems as installed conform to the requirements specified hereinafter. The trenches shall be carefully backfilled with the excavation materials approved for backfilling, consisting of earth, loam, sandy clay, sand and gravel, soft shale, or other approved materials free from large clods of earth or stones deposited in thoroughly and carefully

rammed 6" layers, until the pipe has a cover of not less than one foot for water mains and two feet where possible for other lines.

B. The remainder of the backfill material shall then be thrown into the trench, moistened and tamped in one foot layers. Blasted rock, broken concrete or pavement, and large boulders shall not be used as backfill material. Settling the backfill with water will be permissible and will be a requirement when so directed. Any trenches improperly backfilled or where settlement occurs, shall be reopened to the depth required for proper compaction, then refilled and mounded over, and smoothed off.

C. Open trenches across roadways or other areas to be paved shall be backfilled as specified above, except that the entire depth of the trench shall be backfilled in 6" layers, each layer moistened and compacted to a density at least equal to that of the surrounding earth in such manner as to permit the rolling and compaction of the filled trench together with the adjoining earth to provide the required bearing value, so that paving of the area can proceed immediately after backfilling is completed. Along all other portions of the trenches, the ground shall be graded to a reasonable uniformity and the mounding over the trenches left in a uniform and neat condition.

3.5 OPENING AND RECLOSING PAVEMENT

A. Where excavation requires the opening of existing walks, streets, drives or other existing pavement, that pavement shall be cut as required to install new lines and to make new connections to existing lines. The sizes of the cut shall be held to a minimum, consistent with the work to be completed and when the excavation has been backfilled, the paving shall be patched, using materials to match those cut out. The patches shall thoroughly bond with the original surfaces and shall be level with them. Quality of the patch shall be equal to or better than adjacent paving.

3.6 UTILITY SERVICES

A. Water Service: The contractor shall arrange with the city for a new meter and water service at the point(s) shown on the drawings. Refer to the drawings for details. Pay any charges levied by the city for this connection.

B. Sanitary Sewer: If necessary, the contractor shall arrange with the city for sewer service at the point shown on the drawings. Pay any charges levied by the city for this connection. Refer to the drawings for details.

C. Gas: The contractor shall arrange with the gas utility company for new meter(s) as shown on the drawings. Pay any charges levied by the utility for this connection. From the location of the new meter, extend service to the building. Provide service valves at each service point. Refer to the drawings for details.

D. Electricity: The contractor shall arrange with the electric utility company for new work as shown on the drawings. Pay any charges levied by the utility for this connection. Refer to the drawings for details and Section 16420.

3.7 TESTING

A. Sewer: Prior to testing for leakage the trench shall be backfilled up to at least the lower half of the pipe. If required, sufficient additional backfill shall be placed to prevent pipe movement during testing, leaving the joints uncovered to permit inspection. Visible leaks encountered shall be corrected. Test shall be made by filling the line to be tested with water so that a head of at least 10 feet is provided above the top of the pipe at the upper end of the pipe line to be tested. The filled line shall be allowed to stand not less than 4 hours.

B. Water Lines Soldered or Flanged: Test under hydrostatic pressure of 150 PSIG for 4 hours with no leaks and no pressure drop.

C. Gas: Before backfilling, test under air pressure at 15 PSIG for 24 hours. There shall be no pressure drop, except for correction for temperature variation. If any pressure drop occurs, soap test every joint, correct the leaks and retest.

END OF SECTION

SECTION 15110 NATURAL GAS SYSTEMS

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including GENERAL and SUPPLEMENTARY CONDITIONS and DIVISION 1 SPECIFICATION SECTIONS apply to this Section.

B. Division 15 BASIC MECHANICAL REQUIREMENTS section and Basic Mechanical Materials and Methods sections apply to this section.

C. Section 15100, SITE UTILITIES.

1.2 SUMMARY

A. This Section specifies distribution piping systems for natural gas within the building and extending from the point of delivery to the connections with gas utilization devices. Piping materials and equipment specified in this Section include:

1. Pipes, fittings, and specialties;

2. Special duty valves.

1.3 DEFINITIONS

A. Pipe sizes used in this Specification are Nominal Pipe Size (NPS).

B. Point of Delivery is the outlet of the service meter assembly.

C. Gas Service Piping: The pipe from the gas main or other source of supply including the meter, to the gas entry.

D. Gas Entry: The cut-off valve and regulator assembly between the gas service piping and the gas distribution piping.

E. Gas Distribution Piping: Piping generally within the building which conveys gas from the gas entry to the points of usage.

1.4 SUBMITTALS

A. Product Data: Include gas piping specialties and special duty valves. Include rated capacities of selected models, furnished specialties and accessories, and installation instructions.

B. Maintenance Data: For gas specialties and special duty valves, for inclusion in operating and maintenance manual specified in Division 1 and Division-15 Section "Basic Mechanical Requirements."

C. Quality Control Submittals:

1. Welder's Qualification certificates.

2. Submit test reports specified in Part 3 of this Section.

3. Gas Pressure Regulators.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Installation and replacement of gas piping, gas utilization equipment or accessories, and repair and servicing of equipment shall be performed only by a qualified installer. The term qualified means experienced in such work (experienced shall mean having a minimum of 5 previous projects similar in size and scope to this project), familiar with precautions required, and has completed with the requirements of the authority having jurisdiction. Upon request, submit evidence of such qualifications to the Architect.

B. Qualifications for Welding Processes and Operators: Comply with the requirements of ASME Boiler and Pressure Vessel Code, "Welding and Brazing Qualification."

C. Regulatory Requirements: Comply with the requirements of the following codes:

1. NFPA 54 - National Fuel Gas Code, for gas piping materials and components, gas piping installations, and inspection, testing, and purging of gas piping systems.

2. International Mechanical Code, 2003 Edition.

1.6 EXTRA MATERIALS

A. Valve Wrenches: Furnish to Owner, with receipt, 2 valve wrenches for each type of gas valve installed, requiring same.

2 PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering gas piping system products which may be incorporated in the work include, but are not limited to, the following:

1. Gas Cocks:

Jenkins Bros.
Lunkenheimer Co.
NIBCO, Inc.
Powell Co.
Stockham.

2.2 PIPE AND TUBING MATERIALS

A. General: Refer to Part 3, Article "PIPE APPLICATION" for identification of systems where the below specified pipe and fitting materials are used.

B. Steel Pipe: ASTM A 120, Schedule 40, seamless, black steel pipe, beveled ends.

C. Polyethylene Pipe: Nipak, designed and tested specifically for natural gas piping.

2.3 FITTINGS

A. Malleable-Iron Threaded Fittings: ANSI B16.3, Class 150, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.

1. Joint Compound: suitable for the gas being handled.

B. Steel Fittings: ASTM A 234, seamless or welded, for welded joints.

C. Steel Flanges and Flanged Fittings: ANSI B16.5, including bolts, nuts, and gaskets of the following material group, end connection and facing:

1. Material Group: 1.1.

2. End Connections: Butt Welding.

3. Facings: Raised face.

4. Gasket Material: thickness, material, and type suitable for gas to be handled, and for design temperatures and pressures.

D. Polyethylene Fittings: Nipak, designed and tested specifically for natural gas piping.

2.4 PIPING SPECIALTIES

A. Unions: ANSI B16.39, Class 150, black malleable iron; female pattern; brass to iron seat; ground joint.

B. Dielectric Unions: ANSI B16.39, Class 250; malleable iron and cast bronze; with end connections suitable for pipe to joined; designed to isolate galvanic and stray current corrosion.

C. Protective Coating: When steel piping will be buried, or in contact with material or atmosphere exerting a corrosive action, pipe and fittings shall be mill wrapped. Materials to be incorporated in mill wrap (from surface of pipe outward) are as follows:

1. Semi-plasticized coal tar enamel.

2. Glass fiber mat.

3. Semi-plasticized coat tar enamel.

4. Coal tar saturated pipeline felt.

5. Semi-plasticized coal tar enamel.

6. 70 lb. Kraft paper.

2.5 VALVES

A. General duty valves (i.e., gate, globe, check, ball, and butterfly valves) are specified in Division-15 Section “Valves.” Special duty valves are specified in this Article by their generic name; refer to Part 3 below, Article “VALVE APPLICATION” specific uses and applications for each valve specified.

B. Gas Cocks 2 Inch and Smaller: 150 PSI WOG, bronze body, straight-away pattern, square head, threaded ends.

C. Gas Cocks 2-1/2 Inch and Larger: MSS Sp-78; 175 PSI, lubricated plug type, semi-steel body, single gland wrench operated, flanged ends.

D. Gas Line Pressure Regulators: single stage, steel jacketed, corrosion-resistant gas pressure regulators; with atmospheric vent, elevation compensator; with threaded ends for 2 inch and larger; for inlet and outlet gas pressures, specific gravity, and volume flow indicated.

3 PART 3 EXECUTION

3.1 PIPING APPLICATIONS AND INSTALLATIONS

A. General: Install piping to conform with the requirements NFPA 54 - National Fuel Gas Code.

B. All gas piping and connections to all gas consuming equipment shall be by the Plumbing Contractor.

C. Gas piping inside building and above roof and not exposed to soil shall be of black steel pipe and fittings with threaded connections on smaller than 1-1/2" joints and fittings and at equipment connections. All other joints and fittings shall be welded.

D. Where gas piping runs under floor slabs, or other concrete slabs, or asphalt paving, the piping shall be encased inside another pipe not less than two (2) pipe sizes larger than the gas line with both ends of larger pipe beveled and welded to smaller pipe with gas tight welds. The outer pipe shall be vented to the atmosphere outside the building with a 2" diameter pipe extended 30 inches above grade with an inverted "U" with open end turned down. Provide insect screen in open end of vent. All pipe (inner, outer, and vent pipe) shall be black steel pipe and fittings. The envelope shall terminate six (6) inches above the floor slab inside the building wall or two (2) feet exterior of building wall or end of slab. Vent pipe shall be adjacent to building wall, unless indicated otherwise on the plans. Both gas piping and envelope shall be tested individually after being in place with 100 PSI air pressure for 24 hours before concrete floor is poured and test approved by the Architect.

E. Where governing codes permit, gas piping exterior of buildings shall be Nipak polyethylene pipe and fitting designed and tested specifically for natural gas piping. The Nipak pipe shall have a minimum ground cover of 3'-0". Installation shall be in strict accordance with the manufacturer's recommendations. Care shall be taken not to backfill sharp rocks or frozen earth clogs directly onto plastic piping. Plastic piping shall not be laid directly on logs, rocks, gravel, or other abrasive or solid objects. No Cathodic protection is required for Nipak polyethylene gas piping. Provide tracer wire spirally wrapped around Nipak in accordance with local gas company's recommendations.

F. Where governing codes do not permit Nipak polyethylene pipe, all gas piping exterior of building and exposed to soil shall be new, domestic, Schedule 40, black steel mill wrapped pipe with welded joints and fittings except where indicated or specified otherwise.

1. The mill wrapping shall be as follows:

a. The pipe shall be mechanically cleaned and primed.

b. Next, a flood coat of semi-plasticized coal tar enamel shall be applied. The coal tar enamel shall be an average

thickness of 3/32" for pipes to and including 1-1/2" diameter and 4/32" for pipes 2" and larger.

c. The pipe shall next be spiral wrapped with glass fiber mat.

d. Next, flood of semi-plasticized coal tar enamel to an average thickness of 1/32" shall be applied.

e. The pipe shall next be spiral wrapped with coal tar saturated asbestos pipeline felt.

f. The seal coat of semi-plasticized coal tar enamel shall be applied.

g. The pipe shall next be spiral wrapped with 70 lb. Kraft paper.

h. An electrical holiday inspection shall then be made of all pipe wrapping.

2. Care shall be taken in handling and installing mill wrapped pipe so as not to damage the wrapping. Any damaged areas of pipe wrapping shall be repaired as hereinafter specified.

3. Welded Joints:

a. Heat enamel to a state of relatively free flowing consistency. Stir enamel at regular intervals during melting process. Reduce heat when enamel starts to throw off a yellow-brown smoke.

b. Clean scale from weld with hammer. Clean pipe surface with wire brush. Wipe dry if wet. Burn off any oil spots with torch.

c. Apply one coat of primer with brush.

d. Remove Kraft paper back two or three inches from ends of felt wrapping.

e. Cut a length of felt wrapping lone enough to overlap approximately 3" when wound around pipe.

f. Place length of felt wrapping under and around joint in the form of a sling. Hold felt firmly against bottom of pipe to prevent excess enamel from accumulating in the sling under the pipe and spilling.

g. Pour sufficient hot enamel along top exposed pipe to cause the enamel to flow around the pipe, gently sliding the wrapping sling a short distance back and forth laterally to insure full paint coverage along the bottom of the pipe.

h. When full coverage is attained, pull felt wrapping firmly around pipe to point of overlap; apply more enamel to felt to be overlapped and press overlapping end firmly into place. This operation must be completed before enamel has stiffened too much for a bond between enamel and wrapping to be achieved.

i. CAUTION: Men doing this work wear gloves to protect their hands against possible burns from hot paint.

4. Taps:

a. Heat from welding taps on a pipe causes the enamel to overheat and flow toward the bottom of the pipe. This area must be repaired by removing the damaged enamel and felt and replacing with enamel and felt in this same manner as for welded joints. Notch the felt in order to secure a snug fit around the tap.

b. The tap shall be wrapped the same as described for the main pipe.

5. Damaged Coating: All damage to coating should be repaired.

a. When coating has been damaged sufficiently to expose the pipe, clean the exposed pipe and apply primer if original primer coat has been destroyed.

b. Apply a flood coat of enamel to the exposed surface.

c. The newly coated area should be covered with a piece of felt wrapper, when it is needed to contain the enamel within the damaged area. The felt should be installed while the enamel is still in a molten state to obtain a bond between the felt and enamel.

6. General: Avoid overheating the enamel. Excessive heat carbonizes the enamel which reduces its effectiveness as a high resistance coating. Take all necessary precautions to prevent persons from coming in contact with the hot enamel.

7. Inspection of Wrapping: Prior to backfilling of ditch containing gas piping, the Contractor shall obtain an inspection of all

wrapped pipe from the gas utility company and shall provide all labor and materials required to comply with their recommendations.

G. Cathodic protection:

1. The Contractor shall furnish and install, where indicated on the plans, packaged magnesium anodes each with 12 feet of #6 THW sire. The wire shall be brazed to the top of the gas pipe after which the break in the pipe covering shall be coated with pipe paint and covered with felt before backfilling. Anodes shall be of the size indicated on the plans, located where indicated on the plans and installed in accordance with the detail shown on the plans. All brazing of wire leads to piping shall be by the Thermoweld or Cadweld process.

2. A cast iron Buffalo type extension service box shall be furnished and installed with top flush with finished grade through which the wire from pipe to anode is looped.

3. At all locations where the gas line crosses a “foreign” pipe closer than 6 inches to the “foreign” pipe, the Contractor shall furnish and install a 6” X 6” X 1/16 rigid fiber glass insulating spacer between the “foreign” pipe and the gas line. Continuous rigid fiberglass insulating spacer shall be provided between gas line and any “foreign” pipe running parallel with and closer than 6” to the gas line. Plastic tape or hot pipe enamel shall be used to secure the insulating spacer to the gas line. No metal fasteners will be permitted. In addition, the Contractor shall furnish any and all labor and materials required to completely isolate (electrically) all gas piping receiving cathodic protection from all unprotected piping.

4. Approximately thirty (30) days after the installation of all piping and anodes, the oil-to-pipe voltage reading shall be taken by this Contractor and the readings certified to be correct and delivered to the Owner. If any readings are obtained indicating less than .85 volts, the Owner’s attention shall be called to these readings and more extensive tests made as directed by the Engineer to determine the required corrective measures.

H. Hanger, supports, and anchors are specified in Division-15 Section “SUPPORTS AND ANCHORS. Conform to the table below for maximum spacing of supports:

Steel Pipe:

SIZE	SPACING IN FEET

1/2	6
3/4 to 1	8
1-1/4 and larger (horizontal)	10
1-1/4 and larger (vertical)	every floor level

I. Make reductions in pipe sizes using eccentric reducer fittings installed with the level side down.

J. Make changes in directions and branch connections using fittings.

K. Install unions in pipes 2 inch and smaller, adjacent to each valve, at final connections each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.

L. Insulating Unions and Couplings:

1. This Contractor shall furnish and install an insulating union, coupling, or flange above grade from each service line to each building to isolate protected piping from building piping. Insulating flanges or coupling shall also be furnished and installed by this Contractor between the gas utility company's distribution system and the Owner's service line.

2. Contractor shall furnish and install at any other location where cathodic protected piping joints unwrapped and unprotected piping a boltless insulating sleeve with slipped full rubber insulating gaskets and nylon insert on the end and bead tipped gasket on the other.

M. Install flanges on valves, apparatus, and equipment having 2-1/2 inch and large connections.

3.2 PIPE JOINTS

A. Welded Joints: Comply with the requirements in ASME Boiler and Pressure Vessel Code, Section IX.

B. Threaded Joints: Conform to ANSI B1.20.1, tapered pipe threads for field cut threads. Join pipe, fittings, and valves as follows:

1. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint. Refer to NFPA 54, for guide for number and length of threads for field threading steel pipe.

2. Align threads at point of assembly.

3. Apply appropriate tape or thread compound to the external pipe threads.

4. Assemble joint to appropriate thread depth. When using a wrench on valves place the wrench on the valve end into which the pipe is being threaded.

5. Damaged Threads: Do not use pipe with threads which are stripped, chipped, corroded, or otherwise damaged. If a weld opens during cutting or threading operations, that portion of pipe shall not be used.

C. Flanged Joints: Align flanges surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly to appropriate torque specified by the only manufacturer.

3.3 VALVE APPLICATIONS

A. General: The Drawings indicate valve types, locations, and arrangements.

B. Shut off duty: Use gas cocks specified in Part 2 above.

3.4 VALVE INSTALLATIONS

A. Install valves in accessible locations, protected from physical damage..

B. Install a gas cock upstream of each gas pressure regulator.

3.5 TERMINAL EQUIPMENT CONNECTIONS

A. Install gas cock upstream and within 6 feet of gas appliance. Install a union or flanged connection downstream from the gas cock to permit removal of controls.

B. Sediment Traps (Dirt Leg): Install a tee fitting with the bottom outlet plugged or capped as close to the inlet of the gas appliance as practical. Dirt leg shall be a minimum of 3 pipe diameters in length.

3.6 ELECTRICAL BONDING AND GROUNDING

A. Install above ground portions of gas piping systems, upstream from equipment shutoff valves electrically continuous and bonded to a grounding electrode in accordance with NFPA 70 - “National Electrical Code.”

B. Do not use gas piping as a grounding electrode.

3.7 EXCAVATION AND BACKFILL

A. Excavation and backfill to be provided under this Section of the Specifications. Refer to Section of Division 15 Specifications specifying excavation and backfill for requirements.

3.8 LAYING OF POLYETHYLENE PIPE

A. Copper Tracer Wire: Copper tracer wires consisting of #14 AWG solid, single conductor, insulated copper wire shall be installed in the trench with all piping to permit location of the pipe with electronic detectors. The wire shall not be spiraled around the pipe nor taped to the pipe. Wire connections are to be made by stripping the insulation from the wire and soldering with rosin core solder. Solder joints shall be wrapped with rubber tape and electrical tape. At least every one thousand feet, provide a five pound magnesium anode attached to the main tracer wire by solder joint shall be wrapped with rubber tape and with electrical tape. An anode shall be attached at the end of each line.

B. Magnetic markers may be used in lieu of copper tracer wire to aid in future pipe locating. Generally, install markers on 20 foot centers. If pipe is in a congested piping area, install on 10 foot centers. Prepare as-built drawing indicating exact location of magnetic markers.

3.9 FIELD QUALITY CONTROL

A. Piping Tests: Inspect, test, and purge natural gas systems in accordance with NFPA 54, and local utility requirements.

END OF SECTION

SECTION 15140 HANGERS AND SUPPORTS

1 PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe and equipment hangers and supports.

B. Equipment bases and supports.

C. Sleeves and seals.

D. Flashing and sealing equipment and pipe stacks.

1.2 RELATED SECTIONS

A. Section 15260 - Piping Insulation.

B. Section 15410 - Plumbing Piping.

1.3 REFERENCES

A. ASME B31.1 - Power Piping

B. ASME B31.2 - Fuel Gas Piping

C. ASME B31.5 - Refrigeration Piping

D. ASME B31.9 - Building Services Piping

E. ASTM F708 - Design and Installation of Rigid Pipe Hangers.

F. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.

G. MSS SP69 - Pipe Hangers and Supports - Selection and Application.

H. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

2 PART 2 PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Plumbing Piping - DWV:
   1. Conform to ASME B31.9.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron, adjustable swivel, split ring.
   3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.

4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
7. Vertical Support: Steel riser clamp.
8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

B. Plumbing Piping - Water:
1. Conform to ASME B31.9.
2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: 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. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.
6. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded spacers and hanger rods, cast iron roll.
8. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
9. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
10. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
11. Vertical Support: Steel riser clamp.
12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
13. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
14. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
15. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.2 ACCESSORIES

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

2.3 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.

2.4 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; compatible with roofing.

E. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

2.5 EQUIPMENT CURBS

A. Fabrication: Welded 18 gage galvanized steel shell and base, mitered 3 inch cant, installed wood nailer.

2.6 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.

D. Sleeves for Round Ductwork: Galvanized steel.

E. Sleeves for Rectangular Ductwork: Galvanized steel or wood.

F. Sealant: Acrylic.

3 PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.2 INSERTS

A. Provide inserts for placement in concrete formwork.

B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.

3.3 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as scheduled. All piping shall be adequately supported. All piping shall be installed with due regard to expansion and contraction. Use vibration dampers where required.

B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

C. Place hangers within 12 inches of each horizontal elbow.

D. Use hangers with 1-1/2 inch minimum vertical adjustment.

E. All exposed vertical risers running near column shall be supported with beam clamps. Each line shall have supports not greater than 10'-0" on center, with additional provision that there be a support near top of riser. All supports shall be aligned.

F. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

G. Support riser piping independently of connected horizontal piping.

H. Provide sheet lead packing between hanger or support and piping.

I. Design hangers for pipe movement without disengagement of supported pipe.

J. Perforated strap iron and wire are not acceptable hanger materials.

3.4 EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads of concrete, minimum 4 inches thick and extending 6 inches beyond supported equipment.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct supports of steel members. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.5 FLASHING

A. Provide flexible flashing and metal counterflashing 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 counterflash, and seal.

C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp device.

D. Seal floor drains watertight to adjacent materials.

E. Provide curbs for mechanical roof installations 14 inches minimum high above roofing surface. Flash and counterflash with sheet metal; seal watertight. Attach counterflashing mechanical equipment and lap base flashing on roof curbs. Flatten and solder joints.

F. 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.

3.6 SLEEVES

A. Set sleeves in position in formwork. 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 1 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 stuffing 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.

3.7 SCHEDULES

PIPE SIZE Inches	MAX. HANGER SPACING Feet	HANGER ROD DIAMETER Inches
1/2 to 1-1/4	6.5	3/8
1-1/2 to 2	10	3/8
2-1/2 to 3	10	1/2
4 to 6	10	5/8
8 to 12	14	7/8
14 and Over	20	1
PVC (All Sizes)	6	3/8

END OF SECTION

SECTION 15190 MECHANICAL IDENTIFICATION

1 PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Stencils.

D. Pipe Markers.

1.2 REFERENCES

A. ASME A13.1 - Scheme for the Identification of Piping Systems.

1.3 SUBMITTALS FOR REVIEW

A. Submit list of wording, symbols, letter size, and color coding for mechanical identification.

B. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

C. Obtain Owner’s approval for all identification materials before installing.

1.4 REGULATORY REQUIREMENTS

A. Conform to NFPA 99 requirements for labeling and identification of gas piping systems and accessories.

2 PART 2 PRODUCTS

2.1 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved black letters on yellow background color.

2.2 TAGS

A. Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inches square.

B. Information Tags: Clear plastic with printed "Danger," "Caution," or "Warning" and message; size 3-1/4 x 5-5/8 inches with grommet and self-locking nylon ties.

2.3 STENCILS

A. Stencils: With clean cut symbols and letters of following size:
1. Up to 2 inch Outside Diameter of Insulation or Pipe: 1/2 inch high letters.
2. 2-1/2 to 6 inches Outside Diameter of Insulation or Pipe: 1 inch high letters.
3. Over 6 inches Outside Diameter of Insulation or Pipe: 1-3/4 inches high letters.
4. Ductwork and Equipment: 1-3/4 inches high letters.

B. Stencil Paint: Semi-gloss enamel, colors and lettering size conforming to ASME A13.1.

2.4 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.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Plastic Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.5 PIPING IDENTIFICATION:

A. Identify all above-ground piping and piping in tunnels by means of color coded bands and stencil and paint in accordance with the following tables: (NOTE: Not all systems may be used on this project.)

Systems	Band Color	Label
Domestic Cold Water	Light Blue	DOM-C-WTR
Domestic Hot Water Supply	Dark Blue	DOM-H-WTR SUP
Domestic Hot Water Return	Dark Blue	DOM-H-WTR RET
Chilled Water Supply	Light Green	CHS
Chilled Water Return	Light Green	CHR
Heating Water Supply	Dark Green	HWS
Heating Water Return	Dark Green	HWR
Steam	Light Gray	ST (*)
Condensate	Light Gray	COND
Deionized Water	Light Blue	DEION-WTR
Compressed Air	Yellow	COMP_AIR

Vacuum	Yellow	VAC
Gas	Red	GAS
Drain Lines	Black	DRAIN

* On label on steam lines, include the steam pressure involved within the parenthesis.

B. Install color coded bands and stencils in accordance with the following specific instructions. Stencil and color band pipes at each valve to show proper identification of pipe contents. Where several valves exist on one header, mark only the header. Provide a black arrow marker at each pipe stencil pointing away from the stencil to indicate flow direction. Use a double-ended arrow marker when flow can be in either or both directions. Apply a pipe stencil, color band, and an arrow marker with 10' each side of each point of pipe penetration through walls, floors, or ceilings and at maximum spacing of 10' on exposed piping and 50' on concealed piping. Apply pipe identification on side of pipe providing the least obstructed view. On lines that are dark in color, provide white backgrounds for color bands, stencils, and arrow markers. Characters used in stencils shall be 2" high on lines 3" or more (including insulation) in diameter and 1" high on lines less than 3" in diameter. Color bands shall be 4" wide.

2.6 LOCKOUT DEVICES

A. Anodized aluminum hasp with erasable label surface; size minimum 7-1/4 x 3 inches.

B. Valve Lockout Devices: Lockable handle preventing access to valve operator, accepting lock shackle.

3 PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install identifying devices after completion of coverings and painting.

B. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.

C. Install labels with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer. For unfinished canvas covering, apply paint primer before applying labels.

D. Install tags using corrosion resistant chain. Number tags consecutively by location.

E. Install underground plastic pipe markers 6 to 10 inches below finished grade, directly above buried pipe.

F. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

G. Identify control panels and major control components outside panels with plastic nameplates.

H. Identify valves in main and branch piping with tags.

I. Tag automatic controls, instruments, and relays. Key to control schematic.

J. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

K. Identify ductwork with plastic nameplates. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

SECTION 15260 PIPING INSULATION

1 PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.2 RELATED SECTIONS

A. Section 15190 - Mechanical Identification.

B. Section 15410 - Plumbing Piping: Placement of hangers and hanger inserts.

1.3 REFERENCES

A. ASTM C547 - Standard Specification for Mineral Fiber Preformed Pipe Insulation.

B. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.

C. ASTM C578 - Standard Specification for Preformed, Cellular Polystyrene Thermal Insulation.

D. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyurethane Thermal Insulation.

E. ASTM C610 - Standard Specification for Expanded Perlite Block and Pipe Thermal Insulation.

F. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

G. ASTM D1056 - Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.

H. ASTM D1667 - Standard Specification for Flexible Cellular Materials--Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam).

I. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

J. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

L. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

M. NAIMA National Insulation Standards.

N. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

O. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.4 REGULATORY REQUIREMENTS

A. Conform to maximum flame spread/smoke developed rating of 25/50 in accordance with NFPA 255.

1.5 DELIVERY, STORAGE, AND PROTECTION

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

2 PART 2 PRODUCTS

2.1 DOMESTIC HOT WATER LINES

A. Vapor Barrier Lap Adhesive:
1. Compatible with insulation.

2.2 DOMESTIC COLD WATER LINES

A. Insulation: Owens-Corning Fiberglas ASJ/SSL-II molded sectional glass fiber pipe covering with an all service jacket (ASJ). Vapor seal all insulation.

B. Concealed Valves and Fittings: Preformed “Zeston” PVC covers over fiberglass insulation.

C. Exposed Valves and Fittings: Hamfab insulation fittings.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

2.3 DRAIN LINES

A. Manufacturer: Manville Type II “Aerotube”.
1. Substitutions: Permitted.

B. Insulation: May be slit flange type.

2.4 REFRIGERATION SUCTION LINES

A. Manufacturer: Manville Type II “Aerotube”.
1. Substitutions: Permitted.

B. Insulation: Thread onto piping during fabrication and seal with adhesive.

3 PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with NAIMA National Insulation Standards.

B. Insulate all piping that is exposed to ambient temperatures. In addition provide tenting for piping installed beneath blown insulation in attic.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

E. Glass fiber insulated pipes conveying fluids below ambient temperature:
1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

G. For hot piping conveying fluids over 140 degrees F , insulate flanges and unions at equipment.

H. Glass fiber insulated pipes conveying fluids above ambient temperature:
1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions.

J. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with jacket with seams located on bottom side of horizontal piping.

K. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

3.3 SCHEDULES

A. Plumbing Systems:
1. Domestic Hot Water Supply:
a. Glass Fiber Insulation:
b. Thickness: 1 inch .

2. Domestic Cold Water Supply In Areas Subject to Freezing:
a. Glass Fiber Insulation:
(a) Pipe Size Range: All sizes.
b. Thickness: 1/2 inch.

3. Condensate Drain Lines:
a. Thickness: 3/8 inch.

4. Refrigerant Suction:
a. Thickness: 3/4 inch.

END OF SECTION

SECTION 15270 DUCT INSULATION

1 PART 1 GENERAL

1.1 WORK INCLUDED

A. Duct thermal and acoustic insulation.

1.2 RELATED WORK

A. Section 15260: Piping and Equipment Insulation

1.3 JOB CONDITIONS

A. Deliver material to job site in original non-broken factory packing, labeled with manufacture's density and thickness.

B. Perform work at ambient and equivalent temperatures as recommended by the adhesive manufacturer.

2 PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Johns - Manville

B. Armstrong

C. Owens - Corning

2.2 GENERAL

A. Adhesives and Insulation Materials: Composite fire and smoke hazard ratings maximum 25 for Flame Spread and 50 for Smoke Developed. Adhesives to be waterproof.

2.3 MATERIALS AND COMPONENTS

A. Wrapped Ducts: Flexible fibrous glass insulation "K" value at 75 degrees F maximum 0.26 btu/in.sq.ft./degrees F/hr. with factory applied reinforced aluminum foil vapor barrier.

B. Thermal and Acoustic Lining: Fiberglass insulation with "K" value at 75 degrees F maximum 0.25 btu/in.sq.ft./ degrees F/hr. absolute roughness of exposed surface not to exceed 0.0013, coated to prevent fiber erosion at air velocities up to 4,000 fpm, 1.5 lbs./cu.ft. minimum density.

3 PART 3 EXECUTION

3.1 PREPARATION

A. Ensure insulation is continuous through inside walls. Pack around ducts with fire proof self-supporting insulation material, properly sealed.

B. Thermal and Acoustic Lining:

1. Apply to interior of supply and return ducts as indicated.
2. For acoustically lined or internally insulated duct, outside duct dimensions are shown in parenthesis.
3. Secure to ductwork with adhesive using 50% coverage and 12 gage impale anchor tabs on 16 inch centers; all leading edges shall have fasteners at each corner and @ 8" o.c. maximum.
4. Use 1 inch thick insulation unless otherwise noted.
5. Ducts with acoustic insulation do not require external insulation.
6. All concealed rectangular ducts may be wrapped in lieu of internally lined at Contractor's option.

C. Wrapped Diffuser Boots:

1. Provide mechanical fasteners at 18" centers maximum, to secure insulation to ducts 24" wide and wider.
2. Butt insulation and seal joints and breaks with 2 inch lap of foil adhered over joint.

3.2 INSULATION THICKNESS SCHEDULE

A.	Supply & Return Plenums	1" Liner & 2" Wrapped
B.	Supply & Return Ducts	1" Liner & 2" Wrapped
C.	Sheet Metal Take-Offs and Boots to Diffusers	1" Wrapped

END OF SECTION

SECTION 15300 FIRE PROTECTION

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including GENERAL and SUPPLEMENTARY CONDITIONS and DIVISION 1 SPECIFICATION SECTIONS apply to this Section.

B. Section 15000, GENERAL PROVISIONS FOR MECHANICAL.

C. Section 15100, SITE UTILITIES.

D. Section 15190, MECHANICAL IDENTIFICATION for labeling and identification of fire protection piping system and components.

1.2 SUMMARY

A. This Section specifies automatic sprinkler systems for buildings and structures. Materials and equipment specified in this Section include:

Pipe, fittings, valves, and specialties. Sprinklers and accessories.

B. Products furnished include, but are not limited to, sprinkler head cabinet or cabinets with spare heads and wrenches. Locate as directed by the Owner's maintenance personnel or Engineer.

1.3 DEFINITIONS

A. Pipe sizes used in this Specification are Nominal Pipe Size (NPS).

B. Other definitions for fire protection systems are listed in NFPA Standards 13R, 13, 14, 24, and 25.

C. Working Plans as used in this Section means those documents (including drawings and calculations) prepared pursuant to the requirements contained in NFPA 13R, NFPA 13, NFPA 14, NFPA 24, and NFPA 25 for obtaining approval of the authority having jurisdiction.

1.4 SYSTEM DESCRIPTION

A. Fire protection system is an integrated system of underground and overhead piping designed in accordance with NFPA standards. The installation includes a network of piping, hydraulically designed, to supply water to fire sprinklers throughout the structure.

B. On wet pipe sprinkler systems, small (less than 40 gallon capacity) anti-freeze systems may be utilized to protect unheated areas.

C. Unless specified or required otherwise by NFPA 13R, the following system) minimum densities over the design area shall be provided:

System Design Densities

a. Light Hazard: 0.10 gpm/sq. ft.
b. Ordinary Hazard 1: 0.15 gpm/sq. ft.
c. Ordinary Hazard 2: 0.20 gpm/sq. ft

D. A minimum of 5 psi or 10%, which ever is greater, safety pressure shall be available at the connection to the public water supply for the total water required, including hose allowances required for the system.

E. Water Flow Data:

Static Pressure
Residual Pressure
Flow
Date:
Time:
By:

F. Provide tamper switches on each control valve and water flow switches as noted for interface with building fire alarm system.

1.5 SUBMITTALS

A. Product Data for each type sprinkler head, valve, piping specialty, fire protection specialty, fire department connection.

B. Shop Drawings prepared in accordance with NFPA 13R identified as “Working Plans”, including hydraulic calculations where applicable, and which have been approved by the authority having jurisdiction. The fire protection system installed for this project shall comply with NFPA 13R.

C. Maintenance Data for each type sprinkler head, valve, piping specialty, fire protection specialty, fire department connection, for inclusion in operating and maintenance manual specified in Division 1 and Section 15000, GENERAL PROVISIONS FOR MECHANICAL.

D. Welders’ qualification certificates.

E. Test Reports and Certificates including “Contractor’s Material & Test Certificate for Aboveground Piping” and “Contractor’s Material & Test Certificate for Underground Piping” as described in NFPA 13.

1.6 QUALITY ASSURANCE

A. Contractor Qualifications: The fire sprinkler system contractor shall hold and maintain a Certificate of Registration issued by the State Fire Marshal in accordance with the Texas Insurance Code –Chapter Five, Subchapter C, Article 5.43-3. Upon request, submit evidence of such qualifications to the Architect.

B. Installer Qualifications: Installation and alterations of fire protection piping, equipment, specialties, and accessories, and repair and servicing of equipment shall be performed only by a qualified installer. The term qualified means experienced in such work (experienced shall mean having minimum of 5 previous projects similar in size and scope to this project), familiar with all precautions required, and has complied with all the requirements of the authority having jurisdiction. Upon request, submit evidence of such qualifications to the Architect.

C. Qualifications for Welding Processes and Operators: Comply with the requirements of AWS D10.9. Specifications for Qualifications of Welding Procedures and Welders for Piping and Tubing, Level AR-3."

D. Regulatory Requirements: Comply with the requirements of the following codes:

NFPA - Standard for the Installation of Sprinkler Systems. Use the latest version of the NFPA codes for system requirements. Where those requirements conflict with the requirements of this section, the NFPA codes shall prevail.

UL and FM Compliance: Fire protection system materials and components shall be Underwriter's Laboratories listed and labeled, and Factory Mutual approved for the application anticipated.

Texas Insurance Code – Article 5.43-3.

1.7 SEQUENCING AND SCHEDULING

A. Schedule rough-in installations with installations of other building components.

1.8 EXTRA MATERIALS

A. Head Wrenches: Furnish to Owner two (2) head wrenches for each type of sprinkler head installed.

B. Sprinkler Heads and Cabinets: Furnish six extra sprinkler heads of each style included in the project. Furnish each style with its own sprinkler head cabinet and special wrenches as specified in this Section.

2 PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide fire protection system products from one of the following:

Gate Valves and Ball Valves:

Fairbanks
Jenkins
Kennedy Valve, Div of ITT Grinell Valve Co., Inc.
Stockham

Backflow Preventers:

Ames Company
FEBCO
Watts Regulator

Swing Check Valves:

Fairbanks
Jenkins
Kennedy Valve, Div of ITT Grinell Valve Co., Inc.
Stockham

Grooved Mechanical Couplings:

Stockham
Victaulic Company of America
Central Grooved piping Products

Water Flow Indicators:

Potter Electric Signal Company
System Sensor

Fire Department Connection Valve:

Fire Protection Products Inc
Potter Roemer, Inc.
Elkhart Brass Manufacturing Company.

Sprinkler Heads:

Central Sprinkler Corp.
Firematic Sprinkler Devices, Inc.
Gem Sprinkler Company.
Reliable Automatic Sprinkler Co., Inc.
Star Sprinkler Corp.
Viking Corp.

2.2 PIPE AND TUBING MATERIALS

A. General: Refer to Part 3 Article "PIPE APPLICATIONS" for identification of systems where the below specified pipe and fitting material are used.

2.3 FITTINGS

A. Cast-iron Threaded Fittings: ANSI B16.4, Class 125, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.

B. Malleable-Iron Threaded Fittings: ANSI B16.3, Class 125, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.

C. Steel Fittings: ASTM A 234, seamless or welded, for welded joints.

D. Grooved Mechanical Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47 Grade 32510 malleable iron; or ASTM A53, Type F or Types E or S, Grade B fabricated steel fittings with grooves or shoulders designed to accept grooved end couplings.

E. Grooved Mechanical Couplings: consist of ductile or malleable iron housing, a synthetic rubber gasket of a central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure roll-grooved pipe and fittings.

F. Cast-iron Threaded Flanges: ANSI B16.1, Class 125; raised ground face, bolt holes spot faced.

2.4 JOINING MATERIALS

A. Welding Materials: Comply, with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials appropriate for the wall thickness and chemical analysis of the pipe being welded.

B. Gasket Materials: thickness, material, and type suitable for fluid or gas to be handled, and design temperatures and pressures.

2.5 GENERAL DUTY VALVES

A. Gate Valves - 2 Inch and Smaller: body and bonnet of cast bronze, 125 pound cold water working pressure - non-shock, threaded ends, solid

wedge, outside screw and yoke, rising stem, screw-in bonnet, and malleable iron handwheel. Valves shall be capable of being repacked under pressure, with valve wide open.

B. Gate Valves - 2-1/2 Inch and Larger: UL Listed and FM Approved for fire protection service; iron body; bronze mounted, 125 pound cold water working pressure - non-shock. Valves shall have solid taper wedge; outside screw and yoke, rising stem; flanged bonnet, with body and bonnet conforming to ASTM A 126 Class B; replaceable bronze wedge facing rings; flanged ends; and a packing assembly consisting of a cast iron gland flange, brass gland, packing, bonnet, and bronze bonnet bushing. Valves shall be capable of being repacked under pressure, with valve wide open.

C. Ball Valves: MSS SP-110; UL Listed, FM Approved, Two piece body, chrome plated ball. Valve shall have a blowout-proof stem and reinforced TFE seats.

D. Swing Check Valves: MSS SP-71; Class 125, cast iron body and bolted cap conforming to ASTM A 126, Class B; horizontal swing, with a bronze disc or cast iron disc with bronze disc ring, and flanged ends. Valve shall be capable of being refitted while the valve remains in the line.

2.6 SPECIALTY VALVES

A. Alarm Check Valve: 125 psig working pressure, designed for horizontal or vertical installations, and have cast iron, flanged or grooved inlet and outlet, bronze grooved seat with “O” ring seals, single hinge pin and latch design. Provide trim sets for bypass, drain, electric sprinkler alarm switch, pressure gages, precision retarding chamber, drip cup assembly piped with check valve to main drain line, and fill line attachment with strainer.

B. DOUBLE CHECK ASSEMBLY: shall have two independently operated spring loaded cam-check valves, required testing cocks, and inlet and outlet O. S. & Y. shut off valves. Cam check valve shall be internally loaded and provide a positive drip tight closure against the reverse flow of liquid caused by back siphonage or back pressure.

2.7 AUTOMATIC SPRINKLERS

A. Sprinkler Heads: Fusible link or glass bulb type; style as indicated or required by the application. Unless otherwise indicated or required, provide heads with nominal 1/2 inch NPT, for “Ordinary” temperature range.

B. Sprinkler Head Finishes: Provide heads with the following finishes:

Upright, Pendent, and Sidewall Styles: chrome plated in finish spaces, exposed to view; rough bronze finish for heads in unfinished spaces and not exposed to view. Heads shall be wax-coated where exposed to acids, chemicals, or other corrosive fumes.

Concealed Sprinklers: to be used in all finish ceilings except storage areas and mechanical rooms. Mating cover plates shall be white.

C. Sprinkler Head Cabinet and Wrench: furnish steel cabinet, suitable for wall mounting, with hinged cover space for 6 spare sprinkler heads plus sprinkler head wrench. Provide a separate cabinet and wrench for each style sprinkler head on the project.

2.8 FIRE DEPARTMENT CONNECTIONS

A. Siamese Connections: Flush mounted polished cast brass with two-way connections. Connection sizes shall be 4 inch outlet and two 2-1/2 inch female inlets, having threads compatible with those of the local fire department equipment. Each inlet shall have a clapper valve, and brass cap and brass chain. Unit shall have wall escutcheon of cast brass, finished to match the fire department connection, with words “AUTO SPKR - FIRE DEPT CONNECTION,” in raised letters.

2.9 ALARM DEVICES

A. General: Types and sizes shall mate and match piping and equipment connections.

B. Water Flow Indicators: Vane type waterflow detector, rated to 250 psig; designed for horizontal or vertical installation; have 2-SPDT circuit switches to provide isolated alarm and auxiliary contacts, 7 ampere 125 volts AC and 0.25 ampere 24 Volts DC; complete with factory-set, field-adjustable retard element to prevent false signals, and tamper-proof cover which sends a signal when cover is removed.

C. Supervisory Switches: SPDT, normally closed/open contacts, designed to signal valve in other than full open position.

D. Water Motor Alarm: hydraulically operated mechanical device actuated by flow of water and sounds a continuous alarm while one or more sprinkler heads operate. Locate gong and drain as directed by Engineer.

3 PART 3 EXECUTION

3.1 PIPE APPLICATIONS

A. Install Schedule 40 steel pipe with threaded joints and fittings for 2 inch and smaller. Schedule 10 steel pipe with roll grooved joints for 2-1/2 inch

and larger in wet pipe systems. Schedule 40 galvanized steel pipe in dry pipe and pre-action systems. Piping that complies with the requirements of NFPA-13R is approved.

B. At the Contractor's option, install Schedule 40 steel pipe with roll-grooved ends and grooved mechanical couplings.

3.2 PIPING INSTALLATIONS

A. Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of piping systems. So far as practical, install piping as indicated. Unless approved by the Architect or Engineer, all piping in finished areas shall be concealed.

B. Install piping to conserve building space, to not interfere with use of space and other work. Install risers as near the walls as possible.

C. Install sprinkler piping to provide for system drainage in accordance with NFPA 13R. Pipe all drains to the outside.

D. Use approved fittings to make all changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Hangers and Supports: Comply with the requirements of NFPA 13R. Hanger and support spacing and locations for piping joined with grooved mechanical couplings shall be in accordance with the grooved mechanical coupling manufacturer's written instructions, for rigid systems. Provide protection from damage where subject to earthquake in accordance with NFPA 13R.

F. Make connections between underground and aboveground piping using an approved transition piece strapped or fastened to prevent separation.

G. Install test connections sized and located in accordance with NFPA 13R complete with shutoff valve. Test connections may also serve as drain pipes.

H. Install pressure gage on the riser or feed main at or near each test connection. Provide gage with a connection not less than 1/4 inch and having a soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and where they will not be subject to freezing.

I. Install double check backflow preventer assembly approved for fire sprinkler service.

3.3 PIPE JOINT CONSTRUCTION

A. Welded Joints: AWS D10.9, Level AR-3.

B. Threaded Joints: conform to ANSI B1.20.1, tapered pipe threads for field cut threads. Join pipe, fittings and valves as follows:

Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.

Align threads at point of assembly.

Apply appropriate tape or thread compound to the external pipe threads.

Assemble joint to appropriate thread depth. When using a wrench on valves place the wrench on the valve end into which the pipe is being threaded.

Damaged Threads: Do not use pipe with threads which are corroded or damaged. If a weld opens during cutting or threading operations, that portion of pipe shall not be used.

C. Flanged Joints: Align flanges surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly to appropriate torque specified by the bolt manufacturer.

D. Mechanical Grooved Joints: cut or roll grooves on pipe ends dimensionally compatible with the couplings.

E. End Treatment: After cutting pipe lengths, remove burrs and fins from pipe ends.

3.4 VALVE INSTALLATIONS

A. General: Install fire protection specialty valves, fittings, and specialties in accordance with the manufacturer's written instructions, NFPA 13 and the authority having jurisdiction.

B. Gate Valves: Install supervised-open gate valves so located to control all sources of water supply except fire department connections. Where there is more than one control valve, provide permanently marked identification signs indicating the portion of the system controlled by each valve. Refer to Division-15 Section "Mechanical Identification" for valve tags and signs.

C. Alarm Valve: Install valve in the vertical position, in proper direction of flow including the bypass check valve and retard chamber drain line connection. Install valve trim in accordance with the valve manufacturer's appropriate trim diagram. Test valve for proper operation.

3.5 SPRINKLER HEAD INSTALLATIONS

A. Use proper tools to prevent damage during installations.

3.6 FIRE DEPARTMENT CONNECTION INSTALLATIONS

A. Install automatic drip valve at the check valve on the fire department connection to the system.

B. Install mechanical sleeve seal pipe penetration in outside walls.

3.7 FIELD QUALITY CONTROL

A. Flush, test, inspect sprinkler piping systems in accordance with NFPA 13R. Provide documents per Chapter 8 of NFPA 13R and Article 5.43-3 of the Texas Insurance Code.

B. Replace system piping components which do not pass the test procedures specified, and retest repaired portion of the system.

3.8 SYSTEM ACCEPTANCE AND CLOSEOUT:

A. The contractor's material and test certificates for aboveground and underground piping, all manufacture's literature describing the proper operation and maintenance of any installed equipment or devices, and one NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-based Fire Protection Systems* shall be placed in a binder and provided to the Owner.

B. A set of as-built plans and hydraulic calculations shall be provided to the owner.

C. In addition to the above documents, a copy of the contractor's material and test certificates for aboveground and underground piping , all manufacture's literature describing the proper operation and maintenance of any installed equipment and devices, a set of as-built plans and hydraulic calculations shall be placed in a water-proof envelope and affixed on or near the system riser.

D. All required signs and service tags shall be attached to the system in such a position as to permit convenient inspection and not hamper its actuation or operation.

END OF SECTION

SECTION 15310 FIRE PROTECTION PIPING

1 PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe, fittings, valves, and connections for sprinkler systems.

1.2 REFERENCES

A. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.

B. ASME B16.3 - Malleable Iron Threaded Fittings, Class 150 and 300.

C. ASME B16.4 - Cast Iron Threaded Fittings, Class 125 and 250.

D. ASME B16.5 - Pipe Flanges and Flanged Fittings.

E. ASME B16.9 - Factory-made Wrought Steel Buttwelding Fittings.

F. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

G. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

H. ASTM A135 - Electric-Resistance-Welded Steel Pipe.

I. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless.

J. ASTM A234 - Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

K. ASTM A795 - Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.

L. AWS D10.9 - Specifications for Qualification of Welding Procedures and Welders for Piping and Tubing.

M. NFPA 13 - Installation of Sprinkler Systems.

N. UL 262 - Gate Valves for Fire-Protection Service.

O. UL 312 - Check Valves for Fire-Protection Service.

1.3 REGULATORY REQUIREMENTS

A. City of San Angelo, Texas building codes.

B. Conform to UL. and FM.

C. Sprinkler Systems: Conform work to NFPA 13R.

D. Welding Materials and Procedures: Conform to AWS D10.9.

E. Valves: Bear UL and FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.

F. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

1.4 DELIVERY, STORAGE, AND PROTECTION

A. Deliver and store valves in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

2 PART 2 PRODUCTS

2.1 ABOVE GROUND PIPING

A. Steel Pipe: ASTM A135 UL listed, threadable, light wall; Schedule 10 black.
1. Cast Iron Fittings: ASME B16.4, threaded fittings.
2. Malleable Iron Fittings: ASME B16.3, threaded fittings.
3. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
4. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.

2.2 PIPE HANGERS AND SUPPORTS

A. Conform to NFPA 13R.

B. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel.

C. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.

D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

E. Vertical Support: Steel riser clamp.

F. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.3 GATE VALVES

3 PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Install piping in accordance with NFPA 13R for sprinkler systems. Unless specifically approved by the Architect/Engineer, all piping in finished areas shall be concealed.

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. Install risers as near the walls as possible.

D. Group piping whenever practical at common elevations.

E. Sleeve pipes passing through partitions, walls, and floors.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Inserts:
   1. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.

H. Pipe Hangers and Supports:
   1. Install in accordance with NFPA 13R.
   2. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
   3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   4. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
   5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

I. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

J. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding. Refer to Section 09900.

K. Do not penetrate building structural members unless indicated.

L. Provide sleeves when penetrating floors and walls. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.

M. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

N. Die cut threaded joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.

O. Install valves with stems upright or horizontal, not inverted. Remove protective coatings after installation.

P. Provide gate or butterfly valves for shut-off or isolating service.

Q. Provide drain valves at main shut-off valves, low points of piping and apparatus.

END OF SECTION

SECTION 15410 PLUMBING PIPING

1 PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for piping systems.
   1. Sanitary sewer.
   2. Domestic water.
   3. Natural gas.

1.2 RELATED SECTIONS

A. Section 15190 - Mechanical Identification.

B. Section 15260 - Piping Insulation.

1.3 REFERENCES

A. AGA Z21.22 - Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems.

B. ASME B16.3 - Malleable Iron Threaded Fittings.

C. ASME B31.1 - Power Piping.

D. ASME B31.2 - Fuel Gas Piping.

E. ASME B31.9 - Building Service Piping.

F. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.

G. ASTM B32 - Solder Metal.

H. ASTM B42 - Seamless Copper Pipe.

I. ASTM B68 - Seamless Copper Tube (ASTM B68M - Seamless Copper Tube.

J. ASTM B75 - Seamless Copper Tube (ASTM B75M - Seamless Copper Tube.

K. ASTM B88 - Seamless Copper Water Tube (ASTM B88M - Seamless Copper Water Tube.

L. ASTM B280 - Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

M. ASTM D1785 - Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

N. ASTM D2241 - Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

O. ASTM D2466 - Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

P. ASTM D2513 - Thermoplastic Gas Pressure Pipe, Tubing and Fittings.

Q. ASTM D2564 - Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

R. ASTM D2609 - Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe.

S. ASTM D2665 - Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.

T. ASTM D2729 - Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

U. ASTM D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

V. ASTM F679 - Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.

W. ASTM F708 - Design and Installation of Rigid Pipe Hangers.

X. AWWA C651 - Disinfecting Water Mains.

Y. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. Through 12 in. for Water Distribution.

Z. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.

AA. MSS SP69 - Pipe Hangers and Supports - Selection and Application.

BB. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

CC. NFPA 54 - National Fuel Gas Code.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with City of San Angelo standards.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Identify pipe with marking including size, water pressure rating.

1.5 REGULATORY REQUIREMENTS

A. Perform Work in accordance with City of San Angelo Plumbing Code, and the 2009 International Plumbing Code.

B. Conform to code for installation of backflow prevention devices.

C. Provide certificate of compliance from the City of San Angelo indicating approval of installation of backflow prevention devices.

1.6 DELIVERY, STORAGE, AND PROTECTION

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not install underground piping when bedding is wet or frozen.

2 PART 2 PRODUCTS

2.1 SANITARY SEWER PIPING

A. PVC Pipe: ASTM D3034 SDR 35.
1. Fittings: PVC.
2. Joints: ASTM F477, elastomeric gaskets.

B. PVC Pipe: ASTM D2665 or ASTM D3034.
1. Fittings: PVC.
2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.2 WATER PIPING, BELOW GRADE

A. Copper Tubing: ASTM B88, hard drawn, Type K.
1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
2. Joints: ASTM B32, solder, Grade 95TA.

2.3 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.

2.4 CONDENSATE DRAIN LINES

A. Copper Tubing: ASTM B88, Type L, hard drawn.
1. Joints: ASTM B32, solder, Grade 95TA.

2.5 NATURAL GAS PIPING, BURIED BEYOND 5 FEET OF BUILDING

A. Steel Pipe: ASTM A53 Schedule 40 black.
1. Fittings: ASTM A234/A234M with AWWA C105 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.
2. Joints: ANSI B31.1.

B. Polyethylene Pipe: ASTM D2513, SDR 11.5.
1. Fittings: ASTM D2683 or ASTM D2513 socket type.
2. Joints: Fusion welded.

2.6 NATURAL GAS PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Steel Pipe: ASTM A53 Schedule 40 black.
1. Fittings: ASTM A234/A234M.
2. Joints: ASME B31.1.
3. Jacket: AWWA C105 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.

2.7 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53 Schedule 40 black.
1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M.
2. Joints: NFPA 54, threaded or welded to ANSI B31.1.

2.8 FLANGES, UNIONS, AND COUPLINGS

A. Pipe Size 3 inches and Under:
1. Ferrous pipe: Class 150 malleable iron threaded unions.
2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Pipe Size Over 1 inch :
1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Grooved and Shouldered Pipe End Couplings:
1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.

2. Sealing gasket: "C" shape composition sealing gasket.

D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.9 GLOBE VALVES

A. Up To and Including 3 inches :
1. Manufacturers:
a. Grinnell or equal.
2. MSS SP-80, Class 125 bronze body, bronze trim, handwheel, teflon disc, threaded ends.

2.10 BALL VALVES

A. Manufacturer: Grinell or equal.

B. Construction, 2 inches and Smaller: Model 3810, three-piece body.

2.11 RELIEF VALVES

A. Pressure Relief:
1. AGA Z21.22 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

B. Temperature and Pressure Relief:
1. AGA Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F , capacity ASME SEC IV certified and labeled.

2.12 SOLENOID VALVES

A. Remotely Controlled:
1. Butler and Land 8210 Series. Coordinate voltage with Control Contractor.
2. Brass body, Type 3 general purpose enclosure.

2.13 FIRE STOP SYSTEMS

A. General Purpose Fire Stopping Sealant:
1. Water based, nonslumping, premixed sealant with intumescent properties, rated for 3 hours per ASTM E814 and UL 1479.

B. General Purpose Vibration Resistant Fire Stopping Sealant:
1. Silicone based, nonslumping, premixed sealant with intumescent properties, vibration and moisture resistant, rated for 3 hours per ASTM E814 and UL 1479.

C. DWV Plastic Pipe Systems Fire Stopping Sealant:
1. Silicone based, premixed sealant with intumescent properties, vibration and moisture resistant, rated for 3 hours per ASTM E814 and UL 1479 with metal collars.

3 PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 15260.

H. Establish elevations of buried piping outside the building to ensure not less than 2 ft of cover.

I. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.

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. Provide support for utility meters in accordance with requirements of utility companies.

L. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.

M. Excavate in accordance with Section 15100 for work of this Section.

N. Backfill in accordance with Section 15100 work of this Section.

O. Install bell and spigot pipe with bell end upstream.

P. Install valves with stems upright or horizontal, not inverted.

Q. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.

R. Install water piping to ASME B31.9.

3.4 APPLICATION

A. Use grooved mechanical couplings and fasteners only in accessible locations.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

D. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

E. Provide plug valves in natural gas systems for shut-off service.

3.5 ERECTION TOLERANCES

A. Establish invert elevations, slopes for drainage to 1/4 inch per foot maximum and 1/8 inch per foot minimum. Maintain gradients.

B. Slope water piping minimum 0.25 percent and arrange to drain at low points.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed and clean.

B. 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).

C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

H. Take samples no sooner than 24 hours after flushing, from 5 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.7 SERVICE CONNECTIONS

A. Provide new sanitary sewer service or tie into existing sewer service as shown on drawings. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with approved reduced pressure or double check backflow preventer and water meter with by-pass valves and pressure reducing valve or tie into existing water service valve as shown on drawings.

C. Provide new gas service or tie to existing gas line as shown on drawings. Gas service distribution piping to have initial minimum pressure of 5 pounds. Provide regulators on each building service line as shown on Drawings, sized in accordance with equipment. Regulator to be Rockwell 143 or equal for demands up to 800 CFH and Rockwell 243 or equal for demands up to 2500 CFH.

END OF SECTION

SECTION 15430 PLUMBING SPECIALTIES

1 PART 1 GENERAL

1.1 SECTION INCLUDES

A. Floor drains.

B. Cleanouts.

C. Hose bibs.

D. Backflow preventers.

E. Water hammer arrestors.

F. Pressure reducing valves.

1.2 RELATED SECTIONS

A. Section 15410 - Plumbing Piping.

B. Section 15440 - Plumbing Fixtures.

1.3 REFERENCES

A. ASME A112.21.1 - Floor Drains.

B. ASME A112.26.1 - Water Hammer Arrestors.

C. ASSE 1011 - Hose Connection Vacuum Breakers.

D. ASSE 1012 - Backflow Preventers with Immediate Atmospheric Vent.

E. ASSE 1013 - Backflow Preventers, Reduced Pressure Principle.

F. ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types.

G. AWWA C506 - Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valve Types.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.5 DELIVERY, STORAGE, AND PROTECTION

A. Accept specialties on site in original factory packaging. Inspect for damage.

1.6 EXTRA MATERIALS

A. Supply two hose end vacuum breakers for hose bibs.

2 PART 2 PRODUCTS

2.1 FLOOR DRAINS

A. Floor Drain:
1. Manufacturers:
a. Josam 30003-5A
b. Substitutions: Permitted.
2. ANSI A112.21.1; lacquered cast iron two piece body with double drainage flange, weep holes, 1/2" trap primer and round, adjustable Nikaloy strainer.

2.2 CLEANOUTS

A. Exterior Unsurfaced Areas:
1. Manufacturers:
a. Josam 58180-22.
b. Substitutions: Permitted.
2. Line type with lacquered cast iron body and round bronze cover.

B. Interior Finished Wall Areas:
1. Manufacturers:
a. Josam 58600
b. Substitutions Permitted.
2. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

2.3 HOSE BIBS

A. Exterior:
1. Manufacturers:
a. Woodford Model B-65.
b. Substitutions: Permitted.
2. Bronze or brass, one piece valve plunger to control both flow and drain functions, hose thread spout, loose key, vacuum breaker in conformance with ANSI/ASSE 1011, chrome finished box.

2.4 BACKFLOW PREVENTER

A. Double Check Valve Assemblies:

1. Manufacturers:
   a. Watts Series 009QT for lines 1/2" to 3".
   b. Watts Series 909 for lines 4" to 8".
   c. Substitutions: Permitted.
2. ANSI/ASSE 1015, AWWA C510; Bronze or epoxy coated ductile iron body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent; valve shut offs.

2.5 WATER HAMMER ARRESTORS

A. Manufacturer: Watts Series 15.

B. Other acceptable manufacturers offering equivalent products.
   1. Josam 75000-S Series.
   2. Substitutions: Permitted.

C. ANSI A112.26.1; copper or stainless steel construction, bellows or piston type sized in accordance with PDI WH-201, precharged suitable for operation in temperature range -33 to 180 degrees F and maximum 150 psi working pressure.

2.6 PRESSURE REDUCING VALVES

A. Manufacturer: Watts Series 223B or U5B.
   1. Substitutions: Permitted.

B. Construction: Bronze body, stainless steel strainer, threaded inlet and tailpiece, removable disc holder, sealed cage, high capacity.

C. Provide pressure reducing valve as required by local codes. Set pressure at 80 psi or as required to comply with local codes.

3 PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade. See Drawings for detail.

D. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on main water supply, boiler

feed water lines, janitor rooms, fire sprinkler system, premise isolation, irrigation systems, flush valves, interior and exterior hose bibs.

E. Pipe relief from backflow preventer to nearest drain.

F. Install water hammer arrestors on hot and cold water supply piping to each and every fixture.

END OF SECTION

SECTION 15440 PLUMBING FIXTURES

1 PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water closets.

B. Urinals.

C. Lavatories.

D. Electric water fountain.

E. Electric water heater.

F. Recirculating pump.

1.2 RELATED SECTIONS

A. Section 15140 - Supports and Anchors.

B. Section 15410 - Plumbing Piping.

C. Section 15430 - Plumbing Specialties.

1.3 REFERENCES

A. ARI 1010 - Drinking Fountains and Self-Contained Mechanically Refrigerated Drinking Water Coolers.

B. ASME A112.6.1 - Supports for Off-the-Floor Plumbing Fixtures for Public Use.

C. ASME A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.

D. ASME A112.19.2 - Vitreous China Plumbing Fixtures.

E. ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks, and Urinals.

F. NFPA 70 - National Electrical Code.

1.4 SUBMITTALS FOR REVIEW

A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.6 REGULATORY REQUIREMENTS

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

1.7 DELIVERY, STORAGE, AND PROTECTION

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.

1.8 EXTRA MATERIALS

A. Supply two sets of faucet washers, flush valve service kits and lavatory supply fittings.

2 PART 2 PRODUCTS

2.1 PLUMBING FIXTURE SCHEDULE

A. Refer to drawings for complete plumbing fixture schedule.

2.2 SUBSTITUTIONS

A. Substitutions permitted with Engineer's approval.

3 PART 3 EXECUTION

3.1 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.

3.2 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome plated flexible supplies to fixtures with 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, color to match fixture.

F. Solidly attach water closets to floor with lag screws. Lead flashing is not intended to hold fixture in place.

3.4 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.5 CLEANING

A. Clean plumbing fixtures and equipment.

3.6 PROTECTION OF FINISHED WORK

A. Do not permit use of fixtures.

3.7 SCHEDULES

A. Fixture Heights: Install fixtures to heights above finished floor as indicated.

1. Water Closet:
   a. Standard: 15 inches to top of bowl rim.
   b. Accessible: 17 1/2 inches to top of seat.
   c. Children's Accessible: 15 inches to top of seat.
2. Urinal:
   a. Standard: 24 inches to top of bowl rim.
   b. Accessible: 17 inches to top of bowl rim.
   c. Children's Accessible: 14 inches to to of bowl rim.
3. Lavatory:
   a. Standard: 31 inches to top of basin rim.
   b. Accessible: 34 inches to top of basin rim.
   c. Children's Accessible: 30 inches to top of basin rim.
4. Drinking Fountain:
   a. Standard Adult: 40 inches to top of basin rim.
   b. Accessible: 36 inches to top of spout.

c. Children's Accessible: 32 inches to top of spout.

B. Fixture Rough-In

	Hot	Cold	Waste	Vent
Water Closet:		1 inch	4 inch	3 inch
Urinal:		3/4 inch	2 inch	1-1/2 in
Lavatory:	1/2 inch	1/2 inch	2 inch	1-1/2 in
Drinking		1/2 inch	2 inch	1-1/2 in

END OF SECTION

SECTION 15800 – HVAC GENERAL PROVISIONS

1 PART 1 GENERAL

1.1 TERMS AND CONDITIONS

A. The General Conditions, Supplementary General Conditions and Division 1 documents apply to work of this section.

1.2 SUMMARY

A. It is intended that the air conditioning work indicated in the Specifications and/or on the drawings shall make up into working systems complete in every detail unless indicated otherwise.

B. All materials and labor, whether specifically indicated or not, but incidental to the proper installation of the air conditioning work, shall be furnished complete in every detail unless indicated otherwise.

C. Refer to the architectural, structural, and mechanical drawings for construction details, and coordinate work with that of other trades so as to avoid unnecessary delays or damage to any part of installation.

D. This section includes the necessary labor, materials, equipment, etc., to complete the air conditioning work that is indicated in or required by the contract documents.

E. Generally the air conditioning work includes, but is not limited to, the following:
   1. Air Duct Work
   2. Acoustical Duct Liner
   3. External Insulation
   4. Registers
   5. Grilles
   6. Diffusers
   7. Air Devices
   8. Refrigerant Piping and Fittings
   9. Valves and Accessories
   10. Refrigerant Pipe Insulation
   11. Condensate Drain Piping and Fittings
   12. Condensate Drain Pipe Insulation
   13. Air Handling Units
   14. Auxiliary Drain Pans
   15. Condensing Units
   16. Roof Curbs
   17. Foundations
   18. Sleeves
   19. Escutcheons
   20. Flashings
   21. Hangers
   22. Aluminum Louvers

23. Fire Dampers
24. Exhaust Fans
25. Rooftop Heating/Cooling Units
26. Controls

F. CODES

1. Comply with International Mechanical Code, 2009 Edition.
2. Code requirements shall have precedence over drawings and specifications. Perform modifications to meet code requirements at no additional cost. Notify Architect of such modifications.

G. PERMITS

1. Obtain and pay for all permits and similar required charges incurred on account of the work.

H. DRAWINGS AND SPECIFICATIONS

1. Should any discrepancies exist between the Air Conditioning Specifications and the Air Conditioning Drawings, the Air Conditioning Specifications shall govern.
2. The drawings are diagrammatic, but shall be followed as closely as actual construction of the project will permit. Changes from these drawings necessary to fit the work of various trades, to conform to equipment actually being installed, or the rules of authorities having jurisdiction shall be made at no additional cost.
3. Verify the exact locations and route of the various items with respect to the Architectural details and work of other trades. The Architect reserves the right to make reasonable changes in location of any equipment, controls or air outlets before installation without additional cost.
4. Shop drawings for the air conditioning work shall be furnished by the Contractor if required by the Architect or other trades.

I. SUBMITTALS

1. Submit complete descriptive data, including manufacturer, catalog number, and complete physical and other characteristics for the following items:
   a. Insulation - Pipe and Ductwork
   b. Registers, Grilles, Diffusers, and Air Devices
   c. Air Handling Units
   d. Condensing Units
   e. Roof Curbs
   f. Aluminum Louvers
   g. Fire Dampers
   h. Exhaust Fans
   i. Rooftop Heating/Cooling Units

j. Controls

2. Individual descriptive data sheets and items shall be identified clearly by corresponding letters, numbers, etc. to match corresponding identifications on air conditioning plans before submittals will be approved.
3. Submittals shall be prepared in accordance with requirements of Division I.
4. Partial submittals are not acceptable and will be returned without review.
5. Submit data to Architect for approval before ordering equipment.
6. If original submission is not approved, revise the brochures and resubmit until a submission is approved.

J. VERIFICATION

1. Verification of any job site conditions affecting the air conditioning work shall be the responsibility of the Contractor performing the work of this section unless indicated otherwise.

K. WORKMANSHIP

1. Labor shall be performed by mechanics skilled in their particular trades.
2. Workmanship not in accordance with standard approved practices for installing the air conditioning work shall be made to comply with these practices.
3. The Contractor and his employees shall perform their work in a safe manner and maintain adequate protection for their work, the owners property and all persons on the site to avoid injury, damage, or loss.

2 PART 2 MATERIALS

2.1 AGE

A. Materials for the air conditioning work must be new unless indicated otherwise.

2.2 STANDARDS

A. All items of material and equipment for standards have been established shall be so listed and shall bear listing labels.

2.3 STORAGE AND HANDLING

A. Store materials in a suitable location at the project site in manufacturer's original containers with labels intact.

B. Protect stored material and finished work from damage.

C. Damaged material or equipment shall be rejected and shall be replaced with undamaged items.

D. Close all openings with caps or plugs during construction.

2.4 ELECTRICAL WORK

A. Furnish and install all motors, thermostats, electric valves, and similar items.

B. Power wiring and connections are specified in Division 16 and will be provided under the appropriated sections.

C. Control wiring and wiring devices shall be provided under this Section.

2.5 MOTORS AND MOTOR STARTERS

A. Motors
1. General: Provide all motors generally in accordance with following except as otherwise specified under various equipment headings. Provide totally enclosed fan-cooled motors when exposed to weather.
2. Three-phase Motors: Where designated on drawings, motors shall be standard, drip-proof, squirrel cage induction type, NEMA Design B, with Class B insulation, 1750 rpm 60 cycle, rated at the voltage and HP indicated on the drawings for continuous duty with 1.15 service factor at 40 degrees C ambient temperature. Motors 75 hp and larger shall be increment starting type. Provide grease-lubricated anti-friction bearings, conservatively rated for long life at maximum load conditions, including radial and thrust loading imposed by drive. Provide alemite fittings.
3. Single-phase Motors: Motors shall be standard, drip-proof, 1750 rpm, 115/1/60 or 208/1/60 motors rated at indicated hp for continuous duty with 1.15 service factor at 40 degrees C ambient temperature. Motors 1/6 hp and larger shall be of capacitor start type; smaller motors of split-phase type and equipped with automatic thermal protectors. Provide grease-packed, sealed, anti-friction bearings, conservatively rated for long life at maximum load conditions, including loading imposed by drives.
4. Motor Noise: Replace motor which, in opinion of Architect, is found to have unreasonable noise characteristics, either at time of original installation or during guarantee period, with new "extra quiet" motor, at no additional cost to Owner.

B. Motor Starters: Except where otherwise noted, provide integral with the equipment or as specified under various equipment headings. Motor starters are included as part of work covered in DIVISION 16 - ELECTRICAL.

3 PART 3 EXECUTION

3.1 PROGRESS

A. The air conditioning work shall progress with the other work so that no delays in construction are incurred.

3.2 SCHEDULING

A. Schedule work and provide notice to permit inspection by the Architect and for Authorities having jurisdiction before the work is concealed. Installations shall be consistent in completeness and appearance whether enclosed or exposed. Any items which do not present a neat or workmanlike appearance shall be replaced at no additional cost.

3.3 CUTTING AND PATCHING

A. Perform all cutting, patching and sleeving required for the work. No cuts shall be made that will weaken the structure.

B. Perform all cutting and patching in accordance with the General Conditions and with Architect's approval.

C. Coordinate the work of other trades so that air conditioning work is installed when space is accessible. Cutting and patching caused by failure to coordinate work shall be performed at no additional cost.

D. At all points where piping penetrate the roof, this contractor shall flash and counterflash in an approved manner to obtain water tight construction at the penetration. Roof penetration shall be supervision of the roofing contractor.

E. All sleeves, floor penetration, etc. shall be sealed solid with approved material immediately upon the filling of that opening with pipe or duct.

3.4 LAYOUT OF WORK

A. Verify the exact location of equipment, controls and air outlets and route duct and piping with respect to Architectural details and work of other trades.

B. Adjust piping and ductwork locations to clear light fixtures, piping and other obstructions.

C. Drawings are diagrammatic and minor deviations to fit shall be anticipated.

D. Conceal piping and ductwork in the building structure (except in equipment rooms) unless indicated otherwise and run neatly with building lines when exposed.

3.5 CHANGES

A. Changes in price for the air conditioning work can only be made for changes in the original design intentions and only after written consent of the Architect.

3.6 CLEANING AND PAINTING

A. Dispose of unused material, equipment, waste and rubbish.

B. Remove all labels, dirt, paint, grease and stains from all exposed equipment installed under this contract to present a first class job suitable for occupancy.

C. Clean and touch-up paint all equipment provided under this section that has paint damage. Touch-up paint colors shall match perfectly.

3.7 CERTIFICATE OF ACCEPTANCE

A. Provide written certificates of acceptance from Authorities having jurisdiction before final inspection of the project.

3.8 INSPECTION

A. Upon completion of the contract, there will be a substantial completion inspection of the complete installation. Prior to this inspection, all work under this section shall have been completed, and put in perfect operating condition.

3.9 GUARANTEES AND OPERATING INSTRUCTIONS

A. Before project's final acceptance, the Contractor shall furnish to the Architect three bound sets of descriptive, dimensional and parts data for the following:
1. Registers, Grilles, Diffusers and Air Devices
2. Air Handling Units
3. Condensing Units
4. Exhaust Fans
5. Controls
6. Rooftop Heating/Cooling Units

B. Each set of this literature shall be bound in a permanent type hard cover ring binder and shall be suitably indexed.

C. Equipment manuals shall also include warranties, guarantees, and manufacturer's instruction shipped with equipment.

D. Furnish all special servicing tools and keys to any locked equipment. These materials shall be furnished to the Owner through the Architect prior to final inspection.

E. Furnish operating and maintenance data as specified herein for each product or system and include:

1. Name, address and telephone number of Subcontractor.
2. Description of unit and component parts.
3. Function, normal operating conditions.
4. Performance curves, engineering data and tests.
5. Complete nomenclature and commercial number of all replaceable parts.
6. Operating Procedures
   a. Start-up, break-in, routine and normal operating instructions.
   b. Regulation, control, stopping, shut-down and emergency instructions.
   c. Summer and winter operating instructions.
   d. Special operating instructions.
7. Maintenance Procedures:
   a. Routine operations.
   b. Guide to "trouble-shooting".
8. Parts Lists (Including Source).
9. Servicing and lubricating schedule: List of lubricant required.
10. Manufacturer's printed operating and maintenance instructions.
11. Description of sequence of operation by control manufacturer.
12. As installed control diagrams by controls manufacturer.
13. Instruction of Owner's Personnel:
    a. Prior to final inspection fully instruct Owner's designated operating and maintenance personnel in the operation, adjustment, and maintenance of all products, equipment and systems.
    b. Maintenance manual shall constitute the basis of instruction.
    c. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

3.10 GENERAL GUARANTEES

A. The Owner shall be guaranteed by the Contractor that any defects arising in the work within one year of the date of acceptance shall be corrected free of charge.

END OF SECTION

SECTION 15840 DUCTWORK

1 PART 1 GENERAL

1.1 WORK INCLUDED

A. Supply and Return Ducts.

B. Exhaust Ducts.

1.2 DEFINITIONS

A. Duct sizes: Inside clear dimensions for ducts.

B. For acoustically lined or internally insulated ducts, increase duct dimensions as required.

2 PART 2 PRODUCTS

2.1 MATERIALS

A. Ducts: Galvanized steel lock forming quality, having zinc coating of 1.25 ounces per square foot for each side.

1. Fasteners: Use rivets and bolts throughout; sheet metal screws accepted on low pressure ducts.

2. Sealant: Water resistant, fire resistive, compatible with mating materials.

2.2 LOW PRESSURE SHEETMETAL DUCT

A. Rectangular Ducts:

Largest Duct Dimensions	Gauges of Metal
Up to 18”	No. 26 US Gauge
19” thru 36”	No. 24 US Gauge
37” thru 60”	No. 22 US Gauge
61” thru 96”	No, 20 US Gauge
96” and Up	No. 18 US Gauge

B. Round Ducts:

1. Round ducts shall be 26 gage minimum. All transverse joints shall be secured with a minimum of 3 sheet metal screws.
2. Exposed round ducts shall be 22 gage minimum.

C. Boots to air outlets, returns or exhausts may be Thermaflex M-KF, or approved equal flexible duct.

1. Lengths shall be 48" maximum.
2. Seal duct at inlet and outlet connections with duct sealant.
3. Secure coated steel wire helix to sheet metal with sheet metal band or neoprene ties.
4. Seal insulation ends with foil tape - not duct tape.

D. Provide and install splitter dampers or butterfly dampers as indicated. These dampers shall have blades of 16 gauge steel fastened to square operating rods.

E. Butterfly dampers shall be the full width of the duct in which they are installed.

1. The operating rods shall be fittings with Young Regulators and the operating head shall be securely fastened in place so as to be exposed and accessible in the finished building.
2. Young regulators shall be recessed type with coverplate flush with finish where installed in finished areas.
3. In areas with lay-in ceiling, controllers shall be rod type with ball joint bracket and shall be accessible above ceiling.
4. Operators on round ducts shall be 637 Ventlok with insulation under regulator and adjacent insulation thoroughly sealed with foil tape.

F. To facilitate the final balancing of the air handling system, control devices shall be installed to control the quanity of air delivered by each individual outlet.

G. The following bracing, or SMACNA equal bracing, shall apply:

Largest Duct Dimension	Type of Transverse Joint Connection	Intermediate Bracing
Up thru 18"	S slip or drive slip on 8'-0 maximum centers.	None
19" thru 36"	1" pocket lock or standing S on 4'-0 maximum centers.	None
19" thru 36"	1" pocket lock or standing S on 8'-0" maximum centers.	1"x1"x1/8" angle 48" max.spacing
37" thru 48"	1-1/2" pocket lock or 1-5/8" standing S on 4'-0" maximum centers.	None

49"thru 54"	1-1/2" pocket lock, 22 ga. 8'-0" maximum center.	1-1/2"x 1-1/2" x 1/8" angle 36" max. spacing
55" thru 72"	1-1/2" pocket lock, 20 ga. on 8'-0", max. centers reinforced with 1-1/2" x 1-1/2" 3/16" bar.	1-1/2"x1-1/2" x 1/4" angle 36" max. spacing
73" thru 96"	2" standing S, 20 ga., reinforced with 2"x2"x3/16" angle on 30" maximum centers.	None

H. When ductwork is to remain exposed use 1/2" all-thread from structure and Unistrut P1000T suppport. Spacing shall be per Section 15090 Hangers & Supports.

I. Where indicated, ductwork shall be lined with 1-1/2" density Johns-Manville, Lina-Coustic, or Fiberglass duct liner.

J. Unless otherwise indicated, insulate all low velocity supply, return, exhaust and fresh air ducts constructed from galvanized steel. Insulation brand may be Manville, Owens Corning, or equal.

2.3 FLEXIBLE DUCT

A. Flexible duct shall be a factory fabricated assembly consisting of an inner sleeve, insulation and an outer moisture barrier. The inner sleeve shall be constructed of a continuous vinyl-coated spring steel wire helix fused to a continuous layer of fiber glass impregnated and coated with vinyl. A 1-1/4 inch thick insulating blanket of fiber glass wool shall encase the inner sleeve and be sheathed with an outer moisture barrier of a reinforced Molar or neoprene laminate of low permeability. The flexible duct shall be rated for a maximum working velocity of 6000 FPM and shall be listed by the Underwriters' Laboratories under their UL-181 standards as a Class 1 duct and shall comply with NFPA Standard #90A. The flexible duct shall be Thermaflex M-KE for low pressure application.

B. Flex duct shall not exceed 5'-0" in length or have more than 90 degree of bend. If longer duct is required, use round sheetmetal duct with 1-1/2" thick duct insulation to make-up the difference in length.

3 PART 3 - EXECUTION

3.1 FABRICATION

A. Complete metal ducts within themselves with no single partition between ducts. Open corners are not acceptable.

B. Lap metal ducts in direction of air flow. Hammer down edges and slips to leave smooth duct interior.

C. Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on center line.
   1. Where not possible and where rectangular elbows used, provide double wall air foil type turning vanes.

D. Increase duct sizes gradually, not exceeding 15 degrees divergence however possible. Maximum divergence upstream of equipment to be 30 degrees and 45 degrees convergence downstream.

E. Rigidly construct metal ducts, with joints mechanically tight, substantially airtight, braced and stiffened so as not to breathe, rattle, vibrate, or sag. Seal all joints.

F. Provide easements where low pressure ductwork conflicts with piping and structure. Where easements exceed 10% duct area, split into two ducts maintainting original duct area.

G. Ducts shall be so constructed and installed as to be completely free from vibration under all conditions of operation.

H. Round ducts, ells, and fittings shall have each transverse joint secured with a minimum of 3 sheetmetal screws.
   1. Each joint of round ducts and fittings shall be sealed with a double layer of 2" wide duct tape.

I. Items not shown in detail or covered by detailed specifications shall be as set forth in the SMACNA publication, Low Velocity Duct Construction Standards.

3.2 INSTALLLATION

A. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

B. At each point where ducts pass through partitions, seal joints around duct with sheet metal flanges all around duct, secured to wall, on both sides of wall.

C. Install supply and return grilles indicated and as required.

D. All duct joints shall be reasonably airtight.

E. Seal all transverse slip joints of all ducts. Sealant shall be heavy brush coat of Foster 30-02 or Hardcast 601. Exposed duct shall be sealed internal to joint. Do not insulate exposed duct.

END OF SECTION

SECTION 15850 - HEATING, VENTILATION AND AIR CONDITIONING EQUIPMENT

1 PART 1 GENERAL

1.1 SCOPE

A. Unless specifically designated otherwise herein, this Contractor shall furnish and/ or install each and every item of equipment described in this section and/or shown on the plans, together with all components and incidentals, materials, labor, fees, transportation, tools, storage, cutting, patching, cleanup, etc. necessary to complete the work.

B. Principal work is as follows
1. Heat pump VRF systems as noted and as scheduled on the drawings. Gas heat furnaces with DX coils and outdoor condensing units as noted and as scheduled.
2. Complete supply, return and exhaust ductwork systems with grilles, registers, diffusers and balancing dampers.
3. Thermal and Acoustical Insulation.
4. Complete Control Systems.
5. Equipment Start-Up, Testing, and Balancing.

1.2 ELECTRICAL

A. The Mechanical Contractor shall:
1. Furnish all control equipment, including motor starters, all control wiring, and all control wire installation.
2. Supervise and check out all wiring for correct operation of connected equipment.

B. Electrical Contractor will:
1. Furnish all electrical power wiring external to equipment.
2. Furnish and install all conduit and boxes.

C. Electrical characteristics shall be as noted on plans.

1.3 PLUMBING

A. Condensate drains from units to receptor shall be installed by this Air Conditioning Contractor. Condensate drain piping shall be Schedule 40 PVC.

B. Condensate drains shall be installed and run for complete and correctly operating systems.
1. Run from unit to floor drain for gas furnaces. Provide condensate pump and route condensate to main drain line for wall mounted indoor heat pump units.
2. Install plugged cleanouts at each change in direction to allow cleaning.
3. Provide insulation.

C. Supervise and check out all piping for correct operation of connected equipment.

1.4 EXISTING WORK

A. Locations and elevations of the various existing mechanical systems and equipment to be altered or reconnected have been taken from the plans of the existing building, measurements of the building, and other substantial reliable sources, and are offered a general guide only without guarantee as to complete accuracy. The detailed considerations involved in the work required on the existing facilities, including cutting and interferences, shall be thoroughly investigated by the Installing Contractor.

B. The Contractor shall examine the site and shall verify to his own satisfaction the location of all existing facilities and shall adequately inform himself as to their relations and effect on the work before submitting his bid.

C. The Contractor shall do all cutting required, and shall be responsible for all patching. Coordinate all work with other trades before cutting any portion of building or area which will affect other trades.

1.5 SCHEDULING OF CONSTRUCTION

A. Schedule construction operations so as to keep Owner in complete operation in all areas and at all times, except as specifically approved by Owner.

B. Schedule connections into existing services for minimum of inconvenience to the Owner. All such connections that will disrupt services shall be specifically approved by the Owner prior to disconnecting any service.

2 PART 2 - EQUIPMENT AND MATERIALS

2.1 AIR CONDITIONING SYSTEMS

A. Equipment

1. General: Unitary outdoor heat pumps as indicated on drawings shall be installed to provide performance and capacities shown on the drawings. Each system consists of an electrically controlled, air-to-air heat pump utilizing a scroll compressor for heating and cooling duty. Equipment shall be of the same manufacturer and shall be assembled and tested at the factory. The condensing unit and the fan coil units shall be matched and be certified to produce capacities and other performance requirements in conformance with ARI Standard 240 and 270. Their capacities shall be as indicated on the drawings. Efficiency will be minimum 16.0 SEER.

2. Air Handling Units: Shall meet the performance scheduled on plans without moisture carry-over and for static pressure loss encountered. Provide a condensate drain from the evaporator as indicated on drawings. Each evaporator shall be complete with insulated drain pan, expansion valve, insulated casing, fan, drive motor, belt drive high limit control, and filter section with throw away filters. Adjustable drive sheave shall be installed to provide the air quantity scheduled.
3. Condensing Units: All Power and control wiring shall be factory installed and terminated on a terminal strip. Hermetic compressor and condenser fan motor starters with thermal overload protection shall be included in the unit. Safety devices shall include high and low pressurestats. Provide low ambient head pressure control for 40 FBD or lower. All controls, starters, and wiring shall be in a compartment removed from condenser fan and coil. All units shall be factory painted with an enamel that is standard with the manufacturer with housing suitable for outdoor installation. Condenser coils shall have copper tubes with aluminum fins, factory pressure and leak tested. Furnish coil guards for units with vertical condenser coils. The compressor shall have a 10-year warranty.
4. Foundations: Provide concrete foundations for outdoor units as shown on the plans. Foundations and supports must be constructed in such a manner as to hold equipment a clear 6 inches above finish grade to avoid flooding.
5. Heating Section: Shall be natural gas, UL approved and meet capacities and performances shown on the drawings.

B. Units shall be as scheduled by Carrier, Mitsubishi, Trane or Lennox. Obtain Engineer's approval for other manufacturers.

C. Smoke detectors shall be Fenwall DH-400 AC/DC approved equal, furnished, installed, and wired completely.
1. Interlock A/C Unit Fan Controls thru smoke detector auxiliary contact.
2. Provide power to smoke detector from A/C control power. Provide transformer as required.
3. Detectors shall be complete, with duct housing sample tubes, and remote indicator lamps.
4. Mount detectors in supply air stream, all per Manufacturer's Recommendations and Fire Marshal's Requirements.
5. Mount firestat in return air stream prior to mixing with fresh air makeup.

2.2 FIRE DAMPERS

A. Fire dampers shall be installed in supply, recirculation and exhaust ducts wherever such ducts pass through fire walls, and as required by National Fire Protection Association recommendations and applicable local codes. Fire dampers shall be constructed and tested in accordance with

Underwriters Laboratory Standard UL-555. Fire dampers shall be operated by UL listed fusible link, 165 degrees F. Access panels shall be provided in duct enclosures or in general construction as required to permit access to duct for resetting the damper. Dampers are to have spring closure. Dampers shall have equivalent to Air Balance, Inc., "Fireseal". Equivalent dampers as made by Advanced Air, Ruskin Mfg. Co., Prefco, etc., may be used. Fire dampers shall be installed as per SMACNA manual. Damper shall be 100% free duct opening area type with steel sleeve and retaining angles.

2.3 CONTROL SYSTEM

A. The HVAC Temperature Control Systems shall be furnished complete in all respects under this Section of the specifications. All unit controls and controls furnished as an integral part of the unit shall be furnished under this Section of the specification.

B. All control wiring shall be color coded.

C. Control Wiring shall be installed in conduit where required for physical protection of wiring.

D. Sufficient relays and other protective devices shall be employed as required to eliminate feed-back in all control circuits.

E. All low voltage wiring shall be provided by under Division 15 of the Specifications.

F. Only line voltage interlock wiring or other line voltage wiring specifically specified in Division 16 or shown on the Electrical Drawings shall be provided by the Electrical Trades. Coordinate with electrical trades for portions of conduit systems provided under Division 16 of the specifications.

G. The control systems shall be equivalent to the type indicated on the drawings, and the contractor shall provide and install all components and wiring required to effect a complete and operating system.

2.4 EXHAUST FANS

A. Provide exhaust fans as scheduled and as noted.

B. Equal fans by Cook, Acme, Greenheck or Penn are approved.

2.5 GRILLES AND REGISTERS

A. Registers, grilles, and diffusers shall be surface mounted steel type, as manufactured by Titus or equal. Ceiling devices shall be off-white to match ceiling. Wall grilles and registers shall be off-white, or painted as directed by the Architect, except where noted otherwise on the drawings.

Where fire rated air devices are required they shall be steel and UL listed for their intended use.

B. Equipment and materials shall be as specified on the drawings.

C. All diffusers and registers shall have opposed blade dampers where access to volume dampers is difficult after building is finished.

D. All grilles, registers and ceiling outlets shall be selected to provide a noise criteria no greater than 25. Grilles, registers, and outlet sizes shown on the drawings are minimum sizes; and where larger sizes are required to comply with the above noise criteria, larger grilles, registers and ceiling outlets shall be furnished and installed at no additional cost to the Owner. It shall be the Contractor's responsibility to arrange for any additional space required for such larger grilles, registers and ceiling outlets.

E. Paint all surfaces above (or behind) perforated return air grilles or other open spaced air outlet devices with flat black paint. All piping, conduits, ductwork, structural members shall be painted. Make sure that no nonpainted surfaces are visible to a person standing on the room side and viewing through the device.

F. Diffusers and grilles designated for maximum security type shall be constructed of heavy gauge aluminum or stainless steel designed specifically for installation in such environment. All exposed mounting hardware shall be tamperproof. Provide clamping ring for ceiling mounted devices.

G. Other equal Manufacturers: Airmate, J and J, Metal Aire, Carnes, and other equals.

2.6 FAN CONNECTIONS

A. At all points where ducts connect to fans, provide and install flexible connections. These connections are to be long enough to permit a minimum separation of 3" between duct and fan or unit housing with at least 1" slack in the flexible material itself.

B. These flexible connections shall be made using Ventfab canvas that has been chemically treated to make it fire resistant, waterproof, mildew-resistant, and practically air-tight, and shall weigh approximately 30 oz. per sq. yd. before treating.

2.7 FRESH AIR INTAKE AND EXHAUST OUTLET

A. Fresh air intake and exhaust outlet shall be fabricated as noted.

3 PART 3 EXECUTION

3.1 INSPECTION

A. Examine all areas and conditions under which work of this Section will be installed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 HVAC SYSTEM LAYOUT

A. Lay out the HVAC system in careful coordination with the drawings. Follow the general layout shown on the drawings in all cases except where other work may interfere. Lay out all pipes to fall within partition, walls or roof cavities, and do not require furring other than as shown on the drawings. Coordinate locations of registers, grilles, and diffusers with ceiling layout and other building components.

3.3 INSTALLATION GENERAL

A. Install all HVAC components to clear all beams and obstructions.

B. Provide sleeves for all piping and ducts passing through concrete masonry walls, roofs, and floors. Sleeves shall be of sufficient size to clear by 1/4" all around. Sleeves shall be cut off flush with wall face or below floors and shall extend 6" above the floor or roof. Sleeves around pipe passing through ground floor or outside walls shall be caulked water tight with oakum and plastic cement. Chrome plated brass escutcheons shall be provided wherever pipes pass through floors, walls, and ceilings of finished areas.

3.4 AIR DUCT WORK

A. Air ducts shall be installed as indicated on the drawings and coordinated with the work of the other trades. Check all drawings for exact locations to prevent interferences.

B. Splitter dampers shall be furnished and installed where indicated on the drawings and as required at each branch for air distribution control to the respective branches. Provide chrome plated concealed damper regulators for ducts exposed to view. A sheet metal wear plate shall be attached to the top and bottom of the duct to prevent damper tearing duct liner. Provide end bearings on all dampers.

C. Flashing and counterflashing shall be furnished and installed at all ducts passing through roof and exterior walls to the satisfaction of the Architect.

D. Flexible air duct connections shall be furnished and installed as indicated on the drawings. Flexible air duct runs to diffusers shall not exceed 5 feet.

E. Seal visible openings and audible air leaks at operating conditions. Leakage shall be in accordance with section 4 of SMACNA HVAC Air Duct Leakage Test Manual. Additional care shall be taken with ducts involved in smoke purge systems. Such duct shall be sealed in accordance with SMACNA medium pressure duct system requirements.

3.5 PIPING SUPPORTS

A. Provide all pipe supports required. Horizontal runs of pipe in the building shall be rigidly supported to building structures with adjustable swivel couplings and rod type hangers for sizes #4 and smaller. Perforated strap hangers will not be permitted in any part of the work. Pipe hangers and supports shall be located near change of directions and at points required to properly support piping. Spacing or hangers and supports shall not exceed the following maximum distances between supports:

Pipe Size	Span
1/2" and smaller	5'-0"
1 1/8"	7'-0"
All Plastic piping	4'-0"

B. Provide sheet metal "saddles" at each pipe hanger or support for insulated piping to prevent damage to insulation.

3.6 EQUIPMENT AND OUTLET LOCATION

A. Locations for equipment and outlets for the HVAC work shall be determined by the Architect. Install in accordance with manufacturer's instructions.

3.7 EXHAUST FANS

A. Install exhaust fans and related accessories as indicated on the drawings.

3.8 CONTROL DAMPERS

A. Assemble multiple section dampers with required interconnecting linkage and extend required number of shafts through duct for external mounting of damper motors.

3.9 PIPING AND ACCESSORIES

A. Installation: Joints in copper tubing shall be brazed with silver solder as hereinbefore specified. Surplus brazing material shall be removed at all joints in lines not insulated.

B. Surface Preparation: Prior to insulation installation, clean and dry exterior surfaces of pipe, fittings and valves.

3.10 REFRIGERANT

A. When installation is completed, the Contractor shall thoroughly test for leaks, make the system tight, apply a deep vacuum, and fully charge them with refrigerant. Upon completion of the operating tests, he shall replace any oil or refrigerant lost during the test operations. Upon acceptance Contractor shall leave the systems fully charged.

END OF SECTION

SECTION 15990 TESTING, ADJUSTING AND BALANCING

1 PART 1 GENERAL

1.1 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Measurement of final operating condition of HVAC systems.

1.2 ALLOWANCES

A. Allowance includes testing, adjusting, and balancing of mechanical systems. Work is included in this section and is part of the Contract Sum/Price.

1.3 REFERENCES

A. AABC - National Standards for Total System Balance.

B. ADC - Test Code for Grilles, Registers, and Diffusers.

C. ASHRAE 111 - Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-conditioning, and Refrigeration Systems.

D. NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

E. SMACNA - HVAC Systems Testing, Adjusting, and Balancing.

1.4 SUBMITTALS

A. Test Reports: Indicate data on forms containing information indicated in Schedules and Drawings.

2 PART 2 PRODUCTS

Not used

3 PART 3 EXECUTION

3.1 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. Volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.
12. Proper strainer baskets are clean and in place.
13. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.

C. Beginning of work means acceptance of existing conditions.

3.2 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations.

B. Provide additional balancing devices as required.

3.3 INSTALLATION TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 10 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.4 ADJUSTING

A. An independent testing agency shall perform test described herein, tests being made in the presence of Architect or his representative and to his complete satisfaction.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

F. Piping and ductwork shall be checked and the approved by the Architect before being concealed. The Architect shall be notified at least 24 hours prior to inspection time. No piping or ductwork shall be covered or concealed until approval has been obtained.

G. After work is completed, entire job shall be tested under actual working pressures and conditions and valves and automatic attachments are to be properly set before job is turned over to Owner.

3.5 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.

B. Make air quantity measurements in 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 and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

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. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

I. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

3.6 SYSTEM TESTING AND BALANCING

A. Testing and balancing shall be performed in complete accordance with AABC and/or N.E.B.B. Standards for Field Measurement and Instrumentation, Form

No. 81266, Volume One. Testing and balancing shall be performed by an independent testing agency.

B. Instruments used for testing and balancing of systems must have been calibrated within a period of six months and been checked for accuracy prior to start of work.

C. Five copies of the complete test report shall be submitted prior to final acceptance of the project.

D. The Air Balance and Testing shall be performed in accordance with the following requirements.
1. Test and adjust blower rpm to design requirements.
2. Test and record all motor full load amperes and nameplate data.
3. Make pilot tube traverse of main supply and obtain design cfm at fans.
4. Test and record system static pressures, suction and discharge.
5. Test and adjust system for design cfm recirculated air.
6. Test and adjust system for design cfm outside air.
7. Test and record entering air temperatures (db heating and cooling).
8. Test and record entering air temperatures (wb cooling).
9. Test and record leaving air temperatures (db heating and cooling).
10. Test and record leaving air temperatures (wb cooling).
11. Adjust all main supply and return air flows, and all fans to proper design cfm.
12. Test and adjust each diffuser, grille and register to within 5% of design requirements.
13. Identify each diffuser, grille and register as to location and area.
14. Identify and list size, type, and manufacture of diffusers, grilles, registers, and all testing equipment. Use manufacturer's rating all equipment to make required calculations.
15. In readings and test of diffusers, grilles, and registers, include required fpm velocity and test fpm velocity, and required cfm and test cfm after adjustments.
16. Verify location and operation of all fusible link and smoke dampers, and record results.
17. All air conditioning units shall be tested in both heating and cooling modes.

E. As part of this contract the Mechanical Contractor shall make any changes in the pulleys, belts and dampers, as required for correct balance at no additional cost to the Owner.

END OF SECTION

SECTION 16000 GENERAL PROVISIONS FOR ELECTRICAL

1 PART 1 GENERAL

1.1 SPECIAL NOTE

A. The Architectural and Structural Plans and Specifications, including the supplements issued thereto, Information to Bidders, and other pertinent documents issued by the Owner, are a part of these specifications and the accompanying mechanical and electrical plans, and shall be complied with in every respect. All the above is included herewith, will be issued separately or is on file at the Owner's office, and shall be examined by all bidders. Failure to comply shall not relieve the Contractor of responsibility or be used as a basis for additional compensation due to omission of drawings. Where the Supplementary General Conditions conflict with the General Conditions, the Supplementary General Conditions shall govern.

B. All work covered by this division of the specifications shall be accomplished in accordance with all applicable provisions of the contract documents and any addenda or directive which may be issued.

1.2 CHECKING DOCUMENTS

A. The drawings and the specifications are numbered consecutively. The Contractor shall check the drawings and specifications thoroughly and shall notify the Owner of any discrepancies or omissions of sheets or pages. Upon notification, the Owner will promptly provide the Contractor with any missing portions of the drawings or specifications. No discrepancies or omissions of sheets or pages of the contract documents will relieve the Contractor of his duty to provide all work required by the complete contract documents.

1.3 QUALITY ASSURANCE:

A. All plumbing work shall be in accordance with the requirements of the International Plumbing Code, 2009 Edition.

B. All mechanical work shall be in accordance with the requirements of the International Mechanical Code, 2009 Edition.

C. All electrical work shall be in accordance with the requirements of the National Electrical Code, 2008 Edition.

D. Buy American Act: Only domestic construction materials will be used by the Contractor, Subcontractors, materialmen, and suppliers in the performance of this contract.

E. Products Criteria:

1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 3 years. See other specification sections for any exceptions.

2. Equipment Service: Products shall be supported by a service organization which maintains an adequate inventory of repair parts and is located within a one hundred mile radius of the site.

3. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.

4. Assembled Units: Manufacturers of equipment assemblies, which use components made by others, assume, complete responsibility for the final assembled product.

5. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.

F. Manufacturer's Recommendations: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Architect prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

1.4 LAWS, CODES AND ORDINANCES

A. All work shall be executed in strict accordance with all local, state and national codes, ordinances and regulations governing the particular class of work involved, as interpreted by the inspecting authority. The Contractor shall be responsible for the final execution of the work under this heading to suit those requirements. Where these specifications and the accompanying drawings conflict with these requirements, the Contractor shall report the matter to the Owner, shall prepare any supplemental drawings required illustrating how the work may be installed so as to comply and, on approval, make the changes at no cost to the Owner. On completion of the various portions of the work the installation shall be tested by the constituted authorities, approved and, on completion of the work, the Contractor shall obtain and deliver to the Owner a final certificate of acceptance.

1.5 TERMINOLOGY

A. Whenever the words "furnish", "provide", "furnish and install," "provide and install", and/or similar phrases occur, it is the intent that the

materials and equipment described be furnished, installed and connected under this Division of the Specifications, complete for operation unless specifically noted to the contrary.

B. Where a material is described in detail, listed by catalogue number or otherwise called for, it shall be the Contractor's responsibility to furnish and install the material.

C. The use of the word "shall" conveys a mandatory condition to the contract.

D. "This section" always refers to the section in which the statement occurs.

E. "The project" includes all work in progress during the construction period.

F. "Concealed" areas are those areas which cannot be seen by the building occupants from the floor with all building components in place.

G. "Exposed" areas are all areas which are exposed to view by the building occupants including mechanical rooms.

H. In describing the various items of equipment, in general, each item will be described singularly, even though there may be a multiplicity of identical or similar items.

1.6 ENGINEER'S STATUS DURING CONSTRUCTION:

A. The work, from its commencement to its completion, shall be under the exclusive charge and control of the Contractor, and all risks in connection therewith shall be borne by the Contractor.

B. The Engineer's efforts during periodic site visits will be directed toward assisting the Architect in providing assurance for the Owner that the completed project will conform to the requirements of the contract documents, but the Engineers will not be responsible for the Contractor's failure to perform the work in accordance with contract documents.

C. The Engineer will make recommendations to the Architect regarding disapproval or rejection of work which, in his opinion, is defective, i.e.; is unsatisfactory, faulty or defective, or does not conform to the requirements of the contract documents. Failure on the part of the Engineer to recommend disapproval of or rejection of work, methods, or acts or omissions of any kind shall never at any time be deemed to constitute acceptance or approval of the same.

1.7 GENERAL

A. In general, the lines and ducts to be installed by the various trades under these specifications shall be run as indicated, as specified herein, as required by particular conditions at the site, and as required to conform

to the generally accepted standards as to complete the work in a neat and satisfactorily workable manner. The following is a general outline concerning the running of various lines and ducts and is to be excepted where the drawings or conditions at the building necessitate deviating from these standards.

B. All piping, conduit and ductwork for the mechanical and electrical trades shall be concealed in chases in finished areas, except as indicated on the drawings. Horizontal lines run in areas that have ceilings shall be run concealed in those ceilings, unless otherwise specifically indicated or directed.

C. Piping, ductwork, conduits and raceways may be run exposed in machinery and equipment spaces, where serving as connections to motors and equipment items in finished rooms where exposed connections are required, and elsewhere as indicated on the drawings or required.

D. All conduits in any space where they are exposed shall run parallel with the building walls. They shall enter the concealed areas perpendicular with the walls, ceilings or floors. Fittings shall be used where necessary to comply with this requirement.

E. The Contractor shall thoroughly acquaint himself with the details of the construction and finishes before submitting his bid as no allowances will be made because of the Contractor's unfamiliarity with these details. Place all inserts in masonry walls while they are under construction. All concealed lines shall be installed as required by the pace of the general construction to precede that general construction.

F. The mechanical and electrical plans do not give exact details as to elevations of lines and ducts, exact location, etc., and do not show all the offsets, control lines, pilot lines and other installation details. The Contractor shall carefully lay out his work at the site to conform to the architectural and structural conditions, to provide proper grading of lines, to avoid all obstruction, to conform to details of installation supplied by the manufacturers of the equipment to be installed, and thereby to provide an integrated, satisfactorily operating installation. Each Contractor shall verify that each item of mechanical equipment, each electrical panel, light fixture, and device, each grille or ceiling outlet, and each other item of work furnished by him shall fit into the available space before ordering same. Any required changes due to the Contractor's failure to verify that each item of his equipment will fit into the available space shall be made by the Contractor furnishing the equipment, all at no additional cost to the Owner.

G. The routing of piping, ductwork, conduits, etc., indicated on the drawings is approximate and where light fixtures or other items of work are to be recessed in ceiling, piping, ductwork, conduits, etc., shall be routed around the light fixtures or other items of work where there is not sufficient space for same to be routed above such item of work with the

recessed item properly installed. Any required changes due to the Contractor's failure to properly coordinate his work with recessed items shall be made by the Contractor installing such piping, ductwork, conduits, etc., all at no additional cost to the Owner.

H. The electrical plans show diagrammatically the locations of the various electrical outlets and apparatus and the method of circuiting and controlling them. Exact locations of these outlets and apparatus shall be determined by reference to the general plans and to all detail drawings, equipment drawings, roughing-in drawings, etc., by measurements at the building, and in cooperation with other sections, and in all cases shall be subject to the approval of the Owner. The Owner reserves the right to make any reasonable change in location of any outlet or apparatus before installation (within 10 feet of location shown on drawings) or after installation if an obvious conflict exists, without additional cost to the Owner.

I. The Contractor shall submit working scale drawings of all his apparatus and equipment which in any way varies from these specifications and plans, which shall be checked by the Owner before the work is started, and interferences with the structural conditions shall be corrected by the Contractor before the work proceeds.

J. Order of precedence shall be observed in laying out the pipe, ductwork, material, and conduit in order to fit the material into the space above the ceiling and in the chases and walls. The following order shall govern:

1. Items affecting the visual appearance of the inside of the building such as lighting fixtures, diffusers, grilles, outlets, panelboards, etc. Coordinate all items to avoid conflicts at the site.

2. Large ducts and pipes with critical clearances.

3. Conduit, water lines, and other lines whose routing is not critical and whose function would not be impaired by bends and offsets.

K. Piping, ducts, and conduits serving outlets on items of equipment shall be run in the most appropriate manner. Where the equipment has built-in chases, the lines shall be contained therein. Where the equipment is of the open type, the lines shall be run as close as possible to the underside of the top and in a neat and inconspicuous manner. All piping, ductwork, conduits and all other items of work supported from the structure above shall be installed as high as physically possible (not just as convenient) considering all work required to be installed in the available space. If any such work is installed lower than it could have been installed, the Contractor shall furnish all labor, equipment, and materials to remove same and reinstall the work as high as possible, all at no additional cost to the Owner.

L. Adequate provisions shall be provided for the replacement of all filters.

M. In addition to insulation called for elsewhere in the specifications, all piping and equipment subject to condensation and/or whose normal operating surface temperature is below 70 degrees F or above 110 degrees F shall be insulated. All piping subject to condensation and/or whose operating temperature is below 70 degrees F shall be insulated same as specified elsewhere in the specifications for chilled water or refrigerant suction line piping. All piping with operating surface temperature above 110 degrees F shall be insulated same as specified elsewhere in the specifications for domestic hot water or steam piping. All insulation shall be provided by the particular Contractor who installs the particular equipment or piping system. All equipment shall be insulated and finished in a manner suitable for the conditions and as approved by the Engineers. Armaflex insulations shall not be permitted in breathing air spaces.

N. Exceptions and inconsistencies in plans and specifications shall be brought to the Owner's attention before the contract is signed. Otherwise, the Contractor shall be responsible for any and all changes and additions that may be necessary to accommodate his particular apparatus, material, or equipment.

O. The Contractor shall distinctly understand that the work described herein and shown on the accompanying drawings shall result in a finished and working job, and any item required to accomplish this intent shall be included whether specifically mentioned or not.

P. Each bidder shall examine the plans and specifications for the General Construction. If these documents show any item requiring work under Division 15 or 16 and that work is not indicated on the respective "M", "P" or "E" drawings, he shall notify the Owner in sufficient time to clarify before bidding. If no notification is received, the Contractor is assumed to require no clarification, and shall install the work as indicated on the General Plans in accordance with the specifications.

1.8 DIMENSIONS

A. Before ordering any material or doing any work, the Contractor shall verify all dimensions, including elevations, and shall be responsible for the correctness of the same. No extra charge or compensation will be allowed on account of differences between actual dimensions and measurements indicated on the drawings. Any difference which may be found shall be submitted to the Owner for consideration before proceeding with the work.

1.9 INSPECTION OF SITE

A. The accompanying plans do not indicate completely the existing mechanical and electrical installations. The bidders for the work under these sections of the specifications shall inspect the existing installations and thoroughly acquaint themselves with conditions to met and the work to be accomplished in removing and codifying the existing work, and in

installing the new work in the present building and underground serving to and from that structure. Failure to comply with this shall not constitute grounds for any additional payments in connection with removing or modifying any part of the existing installations and/or installing any new work.

1.10 ELECTRICAL WIRING

A. All electric wiring of every character, both for power supply, for pilot and control, for temperature control, for communications, etc. will be done under Division 16 of these specifications. The Contractor for each section shall erect all his motors in place ready for connections. The Contractor, under Division 16, shall mount all the starters and controls, furnishing the supporting structures and any required outlet boxes.

B. Every electrical current consuming device furnished as a part of this project, or furnished by the Owner and installed in this project, shall be completely wired up under Division 16. Verification of exact location, method of connection, number and size of wires required, voltage requirements, and phase requirements is the responsibility of the Contractor under Division 16. If conflicts occur between the drawings and the actual requirements, actual requirements shall govern.

1.11 MOTORS AND CONTROLS

A. All motors furnished under any of the several sections of these specifications shall be of recognized manufacture, of adequate capacity for the loads involved and wound for the current characteristics shown on the electrical drawings. All motors shall conform to the standards of manufacture and performance of the National Electrical Manufacturer's Association as shown in their latest publications. They shall further be listed by Underwriters Laboratories.

B. Unless otherwise noted, the Contractor under Division 16 shall furnish each motor with a starter and all controls of the types specified or required. The starters shall be of the totally enclosed type, of capacity rating within the required limits of the motors which they are to serve, shall be suitable for the motor current characteristics and shall provide thermal overload protection. All starters shall be of standard manufacture and performance as defined by the National Electrical Manufacturers' Association. They further shall be listed by Underwriters Laboratories. Provide overload protection in each phase wire.

C. All motors larger than 1/3 horsepower shall be of a type that the power consumed is in approximate direct proportion to the load on the motor. At 50% of rated brake horsepower, the power consumed shall be approximately 50% of the power consumed at full load.

1.12 TESTING

A. The Contractor under each division shall at his own expense perform the various tests as specified and required by the Owner and as required by the State and local authorities. The Contractor shall furnish all fuel and materials necessary for making test.

1.13 PAINTING

A. Painting for Divisions 15 and 16 shall be as follows:

1. If the factory finish on any apparatus or equipment is marred, it shall be touched up and then given one coat of half-flat-half-enamel, followed by a coat of machinery enamel of a color to match the original. Paint factory prime surfaces.

1.14 SEALING AROUND PIPES, CONDUITS, DUCTS, ETC.

A. The Contractor installing pipes, conduits, ducts, etc. shall seal all spaces between pipes and/or sleeves where they pierce walls, partitions or floors with Dow Corning No. 2000 fire resistant caulk. The packing shall effect a complete fire and/or air seal where pipes, conduits, ducts, etc., pierce walls, floors or partitions.

1.15 GENERAL

A. The contractor shall provide all labor, equipment, materials, etc. and shall perform all operations in connection with the installation of electrical work in accordance with these contract documents.

B. The contractor shall execute all work specified or indicated on accompanying drawings. Contractor shall provide all equipment necessary and usually furnished in connection with such work and systems, whether or not specifically mentioned.

C. Every contractor shall be responsible for all his work fitting into place in a satisfactory and neat workmanlike manner in every particular to the approval of the owner.

D. Confer with the general contractor and other contractors regarding the location and size of pipes, equipment, fixtures, conduit, ducts, openings, switches, outlets, etc., that there be no interferences between the installation or progress of the work of any contractor on the project.

E. The electrical drawings are diagrammatic and shall be followed as closely as actual construction of the building and the work of other trades will allow. All changes from drawings necessary to make the work of each contractor conform to the building construction and the work of other trades shall be done at the appropriate contractor's expense.

F. Should any bidder consider that any requirement of these specifications and drawings will make the effective operation of any portion or the whole installation impossible, or if he feels a vital component has been omitted, he must describe in his bid changes he deems necessary. Failure to do so shall be considered as an agreement on the part of the bidder to guarantee the effective operation of the installation.

G. All equipment shall be installed complete with all necessary fittings, supports, accessories, etc., as necessary for a complete installation, providing the desired function. All equipment shall be installed in accordance with manufacturer's recommended procedure unless specifically stated otherwise.

H. Nothing in these specifications or drawings shall be construed as directing any contractor from deviating from any legally binding code or ordinance.

1.16 SUBMITTALS

A. Sequence: The contractor is required to submit four copies of the following types of information:

1. Prior to ordering equipment: shop drawings/ component data.

2. At the end of the project before final inspection: maintenance manuals, warranties, certificate of owner's instruction and a certificate of receipt of loose items.

B. Maintenance manuals shall include shop drawings, wiring diagrams, operating instructions, lubrication instructions, maintenance instructions, parts lists, and test reports.

2 PART 2 PRODUCTS

A. PRODUCT LISTING

1. When two or more items of same material or equipment are required, they shall be of the same manufacturer. Product manufacturer uniformity does not apply to raw materials, bulk materials, wire, conduit, fittings, sheet metal, steel bar stock, welding rods, solder, fasteners, motors for dissimilar equipment units, and similar items used in work, except where indicated otherwise.
2. Provide products which are compatible within systems and other connected items.

B. NAMEPLATE DATA

1. Provide permanent operational data nameplate on each item of power operated equipment. Indicate manufacturer, product name, model number, serial number, capacity, operating and power

characteristics, labels of tested compliances, and similar essential data. Locate nameplates in an accessible location.

3 PART 3 EXECUTION

3.1 OPENINGS AND SLEEVES IN CONSTRUCTION

A. Most openings required in wall, floor, roof, ceiling, etc., construction for electrical work will be provided by the general contractor in accordance with information furnished by the electrical contractor. All sleeves, inserts, forms, etc., required for openings shall be furnished by the contractor requiring same. The electrical contractor shall be responsible for their size, fabrication and location. Where new work has been installed previous to this request, the general contractor will do the necessary cutting and patching at the expense of the electrical contractor.

3.2 PROTECTING SITE

A. Provide adequate barricades, signs, torches, etc. as required during progress of the work. Observe all applicable regulations respecting safety provisions.

B. Protect utilities, trees, shrubbery, fences, poles, sidewalks, curbs and all other property and surface structures from damage. Any items which are damaged shall be restored by the contractor at his own expense.

3.3 MECHANICAL-ELECTRICAL COORDINATION

A. Unless otherwise specified the electrical contractor will furnish and install all conduit, wiring, disconnects, starter, overloads, holding coils, remote pushbutton stations, control switches, and pilot lights for all electrically operated mechanical equipment, including final connections.

B. The mechanical contractor shall provide and connect wiring for all control devices such as thermostats, pressure sensors, humidistats, etc., associated with the mechanical equipment, and shall install those items which due to their method of operation must be connected or integrated into the equipment. Items not attached to mechanical equipment, conduit, duct or piping shall be installed by the electrical contractor. All wiring for mechanical control shall be provided and installed by the mechanical contractor. The mechanical contractor is responsible for coordinating his requirements with the electrical contractor. Control diagrams shall be provided by the mechanical contractor.

C. Each contractor shall consult with the electrical contractor before ordering or installing electrical equipment and shall be responsible to insure the equipment installed is of proper size and type.

D. After wiring is completed by the electrical contractor, each mechanical contractor shall inspect the appropriate wiring before motors are

operated. If any discrepancies are discovered, the mechanical contractor shall notify the owner in writing. The owner shall arrange to have changes made as required.

3.4 MOUNTING HEIGHTS TO COMPLY WITH ADA REGULATIONS

A. Install all electrical components regulated by ADA regulations at heights required in areas of the building which comply with ADA regulations. Coordinate the height of any component not listed below.

B. Electrical Components:
1. Light Switches: 48" max. (measured to top of box).
2. Receptacles and Telephone Jacks: 18" min. (measured from floor to center of box).
3. Thermostats: 48" max. (measured from floor to top of box).
4. Audio/Visual Warning Devices: 80" max. (measured from floor to center of device).

3.5 STRUCTURAL CONDITIONS

A. These specifications and the drawings accompanying same are intended to cover an installation which will not interfere with the structural design of the building, which will fit into the several available spaces, and which will insure a complete and satisfactory mechanical and electrical system.

B. Each bidder shall carefully examine the plans for all branches of the work and shall be responsible for the proper fitting of his material and apparatus into the building.

C. Should the particular equipment which any bidder proposes to install require other space conditions than those shown on the drawings, he shall arrange for such space with the Architect before submitting his bid. Should changes become necessary on account of failure to comply with this clause, the Contractor shall make such necessary changes at his (the Contractor's) own expense.

3.6 OWNER INSTRUCTIONS

A. Each contractor shall instruct the owner's representative in the operation and maintenance of each system. Instruction periods shall be at the convenience of the owner. Submit a letter signed by the owner certifying satisfactory completion of instructional activities.

3.7 FINAL INSPECTION

A. Final inspection will be made only after the contractor certifies in writing that the work is 100% complete.

B. A representative from each contractor and sub-contractor shall be present and be prepared to assist the owner in performing the inspection.

C. A report describing incomplete or unacceptable work will be reviewed with the contractor. The contractor shall then certify to the owner in writing that such unacceptable or incomplete work is 100% corrected.

3.8 PROJECT CLOSEOUT

A. Before final application for payment will be accepted, contractor must complete the following requirements:

1. Final inspection performed and all corrections made.

2. Submittal of maintenance manuals, certificate of owner instruction, equipment warranties and receipt for loose items.

END OF SECTION

SECTION 16010 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

1 PART 1 - GENERAL

1.1 DESCRIPTION

A. Related Work Specified Elsewhere:

1. Construction Schedules: Section 01310.

2. Project Record Documents: Section 01711.

1.2 SUBMITTALS

A. Shop and Installation Drawings, Product Data and Samples as required.

B. Prepare and submit, with construction schedule, a separate schedule listing dates when shop drawings, product data and any requested samples will be needed for each product.

1.3 GENERAL

A. Requests for material substitutions must be received and approved prior to submission of shop drawings, said submittals and/or samples; reviewed by architect or engineer does not constitute acceptance of materials other than those originally specified.

1.4 SHOP DRAWINGS

A. Original drawings, which illustrate portion of the work: Showing equipment, layout, setting or installation details. Deviation from Contract Drawings shall be marked in RED with an explanation of reason for change

B. Prepared by a qualified detailer.

C. Identify details by reference to sheet and detail number shown on contract drawings.

D. Reference specification section and paragraph number(s) represented on the submitted drawings.

E. Minimum Sheet Size: 8½" x 11".

1.5 PRODUCT DATA

A. Manufacturer's standard schematic drawings:

1. 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 each copy to identify pertinent materials, products or models.

2. Show dimensions and clearance required.

3. Shop performance characteristics and capacities.

4. Show wiring diagrams and controls.

C. Complete catalogs will not be acceptable. Manufacturer's regular catalog sheets will be acceptable if they completely indicate specification requirements. When manufacturer's catalog sheets are submitted, completely line out material not directly connected with subject.

1. Assemble in indexed brochure, catalog sheets of submittals containing more than five (5) different items or equipment.

D. Reference specification section and paragraph number represented on data submitted.

1.6 CONTRACTORIS RESPONSIBILITIES

A. Review shop drawings, product data and samples prior to submission and certify with signature of reviewer

B. Verify:

1. Field measurements.

2. Field construction criteria.

3. Catalog numbers and similar data.

4. Quantities

C. Coordinate each submittal with requirements of work and of contract documents.

D. Contractor's responsibility for errors, omissions and deviations in submittals from requirements of contractor documents is not relieved by architect's review of submittals, unless architect gives written acceptance of specific deviations.

1. Notify architect in writing of deviations at the time of submittal.

E. Begin no work which requires submittals until return of submittals with architect's stamp and initials or signature indicating review.

F. After architect's / engineer's review, distribute copies.

1.7 SUBMISSION REQUIREMENTS

A. Schedule submissions at least 15 days before dates reviewed submittals will be needed.

B. Submit a minimum of 5 copies of all submittals.

C. Accompany submittals with transmittal in duplicate, containing:

1. Date.

2. Project title and number.

3. Contractor's name and address.

4. The number of each shop drawings, product data and samples submitted.

5. Notification of deviations from contract documents.

6. Other pertinent data.

D. Submittals shall include:

1. Date and revision date.

2. Project title and number.

3. The names of:

a. Architect.

b. Contractor.

c. Subcontractor.

d. Supplier.

e. Manufacturer.

f. 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.

8. Applicable standards, such as ASTM or Federal Specifications numbers.

9. A blank space, 3" x 3" for the architect's stamp.

10. Identification of deviations from contract documents in red ink include justification for deviation.

11. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of field measurements and compliance with contract documents.

Failure to comply with the above requirements shall be grounds for rejection of submittal.

1.8 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 architect.

3. Product Data and Samples: Submit new data and samples as required for initial submittal.

1.9 DISTRIBUTION OF SUBMITTALS AFTER REVIEW

A. Distribute copies of Shop Drawings and Product Data which carry architect's stamp to:

1. Contractor's file.

2. Job-site file.

3. Record document's file.

4. Other prime contractors.

5. Subcontractor.

6. Supplier.

7. Fabricator.

B. Distribute samples as directed.

1.10 ARCHITECT'S / ENGINEER"S RESPONSIBILITIES

A. Review submittals with reasonable promptness.

B. Review for:

1. Design concept of project.

2. Information given in contract documents.

3. Architect or Engineer is not responsible for verification of quantities.

C. Review of separate items does not constitute review of an assembly in which item functions.

D. Affix stamp and initials or signature certifying the review of submittals.

E. Return submittals to contractor for distribution.

END OF SECTION

SECTION 16110 CONDUIT

1 PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal conduit.

B. Flexible metal conduit.

C. Liquidtight flexible metal conduit.

D. Electrical metallic tubing.

E. Nonmetal conduit.

F. Electrical nonmetallic tubing.

G. Flexible nonmetallic conduit.

H. Fittings and conduit bodies.

1.2 RELATED SECTIONS

A. Section 16130 - Boxes.

B. Section 16170 - Grounding and Bonding.

C. Section 16190 - Supporting Devices.

D. Section 16195 - Electrical Identification.

1.3 REFERENCES

A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.

C. ANSI C80.5 - Rigid Aluminum Conduit.

D. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

E. ANSI/NFPA 70 - National Electrical Code.

F. NECA "Standard of Installation."

G. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.

H. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).

I. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.4 DESIGN REQUIREMENTS

A. Conduit Size: ANSI/NFPA 70.

1.5 PROJECT RECORD DOCUMENTS

A. Accurately record actual routing of conduits larger than 2 inches.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle Products to site.

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

D. Protect PVC conduit from sunlight.

1.8 PROJECT CONDITIONS

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

B. Verify routing and termination locations of conduit prior to rough-in.

C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

2 PART 2 PRODUCTS

2.1 CONDUIT REQUIREMENTS

A. Minimum Size: 3/4 inch unless otherwise specified.

B. Underground Installations:

1. More than Five Feet from Foundation Wall: Use thickwall nonmetallic conduit.
2. Within Five Feet from Foundation Wall: Use rigid steel conduit or intermediate metal conduit.
3. In or Under Slab on Grade: Use rigid steel conduit, intermediate metal conduit, Schedule 40 PVC conduit.
4. Minimum Size: 3/4 inch.

C. Outdoor Locations, Above Grade: Use rigid steel, or intermediate metal conduit.

D. In Slab Above Grade:
1. Use rigid steel conduit, intermediate metal conduit, or Schedule 40 PVC conduit. No PVC conduit to extend above concrete.
2. Maximum Size Conduit in Slab: 3/4 inch; 1/2 inch for conduits crossing each other.

E. Wet and Damp Locations: Use schedule 80 PVC conduit or PVC coated rigid conduit.

F. Dry Locations:
1. Concealed: Use rigid steel, intermediate metal conduit or electrical metallic tubing throughout project.
2. Exposed: Use rigid steel, intermediate metal conduit or electrical metallic tubing throughout project.

2.2 METAL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1.

B. Rigid Aluminum Conduit: ANSI C80.5.

C. Intermediate Metal Conduit (IMC): Rigid steel.

D. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit.

2.3 PVC COATED METAL CONDUIT

A. Manufacturers:
1. Robroy Plasti-Bond REDH$_2$OT PVC coated conduit.
2. Substitutions of approved equals permitted.

B. Description: NEMA RN 1; rigid steel conduit with external PVC coating, 40 mil thick. Use in highly corrosive areas.

C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel fittings with external PVC coating to match conduit.

2.4 FLEXIBLE METAL CONDUIT

A. Manufacturers:
1. Hubbell PolyTuff I with nonmetallic liquidtight connectors.
2. Substitutions of approved equals permitted.

B. Description: Interlocked steel construction. Maximum length of 6' for final connections to equipment.

C. Fittings: ANSI/NEMA FB 1.

2.5 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Description: Interlocked steel construction with PVC jacket. Maximum length of 6' for final connections to equipment.

B. Fittings: ANSI/NEMA FB 1.

2.6 ELECTRICAL METALLIC TUBING (EMT)

A. Description: ANSI C80.3; galvanized tubing.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; compression steel type for all applications.

2.7 NONMETALLIC CONDUIT

A. Manufacturers:
1. Carlon Plus 40 and Plus 80 rigid PVC conduit.
2. Substitutions of approved equals permitted.

B. Description: NEMA TC 2; Schedule 40 and Schedule 80 PVC.

C. Fittings and Conduit Bodies: NEMA TC 3.

2.8 NONMETALLIC TUBING

A. Note: Conduit type ENT is NOT allowed.

2.9 TYPE MC AND AC CABLE

A. Type MC and Type AC cable are NOT allowed.

3 PART 3 EXECUTION

3.1 INSTALLATION

A. Install conduit in accordance with NECA "Standard of Installation."

B. Install nonmetallic conduit in accordance with manufacturer's instructions.

C. Arrange supports to prevent misalignment during wiring installation.

D. Support conduit using steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers. In all cases, conduit supports shall be commercially available, conform to code spacing requirements and be recommended by the manufacturer. Galvanized wire, baling wire and pipe strapping are not allowed.

E. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.

F. Fasten conduit supports to building structure and surfaces under provisions of Section 16190.

G. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports

H. Do not attach conduit to ceiling support wires.

I. Arrange conduit to maintain headroom and present neat appearance.

J. Route conduit parallel and perpendicular to walls.

K. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

L. Route conduit in and under slab from point-to-point.

M. Maintain adequate clearance between conduit and piping.

N. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.

O. Cut conduit square using saw or pipecutter; de-burr cut ends.

P. Bring conduit to shoulder of fittings; fasten securely.

Q. 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. Allow joint to cure for 20 minutes, minimum.

R. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations.

S. Install no more than equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2 inch size.

T. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

U. Provide suitable fittings to accommodate expansion and deflection where conduit crosses control and expansion joints.

V. Provide suitable pull string in each empty conduit except sleeves and nipples.

W. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

X. Ground and bond conduit under provisions of Section 16170.

Y. Identify conduit under provisions of Section 16195.

3.2 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements.

B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installation.

END OF SECTION

SECTION 16120 BUILDING WIRE AND CABLE

1 PART 1 GENERAL

1.1 SECTION INCLUDES

A. Building wire and cable.

B. Nonmetallic-sheathed cable.

C. Direct burial cable.

D. Service entrance cable.

E. Armored cable.

F. Metal clad cable.

G. Intercom/Speaker cable.

H. Telephone cable.

I. Computer cable

J. Television cable

K. Wiring connectors and connections.

1.2 RELATED SECTIONS

A. Section 16195 - Electrical Identification.

B. Section 16780 - Communications and Computer Systems.

1.3 REFERENCES

A. NECA Standard of Installation (National Electrical Contractors Association).

B. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

C. NFPA 70 - National Electrical Code, Governing Edition.

D. TIA/EIA Standards 568, 568-A, 569, 570, 606, 607

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years experience.

1.5 REGULATORY REQUIREMENTS

A. Conform to NFPA 70, Governing or Latest Edition as applicable.

B. Furnish products listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.6 PROJECT CONDITIONS

A. Verify that field measurements are as indicated.

B. Conductor sizes are based on copper

C. Wire and cable routing indicated is approximate unless dimensioned.

1.7 COORDINATION

A. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.

2 PART 2 PRODUCTS

2.1 BUILDING WIRE

A. Description: Single conductor insulated stranded wire.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation: NFPA 70, Type THHN/THWN.

2.2 NONMETALLIC-SHEATHED CABLE

A. Description: NFPA 70, Type NMC.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

2.3 DIRECT BURIAL CABLE

A. Description: NFPA 70, Type UF.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation Temperature Rating: 90 degrees C.

E. Use only if specifically permitted on drawing sheets.

F. Underground Warning Tape: 4-inch wide plastic tape, colored red with suitable warning legend describing buried electrical lines.

2.4 SERVICE ENTRANCE CABLE

A. Description: NFPA 70, Type SE or USE.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation: Type RHH or XHHW or THHN.

2.5 ARMORED CABLE

A. Not allowed on this project.

2.6 METAL CLAD CABLE

A. Not allowed on this project.

2.7 INTERCOM/SPEAKER CABLE

A. Description: UL Listed Type CL2.

B. Conductor: Copper.

C. Insulation Voltage Rating: 300 volts.

D. Temperature Range: -20 deg C to 105 deg C.

E. Insulation Material: PVC.

F. Size: 22 gauge, single pair.

G. Aluminum Foil Shield.

H. Raceway: Not required.

2.8 TELEPHONE CABLE

A. Description: Belden type 9566 or equal or CAT-3 or equal.

B. Conductor: Copper.

C. Insulation Voltage Rating: 300 volts.

D. Insulation material: PVC.

E. Size 24 gauge, 3 pair minimum.

F. Unshielded

G. Raceway: Refer to drawings for conduit requirements.

2.9 COMPUTER CABLE

A. Description: EIA/TIA 568 Belden type 1583A or equal, non-plenum rated. Provide CAT-6 or as noted on the drawings. Verify category of cable before bidding on the project.

B. Conductor: Copper.

C. Insulation Rating: 300 volts.

D. Insulation Material: PVC, blue.

E. Size: 24 gauge, 4 pair twisted.

F. The Owner's Representative will install all computer cabling and terminations, UNLESS OTHERWISE NOTED in Specifications Section 16780 or on the drawings.

G. Unshielded.

H. Raceway: Refer to drawings for conduit requirements.

I. Termination: At work area, terminate each 4 pair cable in an eight pin, modular jack. Connectors to be 100-ohm UTP outlets.

2.10 TELEVISION CABLE

A. Description: 75 ohm coaxial cable, Belden type 9104 or equal, RG-59.

B. Conductor: Copper.

C. Insulation: Gas Injected.

D. Jacket: PVC, black.

E. Size: 18 gauge

F. Shielded.

G. Raceway: Not required.

2.11 SECURITY SYSTEM CABLING

A. ALARM
1. Door Contact: 22 ga. / 2 pair Belden
2. Motion Detector: 22 ga. / 4 pair Belden
3. Glass Break Detector: 22 ga. / 4 pair Belden
4. Keypad: 22 ga. / 4 pair or 18 ga. / 4 pair for longer runs Belden. Must be Fire Wire if any fire is involved.
5. Zone Expander: 22 ga. / 4 pair Belden
6. Wireless Expander: 22 ga. / 4 pair Belden
7. Siren: 22 ga. / 2 pair Belden, must be Fire Wire if any fire is involved.
8. A/C Power: 22 ga. / 4 pair Belden, must be Fire Wire if any fire is involved.

B. ACCESS CONTROL
1. Mag Lock: 18 ga. / 2 pair
2. Door Strike: 18 ga. / 2 pair
3. Contact: 22 ga. / 2 pair
4. Reader: CAT-5e or 22 ga. / 6 pair
5. Request to Exit Button: 22 ga. / 4 pair
6. Request to Exit Motion: 22 ga. / 4 pair
7. Kantech KT-300 Link to other KT-300 panels: CAT-5e
8. Touch Crash Exit Bar: 22 ga. / 4 pair

C. CCTV
1. Camera – Analog: RG-59 Coax paired with 18 ga. / 2 pair Siamese wire
2. Camera – IP: CAT-6
3. Camera Power: 18 ga. / 2 pair
4. Other Monitors: RG-59 Coax or RG-6 Coax
5. Microphones: 18 ga. / 2 pair shielded with ground

D. STRUCTURED CABLE
1. Ethernet: CAT-6
2. Telephone: CAT-6
3. CATV: RG-6 Coax

E. Conductor: Copper.

F. Jacket: PVC, Color as determined by Owner.

3 PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that mechanical work likely to damage wire and cable has been completed.

C. Verify that raceway installation is complete and supported.

3.2 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.3 WIRING METHODS

A. Concealed Dry Interior Locations: Use only building wire, THHN insulation, in raceway.

B. Exposed Dry Interior Locations: Use only building wire, Type THHN insulation, in raceway.

C. Wet or Damp Interior Locations: Use only building wire, Type THWN insulation, in raceway.

D. Exterior Locations: Use only building wire, Type THWN insulation, in raceway.

E. Underground Installations: Use only building wire, Type THWN insulation, in raceway.

F. Use wiring methods indicated.

3.4 INSTALLATION

A. Route wire and cable as required to meet Project Conditions.

B. Install cable in accordance with the NECA "Standard of Installation."

C. Use stranded conductor for all feeders and branch circuits.

D. Use stranded conductors for control circuits.

E. Use conductor not smaller than 12 AWG for power and lighting circuits.

F. Use conductor not smaller than 16 AWG for control circuits.

G. Increase wire size by one wire size for branch circuits that are longer than 75 feet.

H. Increase wire size by two wire sizes for branch circuits that are longer than 200 feet.

I. Pull all conductors into raceway at same time.

J. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

K. Protect exposed cable from damage.

L. Support cables above accessible ceiling, using spring metal clips. Do not rest cable on ceiling panels.

M. Use suitable cable fittings and connectors.

N. Neatly train and lace wiring inside boxes, equipment, and panelboards. Provide cable ties every 12 inches minimum to keep wiring neatly trained.

O. Clean conductor surfaces before installing lugs and connectors.

P. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

Q. Use wedget connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

R. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

S. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

T. Trench and backfill for direct burial cable installation. Install warning tape along entire length of direct burial cable, within 6 inches of grade.

U. Identify and color code wire and cable under provisions of Section 16195. Identify each conductor with its circuit number or other designation.

V. Seal all penetrations of fire rated walls.

W. All Computer Cabling drops shall be 295 feet or less, color-coded according to TIA/EIA 568, Section 10.2.1.1.3 and shall have no bends tighter than 6 times the OD of cable.

X. TV terminations to be mounted in a standard cable face plate at height noted on the drawings. Provide 120- volt receptacle within 12 inches of face plate at same height.

3.5 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.3.1.

C. Computer cable shall meet requirements of TIA/EIA 568-A. Any cables failing test shall be replaced at contractor's expense.

END OF SECTION

SECTION 16130 BOXES

1 PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall and ceiling outlet boxes.

B. Floor boxes.

C. Pull and junction boxes.

1.2 RELATED SECTIONS

A. Section 16140 - Wiring Devices: Wall plates in finished areas.

B. Section 16160 - Cabinets and Enclosures.

1.3 REFERENCES

A. NECA - Standard of Installation.

B. NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.

C. NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

D. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

F. NFPA 70 - National Electrical Code.

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Provide Products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

2 PART 2 PRODUCTS

2.1 OUTLET BOXES

A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
   1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.

B. Nonmetallic Outlet Boxes: NEMA OS 2.

C. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer. Provide threaded hubs.

D. Wall Plates for Finished Areas: As specified in Section 16140.

2.2 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

B. Hinged Enclosures: As specified in Section 16160.

3 PART 3 EXECUTION

3.1 EXAMINATION

A. Verify locations of floor boxes and outlets prior to rough-in.

3.2 INSTALLATION

A. Install boxes in accordance with NECA "Standard of Installation."

B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

C. Set wall mounted boxes at elevations to accommodate mounting heights indicated.

D. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Adjust box location up to 10 feet if required to accommodate intended purpose.

E. Orient boxes to accommodate wiring devices oriented as specified in Section 16140.

F. Maintain headroom and present neat mechanical appearance.

G. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

H. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

I. Install boxes to preserve fire resistance rating of partitions and other elements.

J. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

K. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.

L. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

M. Use flush mounting outlet box in finished areas.

N. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation. Provide minimum 24 inches separation in acoustic rated walls.

O. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

P. Use stamped steel bridges to fasten flush mounting outlet box between studs.

Q. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

R. Use adjustable steel channel fasteners for hung ceiling outlet box.

S. Do not fasten boxes to ceiling support wires.

T. Support boxes independently of conduit.

U. Use gang or sectional box where more than one device is mounted together.

V. Use gang box with plaster ring for single device outlets.

W. Use cast outlet box in exterior locations and wet locations.

X. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.

Y. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.

3.3 INTERFACE WITH OTHER PRODUCTS

A. Coordinate installation of outlet box for equipment connected under other sections of this specification.

3.4 ADJUSTING

A. Adjust flush-mounting outlets to make front flush with finished wall material.

B. Install knockout closures in unused box openings.

3.5 CLEANING

A. Clean interior of boxes to remove dust, debris, and other material.

B. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 16140 WIRING DEVICES

1 PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Device plates and decorative box covers.

1.2 RELATED SECTIONS

A. Section 16130 - Boxes.

1.3 REFERENCES

A. NECA - Standard of Installation.

B. NEMA WD 1 - General Requirements for Wiring Devices.

C. NEMA WD 6 - Wiring Device -- Dimensional Requirements.

D. NFPA 70 - National Electrical Code.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Provide Products listed and classified by Underwriters Laboratories, Inc., as suitable for the purpose specified and indicated.

1.6 EXTRA MATERIALS

A. Furnish two of each style, size, and finish wall plate.

2 PART 2 PRODUCTS

2.1 WALL SWITCHES

A. Single Pole Switch:
   1. Hubbell HBL 1201 color as noted on drawings. Verify color with Architect before ordering.

B. Double Pole Switch:
   1. Hubbell HBL 1222, color as noted on drawings. Verify color with Architect before ordering.

C. Three-way Switch:
   1. Hubbell HBL 1203 color as noted on drawings. Verify color with Architect before ordering.

D. Substitutions: Approved equals.

E. Ratings: In all cases match branch circuit and load characteristics.

2.2 RECEPTACLES

A. Duplex Convenience Receptacle:
   1. Hubbell 2162 mounted at 18" AFF except where otherwise noted. Color as noted on drawings. Verify color with Architect before ordering.

B. GFCI Receptacle:
   1. Hubbell GF5262 color as noted on drawings. Verify color with Architect before ordering.

C. Telephone Jack:
   1. Hubbell 5110813 Category 5e Jack.

D. IG Receptacle:
   1. Hubbell IG5262 color as noted on drawings. Verify color with Architect before ordering. Provide receptacle with distinctive triangle mark. Do not install orange colored receptacles.

E. Emergency Receptacle:
   1. If required on project, all emergency receptacles shall be red in color with red wall plates.

F. Substitutions: Approved equals.

2.3 WALL PLATES

A. Decorative Switch Cover Plate:
   1. Brushed stainless steel is to be used unless otherwise noted on drawings. Verify with Architect before ordering.

B. Weatherproof Cover Plate: Gasketed cast metal with hinged gasketed device cover.
   1. Hubbell WPSF26.
   2. Substitutions: permitted.

C. Decorative Receptacle Plate:

1. Brushed stainless steel is to be used unless otherwise noted on drawings. Verify with Architect before ordering.

3 PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that outlet boxes are installed at proper height.

B. Verify that wall openings are neatly cut and will be completely covered by wall plates.

C. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean debris from outlet boxes.

3.3 INSTALLATION

A. Install in accordance with NECA "Standard of Installation."

B. Install devices plumb and level.

C. Install switches with OFF position down.

D. Install receptacles with grounding pole on bottom.

E. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.

F. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

G. Connect wiring devices by wrapping conductor around screw terminal.

H. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

I. Coordinate outlet locations with Architect where outlet should be installed behind equipment.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 16130 to obtain mounting heights specified and indicated on drawings.

B. Install wall switch 48 inches above finished floor to top of switch.

C. Install convenience receptacle 18 inches above finished floor unless noted otherwise.

D. Install convenience receptacle 10 inches above counter unless noted otherwise.

E. Install telephone jack 18 inches above finished floor.

3.5 FIELD QUALITY CONTROL

A. Inspect each wiring device for defects.

B. Operate each wall switch with circuit energized and verify proper operation.

C. Verify that each receptacle device is energized.

D. Test each receptacle device for proper polarity.

E. Test each GFCI receptacle device for proper operation.

F. Verify that each telephone jack is properly connected and circuit is operational.

G. Verify that indicated computer jacks are properly connected and operational.

H. Verify that television jacks are properly connected and operational.

3.6 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Patch any holes, uneven edges, or imperfections showing around the device.

3.7 CLEANING

A. Clean exposed surfaces to remove splatters and restore finish.

END OF SECTION

SECTION 16160 CIRCUIT AND MOTOR DISCONNECTS

1 PART 1 GENERAL

1.1 NOTE

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

1.2 SUBMITTALS

A. Provide complete catalog data and drawings on all items of equipment.

1.3 MANUALS

A. Include all submittal data in the operation and maintenance manuals.

1.4 SCOPE

A. Provide all labor, material, equipment, and service necessary for and incidental to the complete electrical distribution system.

2 PART 2 PRODUCTS

2.1 DISCONNECT SWITCHES

A. Unless otherwise noted or required, all disconnect switches shall be UL listed and shall meet NEMA Standard KS1-1983 for Type HD heavy duty switches. Switches shall be unfused unless noted otherwise; quick make, quick break; in NEMA 3R enclosures if exposed to the weather; elsewhere in NEMA 1 general purpose enclosures unless special enclosures are required. All motor circuit switches shall be horsepower rated.

B. Switches shall be Square D or equivalent. 20 amp, single pole disconnects shall be equal 2510 KG-1. Three pole disconnects shall be equal to Square D class 3110.

C. Where space does not permit use of the above specified switches, such as within weatherproof fan housings, etc., use suitable horsepower rated tumbler switches as unfused disconnects.

D. Where disconnect switches are used to disconnect starters, provide auxiliary poles in switches as required to disconnect all auxiliary control circuits in starters.

3 PART 3 EXECUTION

3.1 INSTALLATION

A. Install disconnects directly on Roof Top Unit cabinets. Do not install solely on stubbed conduit.

END OF SECTION

SECTION 16170 GROUNDING AND BONDING

1 PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding electrodes and conductors.

B. Equipment grounding conductors.

C. Bonding.

1.2 REFERENCES

A. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (International Electrical Testing Association).

B. NFPA 70 - National Electrical Code.

1.3 GROUNDING SYSTEM DESCRIPTION

A. Metal underground water pipe.

B. Metal frame of the building.

C. Rod electrodes.

1.4 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 10 ohms.

1.5 SUBMITTALS FOR CLOSEOUT

A. Project Record Documents: Record actual grounding system resistance of components and grounding electrodes.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

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

2 PART 2 PRODUCTS

2.1 ROD ELECTRODES

A. Material: Copper-clad steel.

B. Diameter: 3/4 inch.

C. Length: 10 feet.

2.2 EXOTHERMIC CONNECTIONS

A. Manufacturers:
1. Erico Cadweld.

2.3 WIRE

A. Material: Stranded copper.

B. Foundation Electrodes: 2/0 AWG.

C. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

3 PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that final backfill and compaction has been completed before driving rods.

3.2 INSTALLATION

A. Install rod electrodes at service entrance and dry type transformers 25 KVA or larger. Install additional rod electrodes to a maximum of three (3) to achieve specified resistance to ground. Bond all electrodes together with #2 copper grounding conductor connected to service entrance grounding electrode.

B. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing.

C. Provide bonding to meet Regulatory Requirements.

D. Bond together metal siding not attached to grounded structure; bond to ground.

E. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

F. Isolated Grounding Conductor: From designated panel grounding bar, run isolated ground conductor continuously back to service entrance grounding electrode. Bond with exothermic weld.

3.3 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.13.

END OF SECTION

SECTION 16190 SUPPORTING DEVICES

1 PART 1 GENERAL

1.1 SECTION INCLUDES

A. Conduit and equipment supports.

B. Anchors and fasteners.

1.2 REFERENCES

A. NECA Standard of Installation (National Electrical Contractors Association).

B. NFPA 70 - National Electrical Code.

1.3 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

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

2 PART 2 PRODUCTS

2.1 PRODUCT REQUIREMENTS

A. Materials and Finishes: Corrosion resistant.

B. Select materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit, including weight of wire in conduit.

C. Anchors and Fasteners:
1. Concrete Structural Elements: Use expansion anchors and preset inserts.
2. Steel Structural Elements: Use beam clamps, spring steel clips, steel ramset fasteners, and welded fasteners.
3. Concrete Surfaces: Use self-drilling anchors and expansion anchors.
4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts and hollow wall fasteners.
5. Solid Masonry Walls: Use expansion anchors and preset inserts.
6. Sheet Metal: Use sheet metal screws.
7. Wood Elements: Use wood screws.

3 PART 3 EXECUTION

3.1 INSTALLATION

A. Locate and install anchors, fasteners, and supports in accordance with NECA "Standard of Installation".

1. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.

2. Do not use powder-actuated anchors without permission from Owner.

3. Do not drill or cut structural members without permission from Owner.

B. Fabricate supports from structural steel or formed steel members. Rigidly weld members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

C. Install surface-mounted cabinets and panelboards with minimum of four anchors.

D. In wet and damp locations use galvanized steel channel supports to stand cabinets and panelboards 1 inch off wall.

E. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION

SECTION 16195 ELECTRICAL IDENTIFICATION

1 PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates and labels.

B. Wire and cable markers.

C. Conduit markers.

1.2 REFERENCES

A. NFPA 70 - National Electrical Code.

1.3 SUBMITTALS FOR REVIEW

A. Product Data: Provide catalog data for nameplates, labels, and markers.

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

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

2 PART 2 PRODUCTS

2.1 NAMEPLATES AND LABELS

A. Nameplates: Engraved three-layer laminated plastic, white letters on black background.

B. Locations:
1. Each electrical distribution and control equipment enclosure.
2. Communication cabinets.

C. Letter Size:
1. 1/8 inch letters for identifying individual equipment and loads.
2. 1/4 inch letters for identifying grouped equipment and loads.

D. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background. Use only for identification of individual wall switches and receptacles, control device stations.

2.2 WIRE MARKERS

A. Description: Cloth tape, split sleeve, or tubing type wire markers.

B. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.

C. Legend:
1. Power and Lighting Circuits: Branch circuit or feeder number indicated.
2. Control Circuits: Control wire number indicated on schematic and interconnection diagrams.
3. Phase.

D. All conductors and branch circuits shall be color coded as herein specified and strictly in accordance with Article 210 of the National Electric Code.

E. All conductors connected to a 120/208 volt power distribution system shall be color coded as follows:

Phase 1 - Black
Phase 2 - Red
Phase 3 - Blue
Neutral - White
Ground - Green

F. All conductors connected to a 277/480 volt power distribution systems shall be color coded as follows:

Phase 1 - Brown
Phase 2 - Yellow
Phase 3 - Purple
Neutral - Grey
Ground - Green

G. All conductors larger than No. 6 may be color coded by taping of black conductors with the proper color tape where exposed in panel boxes, junction boxes, terminal boxes, etc.

H. All conductors intended solely for grounding of equipment and devices shall be green unless indicated on the drawings to be bare. Green colored conductors shall not be used for other than grounding purposes. All conductors No. 6 and smaller shall be of the colors hereinbefore specified without exceptions. Under no circumstances shall green or white be used for any conductors other than for ground or grounded neutral conductors, respectively. Where 3-phase circuits are connected to 3-phase motors, temporary connections shall be made at motor terminals to determine proper rotation and any reversing of phases shall

be done at the motor terminals in order to maintain proper color coding of phase conductors.

2.3 UNDERGROUND WARNING TAPE

A. Description: 6-inch wide x 4-mil thick minimum plastic tape, colored red with suitable warning legend describing buried electrical lines.

B. Location: Along length of each underground conduit.

3 PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

3.2 INSTALLATION

A. Install nameplate and label parallel to equipment lines.

B. Secure nameplate to equipment front using screws or adhesive.

C. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.

D. Identify underground conduits using one underground warning tape per trench at 12 inches below finished grade.

E. Operational Identification and warnings: Wherever reasonably required to ensure safe and efficient operation and maintenance of electrical systems, and electrically connected mechanical systems and general systems, and to prevent misuse by unauthorized personnel, install self-adhesive plastic signs or similar equivalent identification, instruction or warnings on switches, outlets and other

F. controls, devices and covers of electrical enclosures.

END OF SECTION

SECTION 16420 UTILITY SERVICE ENTRANCE

1 PART 1 GENERAL

1.1 SECTION INCLUDES

A. Arrangement with Utility Company for permanent electric service including payment of Utility Company charges for service.

B. Underground service entrance.

1.2 RELATED SECTIONS

A. Section 16110 - Conduit.

B. Section 16170 - Grounding and Bonding.

1.3 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

1.4 SYSTEM DESCRIPTION

A. Utility Company: AEP Co., San Angelo, Texas

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with Utility Company written requirements.

B. Maintain one copy of each document on site.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

2 PART 2 PRODUCTS

2.1 UTILITY METERS

A. Meters will be furnished by Contractor.

2.2 UTILITY METER BASE

A. Meter base will be furnished by Contractor. Contractor to install on pedestal at transformer.

2.3 CT CABINET

A. CT Cabinet will not be required. Confirm with supplying utility.

2.4 MAIN OUTDOOR DISCONNECT SWITCH

A. Furnished in Main Panel “MDP”.

3 PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that service equipment is ready to be connected and energized.

3.2 PREPARATION

A. Make arrangements with Utility Company to obtain permanent electric service to the Project.

B. Coordinate location of Utility Company's facilities to ensure proper access is available.

3.3 INSTALLATION

A. Install service entrance conduits from utility metering equipment and provide trenching for all service conduits.

B. Install main panelboard for each service entering a building.

END OF SECTION

SECTION 16470 PANELBOARDS

1 PART 1 GENERAL

1.1 SECTION INCLUDES

A. Distribution panelboards.

B. Branch circuit panelboards.

C. Load centers.

1.2 RELATED SECTIONS

A. Section 16170 - Grounding and Bonding.

B. Section 16195 - Electrical Identification.

1.3 REFERENCES

A. NECA Standard of Installation (published by the National Electrical Contractors Association).

B. NEMA AB1 - Molded Case Circuit Breakers.

C. NEMA ICS 2 - Industrial Control Devices, Controllers and Assemblies.

D. NEMA KS1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

E. NEMA PB 1 - Panelboards.

F. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

G. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment (published by the International Electrical Testing Association).

H. NFPA 70 - National Electrical Code.

1.4 SUBMITTALS FOR REVIEW

A. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

1.5 SUBMITTALS FOR CLOSEOUT

A. Record actual locations of panelboards and record actual circuiting arrangements in project record documents.

B. Maintenance Data: Include spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

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

1.7 MAINTENANCE MATERIALS

A. Furnish two each panelboard key.

2 PART 2 PRODUCTS

2.1 DISTRIBUTION PANELBOARDS

A. Manufacturers:
1. Square D Type I-LINE or approved equal.

B. Description: NEMA PB 1, circuit breaker type. Feeder breakers are to have individual plug-in mounting. Panel is to accept future breakers designed to attach directly to the vertical bus bars without the use of special kits, or special mounting modules.

C. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.

D. Minimum integrated short circuit rating: 22,000 amps symmetrical on 240 volt or 208 volt applications.

E. Fusible Switch Assemblies: NEMA KS 1, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle. Provide interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate Class R fuses.

F. Molded Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.

G. Molded Case Circuit Breakers with Current Limiters: NEMA AB 1, circuit breakers with replaceable current limiting elements, in addition to integral thermal and instantaneous magnetic trip in each pole.

H. Circuit Breaker Accessories: Trip units and auxiliary switches as indicated.

I. Enclosure: NEMA PB 1, Type 1.

J. Cabinet Front: Surface type, fastened with hinge and latch, finished in manufacturer's standard gray enamel.

2.2 BRANCH CIRCUIT PANELBOARDS

A. Manufacturers:
1. Square D Type NEHB for 480 volt and NQOD for 240 or 208 volt or approved equal.

B. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard. All lighting panels are to be of the same manufacture as distribution panels.

C. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.

D. Minimum Integrated Short Circuit Rating: 10,000 amperes rms symmetrical for 240 or 208 volt panelboards; 22,000 amperes rms symmetrical for 480 volt panelboards.

E. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type HID for high intensity discharge lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers where scheduled. Do not use tandem circuit breakers.

F. Enclosure: NEMA PB 1, Type 1.

G. Cabinet Box: 6 inches deep, 20 inches wide.

H. Cabinet Front: Surface cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

2.3 LOAD CENTERS

A. Manufacturers:
1. Square D Type QO Loadcenters or approved equal.

B. Description: Circuit breaker load center, with bus ratings as indicated. Load centers are to be of the same manufacture as distribution panels.

C. Minimum Integrated Short Circuit Rating: 10,000 amperes rms symmetrical.

D. Molded Case Circuit Breakers: NEMA AB 1, plug-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type HID for high intensity discharge lighting circuits, Class A ground fault interrupter circuit breakers where indicated. Do not use tandem circuit breakers.

E. Enclosure: General Purpose.

F. Box: Surface type with door, and pull ring and latch. Finish in manufacturer's standard gray enamel.

3 PART 3 EXECUTION

3.1 INSTALLATION

A. Install panelboards in plumb accordance with NEMA PB 1.1 and the NECA "Standard of Installation."

B. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.

C. Provide filler plates for unused spaces in panelboards.

D. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

E. Provide engraved plastic nameplates under the provisions of Section 16195.

F. Ground and bond panelboard enclosure according to Section 16170.

3.2 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.4 for switches, Section 7.5 for circuit breakers.

3.3 ADJUSTING

A. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

END OF SECTION

SECTION 16510 LUMINAIRES

1 PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior luminaires and accessories.

B. Exterior luminaires and accessories.

C. Emergency lighting units.

D. Exit signs.

E. Ballasts.

F. Fluorescent lamp emergency power supply.

G. Lamps.

H. Luminaire accessories.

I. Motion Detectors (occupancy sensors).

1.2 REFERENCES

A. ANSI C78.379 - Electric Lamps - Incandescent and High-Intensity Discharge Reflector Lamps - Classification of Beam Patterns.

B. ANSI C82.1 - Ballasts for Fluorescent Lamps - Specifications.

C. ANSI C82.4 - Ballasts for High-Intensity Discharge and Low Pressure Sodium Lamps (Multiple Supply Type).

D. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

E. NFPA 70 - National Electrical Code.

F. NFPA 101 - Life Safety Code.

1.3 SUBMITTALS FOR REVIEW

A. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

B. Product Data: Provide dimensions, ratings, and performance data.

1.4 SUBMITTALS FOR CLOSEOUT

A. Submit manufacturer's operation and maintenance instructions for each product.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

B. ALL DIMMING SYSTEM PANELS, CONTROLS, BALLASTS AND OCCUPANCY SENSORS SHALL BE ALL MANUFACTURED BY THE SAME MANUFACTURER FOR WARRANTY PURPOSES, NO EXCEPTIONS.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Conform to requirements of NFPA 101.

C. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.7 EXTRA PRODUCTS

A. Furnish two of each plastic lens type.

B. Furnish one replacement lamps for each lamp type.

C. Furnish one replacement motion detector for each sensor type.

D. Furnish two of each ballast type.

2 PART 2 PRODUCTS

2.1 LUMINAIRES

A. Manufacturers:
1. Lithonia.
2. Hubbell.
3. Cooper.
4. Substitutions: Permitted.

B. Size and Type: As scheduled.

2.2 EMERGENCY LIGHTING UNITS

A. Furnish products as specified in schedules.

2.3 EXIT SIGNS

A. Furnish products as specified in schedules.

2.4 FLUORESCENT BALLASTS

A. Manufacturers:
1. Howard.
2. Advance.
3. Substitutions: Permitted.

B. Furnish products as specified in schedules.

2.5 HIGH INTENSITY DISCHARGE (HID) BALLASTS

A. Furnish products as specified in schedules.

2.6 LAMPS

A. Lamp Types: As specified for luminaire. Refer to schedules.

B. Reflector Lamp Beam Patterns: ANSI C78.379.

C. LED fixtures to be 3500 deg K. for indoor fixtures and 4000 deg K. for exterior fixtures.

2.7 MOTION DETECTORS

A. Manufacturers:
1. Lutron

2. ALL DIMMING SYSTEM PANELS, CONTROLS, BALLASTS AND OCCUPANCY SENSORS SHALL BE ALL MANUFACTURED BY THE SAME MANUFACTURER FOR WARRANTY PURPOSES, NO EXCEPTIONS.

B. Size and Type: Dual Technology combining passive infrared and ultrasonic technologies. Unit to provide user-specified time delay, adjustable sensitivity, LED display. Occupancy sensor shall control lighting in the sensed area only. Ceiling or wall-mount as shown on the drawings.

C. Power Supply: Capable of switching a 20 amp ballast load. Power supply shall be capable of parallel wiring without regard to AC phases on primary.

3 PART 3 EXECUTION

3.1 INSTALLATION

A. Install suspended luminaires using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.

B. Support luminaires larger than 2 x 4 foot size independent of ceiling framing.

C. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.

D. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.

E. Install wall mounted luminaires, emergency lighting units and exit signs at height as indicated on Drawings.

F. Install accessories furnished with each luminaire.

G. Connect luminaires, emergency lighting units and exit signs to branch circuit outlets provided under Section 16130.

H. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

I. Bond products and metal accessories to branch circuit equipment grounding conductor.

J. Install specified lamps in each emergency lighting unit, exit sign, and luminaire.

K. Locate and aim occupancy sensor in correct location for coverage of room. The contractor shall provide additional sensors if required to properly cover the room. Connect switch leg through power supply of sensor for correct operation.

3.2 FIELD QUALITY CONTROL

A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.3 ADJUSTING

A. Aim and adjust luminaires as indicated.

B. Position exit sign directional arrows as indicated.

C. Position motion detectors as required to minimize false operation.

3.4 CLEANING

A. Clean electrical parts to remove conductive and deleterious materials.

B. Remove dirt and debris from enclosures.

C. Clean photometric control surfaces as recommended by manufacturer.

D. Clean finishes and touch up damage.

3.5 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate luminaire operation for a minimum of two hours.

3.6 PROTECTION OF FINISHED WORK

A. Relamp luminaires that have failed lamps at Substantial Completion.

END OF SECTION

SECTION 16720 FIRE ALARM SYSTEM

PART 1.0 - GENERAL

1.1. DESCRIPTION:

A. This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled, conventional or intelligent reporting fire alarm equipment required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, Fire Alarm Control Panel (FACP), auxiliary control devices, annunciators, and wiring as shown on the drawings and specified herein.

B. 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 and other applicable standards.

1. The Secondary Power Source of the fire alarm control panel will be capable of providing at least 24 hours of backup power with the ability to sustain 5 minutes in alarm at the end of the backup period.

C. The fire alarm system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.

D. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof).

E. Underwriters Laboratories Inc. (UL) - USA:

No. 38 Manually Actuated Signaling Boxes
No. 50 Cabinets and Boxes
No. 864 Control Units for Fire Protective Signaling Systems
No. 268 Smoke Detectors for Fire Protective Signaling Systems
No. 268A Smoke Detectors for Duct Applications
No. 346 Waterflow Indicators for Fire Protective Signaling Systems
No. 464 Audible Signaling Appliances
No. 521 Heat Detectors for Fire Protective Signaling Systems
No. 1971 Visual Notification Appliances

F. The installing company shall employ NICET (minimum Level III) technicians on site to guide the final check-out and to ensure the systems integrity. All fire alarm system components, except conduit and boxes and cable, shall be installed by the licensed fire alarm company technician, NO EXCEPTIONS.

1.2. SCOPE:

A. An intelligent or conventional, microprocessor-controlled, fire alarm detection system shall be installed in accordance to the project specifications and drawings.

B. Basic Performance:

1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 4 Signaling Line Circuits (SLC).

2. Initiation Device Circuits (IDC) shall be wired Class B as part of an addressable device connected by the SLC Circuit.

3. Notification Appliance Circuits (NAC) shall be wired Class B as part of an addressable device connected by the SLC Circuit.

4. All circuits shall be power-limited, per 1995 UL864 requirements.

5. A single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.

6. Alarm signals arriving at the main FACP shall not be lost following a primary power failure or outage of any kind until the alarm signal is processed and recorded.

C. BASIC SYSTEM FUNCTIONAL OPERATION

When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:

1. The system Alarm LED on the FACP shall flash.

2. A local sounder with the control panel shall sound.

3. A backlit 80-character LCD display on the intelligent FACP shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.

4. In response to a fire alarm condition, the system will process all control programming and activate all system outputs (alarm notification appliances and/or relays) associated with the point(s) in alarm

1.3. SUBMITTALS

A. General:

1. Six copies of all submittals shall be submitted to the Architect/Engineer for review.

2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.

3. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

B. Shop Drawings:

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.

2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.

3. Show annunciator layout, configurations, and terminations.

C. Manuals:

1. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.

2. Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.

3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

D. Software Modifications

1. Provide the services of a qualified technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.

2. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and

custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

1.4. GUARANTY:

All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

1.5. APPLICABLE STANDARDS AND SPECIFICATIONS:

The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.

A. National Fire Protection Association (NFPA) - USA:

No. 13 Sprinkler Systems
No. 70 National Electric Code (NEC)
No. 72 National Fire Alarm Code
No. 101 Life Safety Code

B. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.

C. Local and State Building Codes.

D. All requirements of the Authority Having Jurisdiction (AHJ).

1.6. APPROVALS:

A. The system shall have proper listing and/or approval from the following nationally recognized agencies:

UL Underwriters Laboratories Inc

ULC Underwriters Laboratories Canada

FM Factory Mutual

MEA Material Equipment Acceptance (NYC)

CSFM California State Fire Marshal

1.7. CONTRACTOR REQUIREMENTS:

A. The contractor shall have a full-time employee who is a state licensed Fire Alarm System Planning Superintendent. They shall be responsible for the design of the system submitted and shall sign all submittal drawings.

B. All work associated with installation of the fire alarm system shall be under the direct supervision of a state licensed Fire Alarm APS.

C. The contractor shall not have any grievances or complaints of record regarding workmanship, code compliance, or service response with either the Owner or the State Fire Marshal. A contractor that has any prior finding(s) of a Fire Alarm License violation or has any litigation of this type in process with State Fire Marshal is unacceptable.

PART 2.0 PRODUCTS

2.1. EQUIPMENT AND MATERIAL, GENERAL:

A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a fire protective signaling system, meeting the National Fire Alarm Code.

B. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.

C. All equipment shall be attached to walls 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.

D All equipment must be available "over the counter" through the Security Equipment Distributor (SED) market and can be installed by dealerships independent of the manufacturer.

2.2. CONDUIT AND WIRE:

A. Conduit:

1. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements. <u>All fire alarm cabling shall be installed in conduit.</u>

2. All wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are

contained within a single conduit.

3. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760-29.

4. Wiring for 24-volt DC control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.

5. Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.

6. Conduit shall be 3/4-inch (19.1 mm) minimum.

B. Wire:

1. All fire alarm system wiring shall be new. Any fire alarm system wiring that shall be found to have been installed incorrectly, as evidenced by broken or scarred insulation, nicked or bare wires, or with the insulation stripped back too far at connections shall be cause for the ENTIRE wiring in the facility to be replaced at the Contractor's expense.

2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. 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 Appliance Circuits.

3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.

4. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NEC 760 (e.g., FPLR). (N/A)

5. Wiring used for the multiplex communication circuit (SLC) shall be twisted and support a minimum wiring distance of 10,000 feet when sized at 12 AWG. The design of the system shall permit use of IDC and NAC wiring in the same conduit with the SLC communication circuit. Shielded wire shall not be required.

6. All field wiring shall be electrically supervised for open circuit and ground fault.

7. The fire alarm control panel shall be capable of T-tapping Class B (NFPA Style 4) Signaling Line Circuits (SLCs). Systems which do not allow or have restrictions in, for example, the amount of T-taps, length of T-taps etc., are not acceptable.

C. Terminal Boxes, Junction Boxes and Cabinets:

1. All boxes and cabinets shall be UL listed for their use and purpose.

D. The fire 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 ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold water pipe or grounding rod. The control panel enclosure shall feature a quick removal chassis to facilitate rapid replacement of the FACP electronics.

1. The FACP shall be capable of coding Notification Appliance Circuits in March Time Code (120 PPM), Temporal (NFPA 72 A-2-2.2.2), and California Code. Main panel notification circuits (NACs 1 & 2) shall also automatically synchronize any of the following manufacturer's notification appliances connected to them: System Sensor, Wheelock, or Gentex with no need for additional synchronization modules.

2.3. MAIN FIRE ALARM CONTROL PANEL:

A. The FACP shall be equal to Notifier Fire Warden 50 and shall contain a microprocessor-based Central Processing Unit (CPU). The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, printer, annunciators, and other system controlled devices.

B. Operator Control

1. Acknowledge Switch:

a. Activation of the control panel Acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance the 80-character LCD display to the next alarm or trouble condition.

b. Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.

2. Alarm Silence Switch:

Activation of the alarm silence switch shall cause all programmed

alarm notification appliances and relays to return to the normal condition after an alarm condition. The selection of notification circuits and relays that are silenceable by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.

3. Alarm Activate (Drill) Switch:

The Alarm Activate switch shall activate all notification appliance circuits. The drill function shall latch until the panel is silenced or reset.

4. System Reset Switch:

Activation of the System Reset switch shall cause all electronically-latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.

5. Lamp Test:

The Lamp Test switch shall activate all system LEDs and light each segment of the liquid crystal display.

C. System Capacity and General Operation

1. The control panel shall provide, or be capable of, expansion to 198 intelligent/addressable devices.

2. The control panel shall include Form-C Alarm, Trouble and Supervisory relays rated at a minimum of 2.0 amps @ 30 VDC. It shall also include programmable Notification Appliance Circuits (NACs) capable of being wired as Class B (NFPA Style Y) or Class A (NFPA Style Z).

3. The fire alarm control panel shall include an operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display (LCD), individual color-coded system status LEDs, and an alphanumeric keypad for the field programming and control of the fire alarm system.

4. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the fire alarm control panel. The system shall be fully programmable, configurable, and expandable in the field without the need for special tools, PROM programmers or PC based programmers. It shall not require replacement of memory ICs to facilitate programming changes. The control unit will support the ability to upgrade its operating program using FLASH memory technology. The unit shall provide the user with the ability to program from either the included keypad, a standard PS2-style PC keyboard or from a computer running upload/download software.

5. The system shall allow the programming of any input to activate any output or group of outputs. Systems which have limited programming (such as general alarm), have complicated programming (such as a diode matrix), or REQUIRE a laptop personal computer are not considered suitable substitutes.

6. The FACP shall provide the following features:

a. Drift compensation to extend detector accuracy during the accumulation of dust and foreign material.

b. Detector sensitivity test, meeting requirements of NFPA 72, Maintenance alert, with two levels (maintenance alert/maintenance urgent), to warn of excessive smoke detector dirt or dust accumulation.

c. The ability to display or print system reports.

d. Alarm verification, with counters and a trouble indication to alert maintenance personnel when a detector enters verification an excessive number of times.

e. Positive Alarm Sequence (PAS presignal), meeting NFPA 72 3-8.3 requirements.

f. Rapid manual station reporting.

g. Non-alarm points for general (non-fire) control.

h. Periodic detector test, conducted automatically by the software.

i. Walk test, with a check for two detectors set to same address.

7. The FACP shall be capable of coding Notification Appliance Circuits in March Time Code (120 PPM), Temporal (NFPA 72 A-2-2.2.2), and California Code. Main panel notification circuits (NACs 1 & 2) shall also automatically synchronize the following manufacturer's notification appliances connected to them: System Sensor, Wheelock, or Gentex with no need for additional synchronization modules.

D. Central Microprocessor

1. The microprocessor shall be a state-of-the-art, high speed, 16-bit RISC device and it shall communicate with, monitor and control all external interfaces. It shall include an EPROM for system program storage, non-volatile memory for building-specific program storage, and a "watch dog" timer circuit to detect and report microprocessor failure.

2. The microprocessor shall contain and execute all specific actions

to be taken in the condition of an alarm. Control programming shall be held in non-volatile programmable memory, and shall not be lost even if system primary and secondary power failure occurs.

3. The microprocessor shall also provide a real-time clock for time annotation of system displays, printer, and history file.

4. A special program check function shall be provided to detect common operator errors.

5. An auto-programming capability (self-learn) shall be provided to quickly identify devices connected on the SLC and make the system operational.

6. For flexibility and to ensure program validity, an optional Windows(TM) based program utility shall be available. This program shall be used to off-line program the system with batch upload/download. This program shall also have a verification utility which scans the program files, identifying possible errors. It shall also have the ability to compare old program files to new ones, identifying differences in the two files to allow complete testing of any system operating changes. This shall be in incompliance with the NFPA 72 requirements for testing after system modification.

E. Local Keyboard Interface

1. In addition to an integral keypad, the fire alarm control panel will accept a standard PS2-style keyboard for programming, testing, and control of the system. The keyboard will be able to execute the system functions ACKNOWLEDGE, SIGNALS SILENCED, DRILL and RESET.

F. Display

1. The display shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters.

2. The display shall include status information and custom alphanumeric labels for all intelligent detectors, addressable modules, internal panel circuits, and software zones.

3. The display shall contain an alphanumeric, text-type display and dedicated LEDs for the annunciation of AC POWER, FIRE ALARM, SUPERVISORY, TROUBLE, MAINTENANCE, ALARM SILENCED, DISABLED, BATTERY, and GROUND conditions.

4. The display keypad shall be part of the standard system and have the capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels shall be provided to prevent unauthorized system control or programming.

5. The display shall include the following operator control switches: ACKNOWLEDGE, ALARM SILENCE, DRILL (alarm activate), and SYSTEM RESET.

G. Signaling Line Circuit (SLC)

1. The SLC interface shall provide power to and communicate with up to 99 intelligent detectors (ionization, photoelectric or thermal) and 99 intelligent modules (monitor or control) for a system capacity of 198 devices. Each SLC shall be capable of NFPA 72 Style 4, Style 6, or Style 7 (Class A or B) wiring.

2. The CPU shall receive information from all intelligent detectors to be processed to determine whether normal, alarm, prealarm, or trouble conditions exist for each detector. The software shall automatically compensate for the accumulation of dust in each detector up to allowable limits. The information shall also be used for automatic detector testing and for the determination of detector maintenance conditions.

3. The detector software shall meet NFPA 72, Chapter 7 requirements and be certified by UL as a calibrated sensitivity test instrument.

H. Serial Interfaces

1. The system shall provide a means of interfacing to UL Listed Electronic Data Processing (EDP) peripherals using the EIA-232 communications standard.

2. One EIA-232 interface may be used to connect an UL-Listed 80-column printer. The printer shall communicate with the control panel using an interface complying with Electrical Industries Association standard EIA-232D.

I. The control panel will have the capability of Reverse Polarity Transmission or connection to a Municipal Box for compliance with applicable NFPA standards.

J. Digital Alarm Communicator Transmitter (DACT). The DACT is an interface for communicating digital information between a fire alarm control panel and a UL-Listed central station.

1. The DACT shall be stand-alone communicator installed at the telephone board. Communicators installed in the FACP shall not be permitted. Do not power from FACP.

2. The DACT shall include connections for dual telephone lines (with voltage detect), per UL/NFPA/FCC requirements. It shall include the ability for split

reporting of panel events up to three different telephone numbers.

3. The DACT shall be completely field programmable via PC software connected to the panel serial port. The DACT shall support upload/download of programming parameters from a remote location over a phone line using upload/download PC software

4. The DACT shall be capable of transmitting events in at least 15 different formats. This ensures compatibility with existing and future transmission formats.

5. Communication shall include vital system status such as:

- Independent Zone (Alarm, trouble, non-alarm, supervisory)
- Independent Addressable Device Status
- AC (Mains) Power Loss
- Low Battery and Earth Fault
- System Off Normal
- 12 and 24-Hour Test Signal
- Abnormal Test Signal (per UL requirements)
- EIA-485 Communications Failure
- Phone Line Failure

6. The DACT shall support independent zone/point reporting when used in the Contact ID format. In this format, the DACT shall support the transmission of up addressable points with the system. This format shall enable the central station to have exact details concerning the location of the fire for emergency response.

K. Stand Alone Voice Evacuation Control Panel (N/A)

1. A stand-alone Voice Evacuation Control Panel shall be available from the same manufacturer of the main fire alarm system.

2. This Voice Control Panel shall work stand alone or as a slave to the Main Fire Alarm Control Panel.

3. Shall have as minimum requirements:

a. Integral 25 Watt, 25 Vrms audio amplifier with optional converter for 70.7-volt systems. The system shall be capable of expansion to 50 watts total via the insertion of an additional 25-watt audio amplifier module into the same cabinet.

b. Speaker circuit that can be wired both Class A or B.

c. Integral Digital Message Generator with a memory

capacity for up to 60 seconds of messaging. The Digital Message Generator shall be capable of producing five distinct messages (12 seconds each). These messages shall field programmable without the use of additional equipment.

d. Built in alert tone generators with steady, slow whoop, high/low and chime tone field programmable.

e. The Voice Control Panel will be capable of detecting and annunciating the following conditions: Loss of Power (AC and DC), System Trouble, Ground Fault, Alarm, Microphone Trouble, Message Generator Trouble, Tone Generator Trouble, and Amplifier Fault.

4. The Voice Control Panel shall be fully supervised including microphone, amplifier output, message generator, speaker wiring, and tone generation.

5. Speaker outputs shall be fully power-limited.

6. Amplifiers will be supplied power independently to eliminate a short on one circuit from affecting other circuits.

7. The Voice Control Panel will provide full supervision on both active (alarm or music) and standby conditions.

8. An optional zone splitter version shall be available that permits splitting speaker circuits into 8 specific zones.

9. An optional distributed amplifier unit shall be available that permits splitting speaker circuits into up to a total of 24 zones when two distributed amplifiers are combined with the master unit.

L. Speakers (N/A):

1. All speakers shall operate on 25 VRMS or with field selectable output taps from 0.5 to 2.0 Watts.

2. Speakers in corridors and public spaces shall produce a nominal sound output of 84 dBA at 10 feet (3m).

3. Frequency response shall be a minimum of 400 HZ to 4000 HZ.

4. The back of each speaker shall be sealed to protect the speaker cone from damage and dust.

M. Enclosures:

1. The control panel shall be housed in a UL-listed cabinet suitable

for surface or semi-flush mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.

2. The back box and door shall be constructed of steel with provisions for electrical conduit connections into the sides and top.

3. The door shall provide a key lock and shall provide for the viewing of all indicators.

4. The cabinet shall accept a chassis containing the PCB and to assist in quick replacement of all the electronics including power supply shall require no more than two bolts to secure the panel to the enclosure back box.

N. Signaling Power Supply: The FASPS or FCPS is a device designed for use as either a remote 24-volt power supply or as a booster for powering Notification Appliances (N/A)

1. The FCPS shall offer up to 8.0 amps (6.0 amps continuous) of regulated 24-volt power. It shall include an integral charger designed to charge 18.0 amp hour batteries.

2. The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a control relay. Four NAC outputs, wired NFPA Style Y or Z, shall be available for connection to the Notification devices.

3. The FCPS shall optionally provide synchronization of all connected strobes or horn strobe combinations when System Sensor, Wheelock, or Gentex devices are installed.

4. The FCPS shall function as a sync follower as well as a sync generator.

5. The FCPS shall include a surface mount backbox.

6. The Field Charging Power Supply shall include the ability to delay the reporting of an AC fail condition per NFPA requirements.

7. The FCPS shall provide 24 VDC regulated and power-limited circuitry per 1995 UL standards.

O. Power Supply:

1. The main power supply for the fire alarm control panel shall provide 6.0 amps of available power for the control panel and peripheral devices.

2. Provisions will be made to allow the audio-visual power to be increased as required by adding modular expansion audio-visual power supplies.

3. Positive-Temperature-Coefficient (PTC) thermistors, circuit breakers, or other over-current protection shall be provided on all power outputs. The power supply shall provide an integral battery charger or may be used with an external battery and charger systems. Battery arrangement may be configured in the field.

4. The main power supply shall continuously monitor all field wires for earth ground conditions.

5. The main power supply shall operate on 120 VAC, 60 Hz, and shall provide all necessary power for the FACP.

P. Programmable Electronic Sounders:

1. Electronic sounders shall operate on 24 VDC nominal.

2. Electronic sounders shall be field programmable without the use of special tools, to provide slow whoop, continuous, or interrupted tones with an output sound level of at least 90 dBA measured at 10 feet from the device.

3. Shall be flush or surface mounted as show on plans.

Q. Strobe lights shall meet the requirements of the ADA, UL Standard 1971 and shall meet the following criteria:

1. The maximum pulse duration shall be 2/10 of one second.

2. Strobe intensity shall meet the requirements of UL 1971.

3. The flash rate shall meet the requirements of UL 1971.

R. Audible/Visual Combination Devices:

1. Shall meet the applicable requirements of Section A listed above for audibility.

2. Shall meet the requirements of Section B listed above for visibility.

3. Shall be equal to Gentex Commander 2 series, white in color, no exceptions.

S. Manual Fire Alarm Stations

1. Manual fire alarm stations shall be non-code type.

2. Provide stopper II or equal cover if installed in public space.

3. An operated station shall automatically condition itself so as to be visually detected, as operated, at a minimum distance of 100 feet (30.5 m) front or side.

4. Manual stations shall be constructed of metal, with operating instructions provided on the cover. The word FIRE shall appear on the manual station in letters one half inch (12.7 mm) in size or larger.

U. Conventional Photoelectric Area Smoke Detectors

1. Photoelectric smoke detectors shall be a 24 VDC, two-wire, ceiling-mounted, light scattering type using an LED light source.

2. Each detector shall contain a remote LED output and a built-in test switch.

3. The detector shall be of a separate head-in-base design.

4. The detector shall automatically provide drift compensation to minimize nuisance alarms.

5. A visual indication of an alarm shall be provided by dual latching Light Emitting Diodes (LEDs), on the detector, which may be seen from ground level over 360 degrees. These LEDs shall flash every 5 seconds, indicating that power is applied to the detector.

6. The detector shall not go into alarm when exposed to air velocities of up to 3000 feet (914.4 m) per minute.

7. The detector screen and cover assembly shall be easily removable for field cleaning of the detector chamber.

8. All field wire connections shall be made to the base through the use of a clamping plate and screw.

W. Duct Smoke Detectors (N/A)

1. Duct smoke detectors shall be a 24 VDC type with visual alarm and power indicators, and a reset switch. Each detector shall be installed upon the composite supply/return air ducts(s), with properly sized air sampling tubes. Each detector shall be powered from a 120 volt circuit independent of the HVAC unit.

X. Projected Conventional Beam Detector (N/A)

1 The projected beam type shall be a 4-wire 24 VDC conventional smoke detector device.

2 The detector shall be listed to UL 268 and shall consist of a single transmitter\receiver and corresponding non powered reflector.

3 The detector shall operate in either a short range (16' - 230') or long range (16' - 328') when used with an extender module.

4. The temperature range of the device shall be -22 degrees F to 131 degrees F.

5. The detector shall feature an optical sight and 2-digit signal strength meter to ensure proper alignment of unit without need of special tools.

6. The unit shall be both ceiling and wall mountable.

7. The detector shall have the ability to be tested using calibrated test filters or magnet-activated remote test station.}

Y. Projected Conventional Beam Detector (N/A)

1 The projected beam type shall be a 4-wire 24 VDC conventional smoke detector device.

2 The detector shall be listed to UL 268 and shall consist of a single transmitter\receiver and corresponding non powered reflector.

3 The detector shall operate in either a short range (16' - 230') or long range (16' - 328') when used with an extender module.

4. The temperature range of the device shall be -22 degrees F to 131 degrees F.

5. The detector shall feature an optical sight and 2-digit signal strength meter to ensure proper alignment of unit without need of special tools.

6. The unit shall be both ceiling and wall mountable.

7. The detector shall have the ability to be tested using calibrated test filters or magnet-activated remote test station.

8. The detector shall be equipped with an integral sensitivity test feature that consists of a test filter attached to a servomotor inside the detector optics. Using the remote test station, the motor shall be activated and shall move the filter in the pathway of the light beam, thereby testing detector sensitivity. This integral sensitivity

test feature shall allow the user to quickly and easily meet the annual maintenance/test requirements of NFPA 72.

Z. Automatic Conventional Heat Detectors (N/A)

1. Automatic heat detectors shall have a combination rate of rise and fixed temperature rated at 135 degrees Fahrenheit (57.2 Celsius) for areas where ambient temperatures do not exceed 100 degrees (37.7 Celsius), and 200 degrees (93.33 Celsius) for areas where the temperature does not exceed 150 degrees (65.5 Celsius).

2. Automatic heat detectors shall be a low profile, ceiling mount type with positive indication of activation.

3. The rate of rise element shall consist of an air chamber, a flexible metal diaphragm, and a factory calibrated, moisture-proof, trouble free vent, and shall operate when the rate of temperature rise exceeds 15 degrees F (9.4 degrees C) per minute.

4. The fixed temperature element shall consist of a fusible alloy retainer and actuator shaft.

5. Automatic heat detectors shall have a smooth ceiling rating of 2500 square feet (762 square meters).

AA. Waterflow Indicator:

1. Waterflow Switches shall be an integral, mechanical, non-coded, non-accumulative retard type.

2. Waterflow Switches shall have an alarm transmission delay time which is conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30-45 seconds.

3. All waterflow switches shall come from a single manufacturer and series.

4. Waterflow switches shall be provided and connected under this section but installed by the mechanical contractor.

5. Where possible, locate waterflow switches a minimum of one (1) foot from a fitting which changes the direction of the flow and a minimum of three (3) feet from a valve.

BB. Sprinkler and Standpipe Valve Supervisory Switches:

1. Each sprinkler system water supply control valve riser, zone

control valve, and standpipe system riser control valve shall be equipped with a supervisory switch. Standpipe hose valves, and test and drain valves shall not be equipped with supervisory switches.

2. PIV (post indicator valve) or main gate valves shall be equipped with a supervisory switch.

3. The switch shall be mounted so as not to interfere with the normal operation of the valve and adjusted to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.

4. The supervisory switch shall be contained in a weatherproof aluminum housing, which shall provide a 3/4-inch (19 mm) conduit entrance and incorporate the necessary facilities for attachment to the valves.

5. The switch housing shall be finished in red baked enamel.

6. The entire installed assembly shall be tamper proof and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.

7. Valve supervisory switches shall be provided and connected under this section and installed by mechanical contractor.

CC. Specific System Operations (Addressable only)

1. Alarm Verification: Each of the intelligent addressable smoke detectors in the system may be independently programmed for verification of alarm signals. The alarm verification time period shall not exceed 2 minutes.

2. Point Disable: Any addressable device or conventional circuit in the system may be enabled or disabled through the system keypad.

3. Point Read: The system shall be able to display the following point status diagnostic functions:

a. Device status
b. Device type
c. Custom device label
d. Device zone assignments

4. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing all system status.

5. System History Recording and Reporting: The fire alarm control

panel shall contain a history buffer that will be capable of storing up to 1000 events. Each of these activations will be stored and time and date stamped with the actual time of the activation. The contents of the history buffer may be manually reviewed, one event at a time, or printed in its entirety.

The history buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable substitutes.

6. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent detector and shall analyze the detector responses over a period of time. If any intelligent detector in the system responds with a reading that is above or below normal limits, then the system will enter the trouble mode, and the particular detector will be annunciated on the system display. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.

7. Pre-Alarm Function: The system shall provide two levels of pre-alarm warning to give advance notice of a possible fire situation. Both pre-alarm levels shall be fully field adjustable. The first level shall give an audible indication at the panel. The second level shall give an audible indication and may also activate control relays. The system shall also have the ability to activate local detector sounder bases at the pre-alarm level, to assist in avoiding nuisance alarms.

8. The fire alarm control panel shall include Silent and Audible Walk Test functions - Silent and Audible. It shall include the ability to test initiating device circuits and Notification Appliance Circuits from the field without returning to the panel to reset the system. The operation shall be as follows:

a. The Silent Walk Test will not sound NACs but will store the Walk Test information in History for later viewing.

b. Alarming an initiating device shall activate programmed outputs, which are selected to participate in Walk Test.

c. Introducing a trouble into the initiating device shall activate the programmed outputs.

d. Walk Test shall be selectable on a per device/circuit basis. All devices and circuits which are not selected for Walk Test shall continue to provide fire protection and if an alarm is detected, will exit Walk Test and activate all programmed alarm functions.

e. All devices tested in walk test shall be recorded in the history buffer.

9. Waterflow Operation

An alarm from a waterflow detection device shall activate the appropriate alarm message on the control panel display; turn on all programmed Notification Appliance Circuits and shall not be affected by the Signal Silence switch.

10. Supervisory Operation

An alarm from a supervisory device shall cause the appropriate indication on the control panel display, light a common supervisory LED, but will not cause the system to enter the trouble mode.

11. Signal Silence Operation

The FACP shall have the ability to program each output circuit (notification circuit or relay) to deactivate upon depression of the Signal Silence switch.

12. Non-Alarm Input Operation

Any addressable initiating device in the system may be used as a non-alarm input to monitor normally open contact type devices. Non-alarm functions are a lower priority than fire alarm initiating devices.

2.4. SYSTEM COMPONENTS: (ADDRESSABLE)

A. Addressable Pull Box (manual station)

1. Addressable pull boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.

2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.

3. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.

B. Intelligent Multi-Sensing Detector (N/A)

1. The intelligent detector shall be an addressable device which is capable of detecting multiple threats by employing photoelectric and thermal technologies in a single unit. This detector shall utilize advanced electronics which react to slow smoldering fires (photoelectric) and heat (thermal) all within a single sensing device.

2. The multi-detector shall include two bicolor LEDs for 360-degree viewing.

3 Automatically adjusts sensitivity levels without the need for operator intervention or programming. Sensitivity increases with heat.

C. Intelligent Photoelectric Smoke Detector (N/A)

1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.

2. The detectors shall be ceiling-mounted and available in an alternate model with an integral fixed 135-degree heat-sensing element.

3. Each detector shall contain a remote LED output and a built-in test switch.

4. Detector shall be provided on a twist-lock base.

5. It shall be possible to perform a calibrated sensitivity and performance test on the detector without the need for the generation of smoke. The test method shall test all detector circuits.

6. A visual indication of an alarm shall be provided by dual latching Light Emitting Diodes (LEDs), on the detector, which may be seen from ground level over 360 degrees. These LEDs shall periodically flash to indicate that the detector is in communication with the control panel.

7. The detector shall not go into alarm when exposed to air velocities of up to 1500 feet per minute (fpm).

8. The detector screen and cover assembly shall be easily removable for field cleaning of the detector chamber.

9. All field wire connections shall be made to the base through the use of a clamping plate and screw.

D. Projected Addressable Beam Detector (N/A)

1. The projected beam type shall be a 4-wire 24 VDC intelligent, addressable projected beam smoke detector device.

2. The detector shall be listed to UL 268 and shall consist of a single transmitter\receiver and corresponding non powered reflector.

3. The detector shall operate in either a short range (16' - 230') or long range (16' - 328') when used with an extender module.

4. The temperature range of the device shall be -22 degrees F to 131 degrees F.

5. The detector shall feature an optical sight and 2-digit signal strength meter to ensure proper alignment of unit without need of special tools.

6. The unit shall be both ceiling and wall mountable.

7. The detector shall have the ability to be tested using calibrated test filters or magnet-activated remote test station.

E. Projected Addressable Beam Detector (N/A)

1. The projected beam type shall be a 4-wire 24 VDC intelligent, addressable projected beam smoke detector device.

2. The detector shall be listed to UL 268 and shall consist of a single transmitter\receiver and corresponding non powered reflector.

3. The detector shall operate in either a short range (16' - 230') or long range (16' - 328') when used with an extender module.

4. The temperature range of the device shall be -22 degrees F to 131 degrees F.

5. The detector shall feature an optical sight and 2-digit signal strength meter to ensure proper alignment of unit without need of special tools.

6. The unit shall be both ceiling and wall mountable.

7. The detector shall have the ability to be tested using calibrated test filters or magnet-activated remote test station.

8 The detector shall have four standard sensitivity selections along with two automatic self-adjusting settings. When either of the two automatic settings is selected the detector will automatically adjust its sensitivity using advanced software algorithms to select the optimum sensitivity for the specific environment.

F. Intelligent Ionization Smoke Detector (N/A)

1. The detectors shall use the dual-chamber ionization principal to measure products of combustion and shall, on command from the control panel, send data

to the panel representing the analog level of products of combustion.

G. Intelligent Thermal Detectors (N/A)

1. Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit.

H. Intelligent Duct Smoke Detector (N/A)

1. The smoke detector housing shall accommodate either an intelligent ionization detector or an intelligent photoelectric detector, of that provides continuous analog monitoring and alarm verification from the panel.

2. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.

I. Addressable Dry Contact Monitor Module

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any normally open dry contact device) to one of the fire alarm control panel SLCs.

2. The monitor module shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box.

3. The IDC zone shall be suitable for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

4. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch (70 mm) x 1-1/4 inch (31.7 mm) x 1/2 inch (12.7 mm). This version need not include Style D or an LED.

J. Two-Wire Detector Monitoring

1. Means shall be provided for the monitoring of conventional Initiating Device Circuits populated with 2-wire smoke detectors as well as normally open contact alarm initiating devices (pull stations, heat detectors, etc).

2. Each IDC of conventional devices will be monitored as a distinct address on the polling circuit by an addressable module. The module will supervise the IDC for alarms and circuit integrity (opens).

3. The monitoring module will be compatible, and listed as such, with all devices on the supervised circuit.

4. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

5. The monitoring module shall be capable of mounting in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box or in a surface mount backbox.

K. Addressable Control Relay Module

1. Addressable control relay modules shall be provided to control the operation of fan shutdown and other auxiliary control functions.

2. The control module shall mount in a standard 4-inch square, 2-1/8 inch deep electrical box, or to a surface mounted backbox.

3. The control relay module will provide a dry contact, Form-C relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relays may be energized at the same time on the same pair of wires.

4. The control relay module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.

L. 6 Output Addressable Control Relay Module

1. Up to 6 Addressable intelligent control relay modules combined on one circuit board shall be provided to control the operation of fan shutdown and other auxiliary control functions.

2. Using rotary address switches, the first module shall be addressed from 01 to 154 while the remaining modules shall be automatically assigned to the next five higher addresses. Note: binary dipswitches for setting address are not acceptable.

3. Provision shall be included for disabling a maximum of three unused modules

4. A single isolated set of dry relay form C contacts shall be provided for each of the 6 module addresses, which shall be capable of being wired for either a normally open or normally closed operation.

5. The module shall allow an addressable control panel to switch these contacts on command.

6. The module shall contain removable plug in terminal blocks capable of supporting 12 AWG to 18 AWG wire.

7. The control relays mounted on the module shall be suitable for pilot duty applications and rated for a maximum of 3.0 amps at 30 VDC, resistive, non-coded and 2.0 amps at 30 VDC maximum, resistive, coded.

M. Six-Zone Interface Module

1. A six-zone interface module shall be provided as an interface between the addressable panel and two-wire conventional detection zones.

2. A common SLC input shall be used for all modules, and the initiating device circuits shall share a common external supervisory supply and ground.

3. The first address on the interface module shall be addressed from 01 to 154 while the remaining modules are automatically assigned to the next five higher addresses.

4. Address shall be set using decimal encoded rotary address switches. Binary address switches are not acceptable.

5. Provision shall be included for disabling a maximum of two unused addresses of the six available.

6. All two-wire detectors being monitored shall be two-wire compatibility listed with the six zone input module.

7. The six zone input module shall transmit the status of a zone of two-wire detectors to the fire alarm control panel. Status shall be reported as normal, open or alarm.

8. Removable plug-in terminals shall be provided capable of accepting from 18 AWG up to 12 AWG wire.

N. Multiple Two-Wire Detector Monitoring

1. A single multi input module shall be provided for the monitoring of up to 10 conventional Initiating Device Circuits populated with 2-wire smoke detectors as well as normally-open contact alarm initiating devices (pull stations, heat detectors, etc).

2. Each IDC of conventional devices will be monitored as a distinct

address on the polling circuit by an addressable point. The module will supervise the IDC for alarms and circuit integrity (opens).

3. The first address on the 10 input boards shall be set from 01 to 150 and the remaining module addresses shall be automatically assigned to the next nine higher addresses.

4. Provision shall be included for disabling a maximum of two unused addresses.

5. The supervised state (normal, open, or short) of the monitored device shall be sent back to the panel. A common SLC input shall be used for all modules, and the initiating device loops shall share a common supervisory supply and ground.

6. The IDC zone may be wired for Class A or B (Style D or Style B) operation. A green LED for each circuit shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel. LEDs shall latch on when a circuit is in alarm.

O. Isolator Module

1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Style 6 (Class A) or Style 4 (Class B branch). The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop segment or branch. At least one isolator module shall be provided for each floor or protected zone of the building.

2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.

3. The isolator module shall not require any address setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.

4. The isolator module shall mount in a standard 4-inch (101.6 mm) deep electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

P. Serially Connected Annunciator

1. The annunciator shall communicate with the fire alarm control panel via a two wire EIA 485 (multi-drop) communications circuit.

2. The annunciator shall require no more than four wires for operation. Annunciation shall include: intelligent addressable points, system software zones, control relays, and notification appliance circuits. The following operations shall also be provided:

a. Up to 32 annunciators, each with up to 64 points may be installed on the system.

b. The annunciator shall include a single electrical key switch to disable all switch functions.

c. The annunciator shall provide alarm and trouble resound, with flash for new conditions.

d. This unit shall provide for each zone: alarm indications, using a red alarm and yellow trouble LEDs, and switches for the control of fire alarm control panel functions. The annunciator will also have an ON-LINE LED, local piezo electric signal, local acknowledge/lamp test switch, and custom slide-in zone/function identification labels.

e. Switches shall be available for remote annunciation and control of output points in the system, system acknowledge, telephone zone select, speaker select, global signal silence, and global system reset within the confines of all applicable standards.

3. This system shall provide a means of interfacing to graphic style annunciator.

4. The graphic annunciator interface will possess the capability of individually annunciating each individual addressable device in the system.

Q. Alphanumeric LCD Type Annunciator:

1. The alphanumeric display annunciator shall be a supervised, remotely located backlit LCD display containing a minimum of eighty (80) characters for alarm annunciation in clear English text.

2. The LCD annunciator shall display all alarm and trouble conditions in the system.

3. An audible indication of alarm shall be integral to the alphanumeric display.

4. The display shall be UL listed for fire alarm application.

5. It shall be possible to connect up to 32 LCD displays and be

capable of wiring distances up to 6,000 feet from the control panel.

6. The annunciator shall connect to a separate, dedicated "terminal mode" EIA-485 interface. This is a two-wire loop connection and shall be capable of distances to 6,000 feet. Each terminal mode LCD display shall mimic the main control panel.

R. Door Holders:

1. Door Holders will be available in 120 VAC and 24 VDC models.

2. 120 VAC models will be transient-protected against surges up to 600 volts.

3. Door holders will be designed for Fail Safe operation (power failure release door to close).

S. Elevator Recall (N/A):

1. Smoke detectors will be installed in the elevator hoist shaft. An alarm from such devices will signal the elevator to initiate emergency procedures. All lift call buttons; door buttons and signals will become inoperative in the lift bank serving the machine room. Lifts will immediately be sent to the main floor of egress (ground level) where they will be decommissioned until the alarm condition has been cleared or manually taken over by Fire Department personnel.

2 Smoke detectors will be installed in each elevator lobby. These detectors will function to signal the elevator to recall to the primary floor of egress (ground level) in the event of an alarm. Detectors on the first floor will signal the elevator to recall to the secondary floor of egress.

T. Field Wiring Terminal Blocks

For ease of service all panel I/O wiring terminal blocks shall be removable, plug-in types and have sufficient capacity for #18 to #12 AWG wire. Terminal blocks which are permanently fixed are not acceptable.

2.5. SYSTEM COMPONENTS - ADDRESSABLE DEVICES

A. Addressable Devices - General

1. Addressable devices shall employ the simple-to-set decade addressing scheme. Addressable devices which use a binary-coded address setting method, such as a DIP switch, are not an allowable substitute.

2. Detectors shall be addressable and intelligent, and shall connect

with two wires to the fire alarm control panel signaling line circuits.

3. Addressable smoke and thermal (heat) detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect an external remote alarm LED.

4. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.

5. Detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Base options shall include a base with a built-in (local) sounder rated for a minimum of 85 DBA, a relay base and an isolator base designed for Style 7 applications.

6. Detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel.

7. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).

8. Detectors shall provide address-setting means using decimal switches.

2.6. BATTERIES:

A. Upon loss of Primary (AC) power to the control panel, the batteries shall have sufficient capacity to power the fire alarm system for required standby time (24 or 60 hours) followed by 5 minutes of alarm.

B. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills, and leakage shall not be required.

C. If necessary to meet standby requirements, external battery/charger systems may be used.

PART 3.0 - EXECUTION

3.1. 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. Manual pull stations shall be suitable for surface mounting or semi flush mounting as shown on the plans, and shall be installed 48 inches (122 mm) above the finished floor to the top of the device.

3.2. TEST:

The service of a competent, factory-trained engineer or technician NICET Level III shall be provided to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72, Chapter 7.

A. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

B. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.

C. Verify activation of all waterflow switches.

D. Open initiating device circuits and verify that the trouble signal actuates.

E. Open and short signaling line circuits and verify that the trouble signal actuates.

F. Open and short notification appliance circuits and verify that trouble signal actuates.

G. Ground all 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 of all intelligent smoke detectors using the walk test.

J. Each of the alarm conditions that the system is required to detect should

be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

K. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.3. FINAL INSPECTION:

A. At the final inspection a minimum NICET Level III technician shall demonstrate that the system functions properly in every respect.

3.4. INSTRUCTION:

A. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.

B. The contractor or installing dealer shall provide a user manual indicating "Sequence of Operation."

3.5. FINAL DOCUMENTATION

A. Record drawings provide information that is essential to those who test and maintain the fire alarm system. These drawings must be developed during the installation by the installer and consist of the original fire alarm system shop drawings that have been annotated during the installation of the system to show exactly where the fire alarm system components (Including remote power extenders and control units or modules) have been installed, how the cable and conduit has been routed, wiring sequences, wiring methods and the locations of all terminal and junction boxes. Record drawings account for all field changes that were made during the installation. They also show details of how each conductor of each fire alarm system circuit was installed, the locations of raceways, the number and color codes of the conductors used, the actual location of each device and appliance, terminal cabinets, terminal identifications, and dates of software and system revisions. Any changes made throughout the life of the fire alarm system must be noted on the record drawings. The record drawings, once completed by the contractor, should be transmitted to the designer for review and acceptance before delivering them to the owner or authority having jurisdiction. Contractor shall comply with all items listed in this paragraph.

B. A detailed narrative description of the system inputs, evacuation signaling, ancillary functions, annunciation, intended sequence of operations, expansion capability, application considerations and limitations.

C. Operator instructions for basic system operations, including alarm

acknowledgment, system reset, interpretation of system output (LEDs, CRT display, and printout), operation of manual evacuation signaling and ancillary function controls, and change of printer paper.

D. A detailed description of routine maintenance and testing as required and recommended and as would be provided under a maintenance contact, including testing and maintenance instructions for each type of device installed. This information should include a listing of the individual system components that required periodic testing; step-by-step instructions detailing the requisite testing and maintenance procedures, and the intervals at which these shall be performed; and a schedule that correlates the testing and maintenance procedures recommended.

E. A service directory, including a list of names and telephone numbers of those who provide service for the system.

END OF SECTION

SECTION 16780 COMMUNICATIONS AND COMPUTER SYSTEMS

1 PART 1 GENERAL

1.1 SECTION INCLUDES

A. Equipment mounting.

B. Premises wiring and outlets.

1.2 RELATED SECTIONS

A. Section 16110 - Conduit.

B. Section 16120 - Building Wire and Cable

C. Section 16785 – COSA Systems Wiring Standards. This section has precedence over all items in Section 16780.

1.3 REFERENCES

A. EIA/TIA-568 - Commercial Building Wiring Standard.

B. EIA/TIA-569 - Commercial Building Standard for Telecommunication Pathways and Spaces.

C. T-568B - Standard for Computer Wiring.

D. NFPA 70 - National Electrical Code.

1.4 SYSTEM DESCRIPTION

A. Backbone Pathway: Conform to EIA/TIA 569.

B. Horizontal Pathway: Conform to EIA/TIA 569.

C. Premises Wiring: Complete from equipment to each outlet, using wire and cable as specified. All work contained in this section to be performed by Contractor.

1.5 QUALIFICATIONS

A. Installer: Company specializing in installing telephone premises wiring with minimum years experience.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish Products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

1.7 MAINTENANCE SERVICE

A. Furnish service and maintenance of premises wiring for one year from Date of Substantial Completion.

1.8 EXTRA MATERIALS

A. Provide two of each type of outlet jack.

2 PART 2 PRODUCTS

2.1 WIRE AND CABLE

A. Refer to Section 16120 for complete description of all cables.

2.2 WIRING DEVICES

A. Computer terminations: Leviton Quick Port modules or equal. Provide one module for telephone module, one module for RJ-45 connector and one blank in 3 port wall plate.

B. Telephone terminations: Leviton Quick Port modules or equal. Provide two modules for telephone jacks in 2 port wall plate.

C. Television terminations: Leviton Quick Port modules or equal. Provide one module for RG-59 coaxial connector in 1 port wall plate.

2.3 WIRING CLOSETS

A. Wiring closets to contain jack strips mounted minimum of 84" AFF at location shown on plans. Provide one RJ-45 connector per cable. Locate 120 volt receptacle adjacent to jack strip.

2.4 PATCH PANELS

A. The transmission properties of internally wired connecting devices shall meet or exceed those specified in TIA/EIA 568, Section 12.2.6.2.

B. Standard interface jack and plugs shall meet the requirements of TIA/EIA-TSB-31, Ref B 1.37.

C. Interface jacks shall be eight pin jacks with pin/pair assignments according to the 568A designation with applicable color code combinations. These pin/pair assignments to be compatible with ISDN BRI (ISO 8877), Ref B 1.24.

3 PART 3 EXECUTION

3.1 INSTALLATION

A. Install wire and cable in accordance with manufacturer's instructions and in accordance with EIA/TIA 568. Insure that standard T-568B is adhered to for all Category 6 installations.

B. Support raceways, backboards, and cabinets. Install termination backboards and cabinets plumb, and attach securely to building wall at each corner.

C. Install polyethylene pulling string in each empty telephone conduit.

D. Install category 6 cable and other cable as required to each box serving telephone or computer outlets. Install category 6 cable from outlet to electrical room to location of computer hub.

E. All communications and computer outlets to have minimum 1" conduit stubbed to 6" above ceiling.

END OF SECTION

City of San Angelo Network Wiring Specifications

(Gigabit Speed Copper Cable and Fiber Optic)

Revised April 14, 2010

This standard covers cabling for Copper Data, Fiber Optic.

1. Data Cabling Standards –

1.1. Copper Cable

1.1.1. Install, label, and test (plenum or non-plenum-rated for above ceiling locations depending on local fire codes and ventilation systems), Gigabit Ethernet (1000BaseT) unshielded twisted pair (UTP), 24 AWG 4 pair wire, in each. The wiring is to be home run from each station location marked on the building plans. A patch panel mounted on a relay rack and a mounted cable rack in the appropriate wiring closet will be provided by the vendor. During the warranty period, the vendor must resolve all installation and hardware problems on site within a two hour time frame. All wiring will be a complete Commscope, Systimax, Ortronics, Panduit, Leviton, Hitachi, ADC solution, or vendors of like quality.

1.1.2. Each floor of city hall will have a dedicated 48 port Cat-6 Patch Panel(s) (vendor provided) located in the IT server room in the basement for cable termination. The vendor will provide relay rack, cable trays, Panduit cable management for relay rack, and cable ladders.

1.1.3. Cables will be terminated in the Patch Panel in a sequential order by room number or location. The only exception would be when a new cable is added to an existing patch panel and the next consecutive location is taken. In this case the next available empty jack will be used. Each floor will start with drop 1 and position 1 on the Patch Panel.

1.1.4. Designate each as follows: Wiring Closet Termination Point, Room, Drop, Position, and Jack ID Label (Sample shown below). This information will be recorded and the data provided to the city I.T. department.

Example:

Closet	Room	Floor	Drop/Position	Length	Jack ID
Basement	B122	1	1	75	1, 1

1.1.5. All work will be done in accordance with Category 6 specifications as published in TIA/EIA standards 568, 568-B, 569, 570, 606, and 607 and applicable standards for 1000BaseT. Additions are listed in TSB31, 36, and 40 and The National Electric Code

for low voltage wiring. BICSI Telecommunications Standards will be considered as the standard for all installation practices. In addition, all installation will be compliant with ISDN BRI (ISO 8877). Cable connectors shall meet IEEE 802.3i specifications. All Jacks will be wired in accordance with the TIA/EIA 568-B wiring method.

1.1.6. If any fire rated wall is penetrated it must be sealed to maintain the fire rating that existed prior to the penetration.

1.1.7. All interior or exterior wall penetrations will be appropriately sealed. Interior wall penetration will, at the minimum, be sealed with fire resistant, insulating foam. Exterior penetrations will be sealed with cement, metal, caulking, or foam where appropriate.

1.1.8. All exterior wall penetrations will have a commercial weather head installed.

1.2. Conduit and Cable Bends

1.2.1. If running cables "bare" or on cable trays, cables must be plenum rated if required by local fire codes.

1.2.2. Neatness in cabling, ensuring that all cables are "hidden" from open view or run in wall mounted raceway, is mandatory. Floor area runs are to be avoided. Cables shall not be stapled to walls, abutments, supports, or any other objects. Concurrent data cable runs shall be bundled together neatly and loosely.

1.3. Wiring Drop and Connector Specifications

1.3.1. Each wiring drop will include: as a minimum a single port wall plate with one (1) terminated cable. One (1) GigaSpeed cable per plate terminated and tested. Multiple drops can be installed in the same box with multi-port face plates when the drops will be in close proximity to each other.

1.3.2. Each four pair, 24 AWG GigaSpeed cable will be terminated in an eight pin, modular jack at the work area. These connectors shall be UTP outlets, which meet all criteria, listed in TIA/EIA 568.

1.4. Wiring Description for Horizontal Cabling

1.4.1. All wiring cables with a run length of 295 feet or under shall consist of 24 AWG plastic insulated conductors formed into four twisted pairs and enclosed by a plastic jacket. Cabling will be plenum rated (if required by local fire codes). The manufacturer to be certified as Gigaspeed compliant shall rate all cables.

1.4.2. The wire O.D. of the cable shall be no less than .18 and no more than .22 trade size.

1.4.3. The pair assembly shall meet the color code according to TIA/EIA 568, section 10.2.1.1.3.

1.4.4. No wire can be bent tightly [i.e., greater than 6 X Outside Diameter (O.D.) of the cable] or kinked at the jack.

1.4.5. All cables must be tested at least once and shall perform better than the minimum requirements as outlined in TIA/EIA 568-B (including appendices) as it pertains to GigaSpeed cabling.

1.4.6. Any cable that fails to meet testing measurements will be completely re-run at the vendor's expense including equipment, parts, and time.

1.4.7. All horizontal data cabling will be yellow or blue.

1.4.8. Cable lengths are to be recorded using cable test equipment and the data provided to the City I.T. department.

1.4.9. All cabling when terminated will be untwisted the minimum distance necessary to make the connection. At no time should the untwisted strands exceed maximum length recommended by the EIA/TIA and BICSI standards.

1.5. Electrical Considerations

1.5.1. All wires must be run per the following standoff distance table:

Condition:	2kVA	2.5kVA	5kVA
Unshielded power lines or electrical equipment in proximity to open or non-metal pathways	5 inches	12 inches,	24 inches
Unshielded power lines or electrical equipment in proximity to a grounded metal conduit pathway	2.5 inches,	6 inches,	12 inches
Power lines enclosed in a grounded metal conduit in proximity to a grounded metal conduit pathway	3 inches	6 inches	

1.5.2. All wires must be run at least 6.5 feet from any electromagnetic field, such as those generated by electrical motors, converters and invertors.

1.5.3. All wires must be run at least 6 inches distant from fluorescent lights.

1.5.4. All wires must be run at least 1 foot from FAX machines, refrigerators, microwaves, and copiers.

1.6. Wiring Closets (Technology Closet)

1.6.1. The wiring closets are transition points between the horizontal distribution pathways and the backbone or part of the backbone itself.

1.6.2. The wiring closets are to contain one or more floor, wall or ceiling mounted jack strips. The placement will be (7) to more than (8) feet above the floor. There will be one RJ-45 connector per cable. There will also be a 110 Volt AC receptacle located adjacent to each jack strip.

1.7. Patch Panels (Connecting Hardware)

1.7.1. The transmission properties of the internally wired connecting devices shall meet or exceed the transmission performance requirements specified in TIA/EIA 568, section and the NEC, interfaces included.

1.7.2. Standard interface jacks and plugs shall meet the requirements of TIA/EIA-TSB-31, Ref B 1.37.

1.7.3. Interface jacks shall be eight pin jacks with pin/pair assignments according to the 568B designation with applicable color code combinations. These pin/pair assignments are compatible with ISDN BRI (ISO 8877), Ref B1.24. Wiring will be terminated with the **TIA/EIA 568B wiring method.**

1.8. All cable will be sequentially installed according to the room number or location number.

1.9. Wiring Labels and Wiring Management

1.10. Labeling all wall jacks, cables, patch cables and patch panel jacks is mandatory. The method for applying labels will be left to the discretion of the installer; however the City I.T. department will be supplied with a sample for approval prior to any installations. Labels will be of some indelible ink, non-removable, tape or under a plastic retaining strip which is part of the faceplate or jack strip.

1.11. The labels themselves shall be in accordance with the description given in this document.

1.12. Testing

1.12.1. All cable testing shall be performed at least once by the installation vendor and the resulting data provided to the city I.T. department.

1.12.2. All cables shall be tested by a certified, calibrated scanner according to an accepted and approved GigaSpeed test procedure as noted in TIA/EIA 568-B.

1.12.3. Any cable runs that fail to meet specifications in the bid and that fail the scanner test shall be completely rerun at the expense of the vendor.

1.12.4. All cables that are rerun will be tested for compliance as if they were an initial run. The results of these tests shall be treated the same as described above.

1.13. Conduit and Raceways

1.14. All wiring which cannot be installed in the walls or ceiling will be enclosed in surface mounted raceway.

1.15. Any wiring which must extend through an outdoor area must be in conduit.

1.16. Cabling will never be laid directly on the ceiling grid. It will be suspended above the ceiling grid on approved J hooks or equivalent whenever possible.

1.17. Cabling will not be attached to existing cabling, plumbing, water pipes, air ducts, ceiling supports or electrical or communications conduit.

2. Fiber Optic Cabling

2.1. All standards mentioned above for installation apply except those that are specifically for copper wiring. Fiber optic cable shall be certified to meet or exceed the current American National Standards Institute (ANSI) Fiber Distributed Data Interface (FDDI) specification.

2.2. Cabling will be a minimum of twelve strand indoor/outdoor cable, multimode, 62.5/125 micron plenum or PVC according to local fire codes. 50/125 micron multimode OM3

plenum or PVC cable will be utilized in new installations where it is not mixed with 62.5 micron fiber.

2.3. Single mode fiber will be a minimum of 1-strand 08/125 micron.

2.4. All terminations will be with ST type ceramic or stainless connectors, glued not crimped.

2.5. All cable will terminate in a City of San Angelo approved distribution enclosure.

2.6. The enclosure will be populated with sufficient ST to ST bulkhead adapters so that each fiber is connected to an adapter.

2.7. All fiber optic cable installations will be certified with an approved fiber optic certification tester and written results of testing supplied to City of San Angelo I.T. department. For multimode fibers, testing will be done at both 850 and 1300nm, using LED sources.

2.8. Conduit - All exposed fiber optic cabling exterior to a building will be installed in conduit from the point of egress from the building.

2.9. This cable shall be suitable for installation free-air, in building Risers, in Conduit, in Cable Tray and/or in interduct.

2.10. Cable Materials shall be all dielectric (no conductive materials).

2.11. Outer Sheath: The Outer Sheath shall be marked with the manufacturer's name, date of manufacture, fiber type, flame rating, UL symbol, and sequential length markings every two feet.

2.12. Temperature Range:

2.13. Storage: -40 to +70° C (no irreversible change in attenuation)

2.14. Operating: -20 to +70° C (OFNP)

2.15. Humidity Range: 0 to 100%

2.16. Max. Tensile Load (□12-fibers; Backbone, Riser, Intra-building) During Installation: 1332 Newton's (300 lb. force) (no irreversible change in attenuation). Long Term: 600 N (135 lb. force)

2.17. Bending Radius:

2.17.1. During Installation: 20 times cable diameter

2.17.2. No Load: 10 times cable diameter.

2.18. All optical fibers shall be sufficiently free of surface imperfections and inclusions to meet the optical, mechanical, and environmental requirements of this specification. Factory optical fiber splices are not allowed.

2.19. All fibers shall have been subjected to a minimum tensile proof test by the fiber manufacturer equivalent to 100-kpsi.

2.20. All fibers in each cable shall be guaranteed to meet the San Angelo City I.T. department's specifications.

2.21. Multi-mode Fiber cables shall be sized as needed.

2.22. Multi-mode Optical Fibers in each cable shall meet the following specifications:

2.22.1. Fiber Type: Multi-mode; doped silica core surrounded by a concentric glass

cladding.

2.22.2. Index Profile: Graded Index
2.22.3. Transmission Windows: 850nm and 1300nm
2.22.4. Core Diameter: (nom) 50nm (microns)
2.22.5. Cladding Diameter: 125nm
2.22.6. Core-clad Concentricity: 3nm
2.22.7. Cladding Non-circularity 2.0%
2.22.8. Fiber Coating Diameter 250nm (primary coating)
2.22.9. 900-nm (nominal) Secondary coating (tight buffer)
2.22.10. All coatings shall be mechanically strippable without damaging the optical fiber.

2.23. When tested in accordance with FOTP-3, "Procedure to Measure Temperature Cycling Effects on Optical Fibers, Optical Cable, and Other Passive Fiber Optic Components", the average change in attenuation over the rated temperature range of the cable shall not exceed 0.50 dB/km with 80% of the measured fibers not exceeding 0.25 dB/km.

2.23.1. Bandwidth (min.) @ 850-nm 160-MHz*km @ 1300-nm 500 “
2.23.2. No multi-mode optical fiber shall show a point discontinuity greater than 0.2 dB at the specified wavelengths. Such a discontinuity or any discontinuity showing a reflection at that point shall be cause for rejection of that fiber by the Owner.
2.23.3. Product: Commscope, Berk-Tek, or equivalent (plenum)

2.24. All fiber optic cable will be installed in accordance with City of San Angelo Wiring Standards and within BICSI code allowances.

2.25. All new fiber optic cable will be installed in **interduct** in the ceiling and in the tunnel system and buried conduits when exterior and not aerial.

2.26. All strands will be terminated in a lockable metal box as specified in the City of San Angelo Wiring Standards or a lockable fiber optic assembly in the equipment rack co-located in lockable data cabinet.

2.27. All new fibers will be terminated with SC connectors.

2.28. If different length or termination connectors are needed for the fiber optic patch cables the vendor will supply them.

2.29. **Warranty:** Installed cabling (walls, ceiling, under floor) will be warranted for a period of 20 years. Wall jacks, and patch panels must be warranted for a period of 20 years. both 850 and 1300nm, using LED sources.

2.30. The installed fiber cable should have at least 10 feet of coiled slack cable at each end to allow for repair and relocation.

2.31. Cabling will be plenum or non-plenum depending on local fire codes and ventilation system requirements.

2.32. Interduct - All exposed fiber optic cabling interior to a building, or where deemed appropriate on the interior to a building, will be in interduct.

3. Video Cable Wiring

3.1. Office

3.1.1. All cable to the office will be RG-6 non-plenum or plenum rated cable depending on local fire codes.
3.1.2. All cables from the office will be home run to a wiring closet room.
3.1.3. Cables be terminated with “F” Type connectors on either end.
3.1.4. All terminations will be in a front corner of the room mounted just below the ceiling as specified in the floor plans and mounted in a standard cable face plate.
3.1.5. There will be a duplex 110 Volt AC receptacle installed adjacent to each cable outlet jack. If possible, the AC outlet and the cable jack should be in the same face plate.
3.1.6. The signal strength in each office should be no less than 0db.

3.2. Wiring Closet

3.2.1. All terminations in the wiring closet will be mounted to a passive splitter to provide easy connectivity to the video cable coming from the main video (Audio-Video).
3.2.2. If the signal strength at the wiring closet is not sufficient then an amplifier must be installed to boost the signal strength for a strength of 0db at the office termination.
3.2.3. A duplex 110 AC outlet will be mounted near the cable termination panel in the wiring closet.

COM*check* Software Version 4.0.5.4

Envelope Compliance Certificate

Section 1: Project Information

Energy Code: **2009 IECC**
Project Title: New Fire Station No. 4
Project Type: New Construction

Construction Site:
3415 Edgewood Dr.
(South Chadbourne St. & Edgewood Dr.)
San Angelo, TX 76903

Owner/Agent:
Brian Dunn, Fire Chief
San Angelo Fire Department
306 West 1st. St.
San Angelo, Texas, TX 76903
325-657-4355
briand@safiredept.com

Designer/Contractor:
Gary Donaldson
Gary Donaldson Architecture
949 Turner St.
San Angelo, TX 76903
325-655-4805
donaldson @suddenlinkmail.com

Building Location (for weather data): San Angelo, Texas
Climate Zone: 3b
Vertical Glazing / Wall Area Pct.: **9%**

Building Use: Activity Type(s)	Floor Area
1-Police/Fire Station : Nonresidential	11100

Section 2: Envelope Assemblies and Requirements Checklist

Envelope PASSES: Design 6% better than code.

Envelope Assemblies:

Component Name/Description	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Proposed U-Factor	Budget U-Factor(a)
Roof: Attic Roof with Wood Joists, [Bldg. Use 1 - Police/Fire Station]	11500	20.5	0.0	0.049	0.027
Quarters Ext. Wall: Wood-Framed, 16" o.c., [Bldg. Use 1 - Police/Fire Station]	2950	23.0	5.0	0.043	0.089
Alum. Windows: Metal Frame with Thermal Break:Double Pane with Low-E, Perf. Type: Energy code default, Double Pane with Low-E, Tinted , SHGC 0.60, [Bldg. Use 1 - Police/Fire Station]	570	---	---	0.650	0.650
Alum. Doors: Glass (> 50% glazing):Metal Frame, Perf. Type: Energy code default, Double Pane with Low-E, Tinted , SHGC 0.60, [Bldg. Use 1 - Police/Fire Station]	42	---	---	0.800	0.900
Hol. Metal Doors: Insulated Metal, Swinging, [Bldg. Use 1 - Police/Fire Station]	42	---	---	0.350	0.700
Appratus Ext. Wall: Concrete Block:8", Partially Grouted, Cells Empty,Normal Density , Furring: None, [Bldg. Use 1 - Police/Fire Station]	4176	---	5.0	0.138	0.123
Glass Block: Other Window, Perf. Specs.: Product ID 201-2004, SHGC 0.65, PF 1.00, [Bldg. Use 1 - Police/Fire Station] (c)	30	---	---	0.480	0.650
Overhead Doors: Insulated Metal, Non-Swinging, [Bldg. Use 1 - Police/Fire Station]	1176	---	---	0.350	1.450
Floor: Slab-On-Grade:Unheated, [Bldg. Use 1 - Police/Fire Station]	513	---	---	---	---

(a) Budget U-factors are used for software baseline calculations ONLY, and are not code requirements.

(b) 'Other' components require supporting documentation for proposed U-factors.

(c) Fenestration product performance must be certified in accordance with NFRC and requires supporting documentation.

Air Leakage, Component Certification, and Vapor Retarder Requirements:

❑ 1. All joints and penetrations are caulked, gasketed or covered with a moisture vapor-permeable wrapping material installed in accordance with the manufacturer's installation instructions.

- ❑ 2. Windows, doors, and skylights certified as meeting leakage requirements.
- ❑ 3. Component R-values & U-factors labeled as certified.
- ❑ 4. No roof insulation is installed on a suspended ceiling with removable ceiling panels.
- ❑ 5. 'Other' components have supporting documentation for proposed U-Factors.
- ❑ 6. Insulation installed according to manufacturer's instructions, in substantial contact with the surface being insulated, and in a manner that achieves the rated R-value without compressing the insulation.
- ❑ 7. Stair, elevator shaft vents, and other outdoor air intake and exhaust openings in the building envelope are equipped with motorized dampers.
- ❑ 8. Cargo doors and loading dock doors are weather sealed.
- ❑ 9. Recessed lighting fixtures installed in the building envelope are Type IC rated as meeting ASTM E283, are sealed with gasket or caulk.
- ❑ 10. Building entrance doors have a vestibule equipped with self-closing devices.
  Exceptions:
  - ❑ Building entrances with revolving doors.
  - ❑ Doors not intended to be used as a building entrance.
  - ❑ Doors that open directly from a space less than 3000 sq. ft. in area.
  - ❑ Doors used primarily to facilitate vehicular movement or materials handling and adjacent personnel doors.
  - ❑ Doors opening directly from a sleeping/dwelling unit.

Section 3: Compliance Statement

Compliance Statement: The proposed envelope design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed envelope system has been designed to meet the 2009 IECC requirements in COM*check* Version 4.0.5.4 and to comply with the mandatory requirements in the Requirements Checklist.

Name - Title	Signature	Date

COM*check* Software Version 4.0.5.1

Interior Lighting Compliance Certificate

Section 1: Project Information

Energy Code: **2009 IECC**
Project Title: New Fire Station #4 San Angelo Fire Dept.
Project Type: New Construction

Construction Site:
3415 Edgewood Drive
San Angelo, TX 76903

Owner/Agent:
Brian Dunn
Fire Chief
306 W. 1st St.
San Angelo, TX 76903
325.657.4335
support@safiredept.com

Designer/Contractor:
Paul Wilkerson
PowerSystems
Firm #F-6257
P.O. Box 2863
San Angelo, TX 76902
325.659.2235

Section 2: Interior Lighting and Power Calculation

A Area Category	B Floor Area (ft2)	C Allowed Watts / ft2	D Allowed Watts (B x C)
Police/Fire Station	11100	1	11100
		Total Allowed Watts =	11100

Section 3: Interior Lighting Fixture Schedule

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixtures	D Fixture Watt.	E (C X D)
Police/Fire Station (11100 sq.ft.)				
LED: B: WRAPAROUND: Other:	1	10	73	730
LED: B2: WRAPAROUND: Other:	1	14	48	672
LED: C: 4' WRAPAROUND: Other:	1	4	73	292
LED: D/DE: SUSPENDED: Other:	1	19	79	1501
LED: E: 6" DOWNLIGHT: Other:	1	23	15	345
LED: F: 2' STRIP: Other:	1	3	17	51
LED: G: UP/DOWN: Other:	1	10	43	430
LED: H: VANITY: Other:	1	6	21	126
LED: L/LE: HIGH BAY: Other:	1	20	307	6140
Linear Fluorescent: N: 4' DIRECT/INDIRECT: 46" T5 28W: Electronic:	2	4	56	224
LED: R/RE: WRAPAROUND: Other:	1	8	67	536
			Total Proposed Watts =	11047

Section 4: Requirements Checklist

Interior Lighting PASSES: Design 0.5% better than code.

Lighting Wattage:

❑ 1. Total proposed watts must be less than or equal to total allowed watts.

Allowed Watts	Proposed Watts	Complies
11100	11047	YES

Controls, Switching, and Wiring:

❑ 2. Daylight zones under skylights more than 15 feet from the perimeter have lighting controls separate from daylight zones adjacent to vertical fenestration.

❑ 3. Daylight zones have individual lighting controls independent from that of the general area lighting.

Exceptions:

❑ Contiguous daylight zones spanning no more than two orientations are allowed to be controlled by a single controlling device.

❑ Daylight spaces enclosed by walls or ceiling height partitions and containing two or fewer light fixtures are not required to have a separate switch for general area lighting.

❑ 4. Independent controls for each space (switch/occupancy sensor).

Exceptions:

❑ Areas designated as security or emergency areas that must be continuously illuminated.

❑ Lighting in stairways or corridors that are elements of the means of egress.

❑ 5. Master switch at entry to hotel/motel guest room.

❑ 6. Individual dwelling units separately metered.

❑ 7. Medical task lighting or art/history display lighting claimed to be exempt from compliance has a control device independent of the control of the nonexempt lighting.

❑ 8. Each space required to have a manual control also allows for reducing the connected lighting load by at least 50 percent by either controlling all luminaires, dual switching of alternate rows of luminaires, alternate luminaires, or alternate lamps, switching the middle lamp luminaires independently of other lamps, or switching each luminaire or each lamp.

Exceptions:

❑ Only one luminaire in space.

❑ An occupant-sensing device controls the area.

❑ The area is a corridor, storeroom, restroom, public lobby or sleeping unit.

❑ Areas that use less than 0.6 Watts/sq.ft.

❑ 9. Automatic lighting shutoff control in buildings larger than 5,000 sq.ft.

Exceptions:

❑ Sleeping units, patient care areas; and spaces where automatic shutoff would endanger safety or security.

❑ 10. Photocell/astronomical time switch on exterior lights.

Exceptions:

❑ Lighting intended for 24 hour use.

❑ 11. Tandem wired one-lamp and three-lamp ballasted luminaires (No single-lamp ballasts).

Exceptions:

❑ Electronic high-frequency ballasts; Luminaires on emergency circuits or with no available pair.

Section 5: Compliance Statement

Compliance Statement: The proposed lighting design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed lighting system has been designed to meet the 2009 IECC requirements in COM*check* Version 4.0.5.1 and to comply with the mandatory requirements in the Requirements Checklist.

Name - Title	Signature	Date

Project Notes:

MEP Project #1611
PE License #50732
February 09, 2017

Architect: Gary Donaldson, AIA
949 Turner St.
San Angelo, TX
325.655.4805

COM*check* Software Version 4.0.5.1

Exterior Lighting Compliance Certificate

Section 1: Project Information

Energy Code: **2009 IECC**
Project Title: New Fire Station #4 San Angelo Fire Dept.
Project Type: New Construction
Exterior Lighting Zone: 2 (Residential mixed use area)

Construction Site:
3415 Edgewood Drive
San Angelo, TX 76903

Owner/Agent:
Brian Dunn
Fire Chief
306 W. 1st St.
San Angelo, TX 76903
325.657.4335
support@safiredept.com

Designer/Contractor:
Paul Wilkerson
PowerSystems
Firm #F-6257
P.O. Box 2863
San Angelo, TX 76902
325.659.2235

Section 2: Exterior Lighting Area/Surface Power Calculation

A Exterior Area/Surface	B Quantity	C Allowed Watts / Unit	D Tradable Wattage	E Allowed Watts (B x C)	F Proposed Watts
Other door (not main entry)	9 ft of door width	20	Yes	180	384
Main entry	3 ft of door width	20	Yes	60	46
Entry canopy	1221 ft2	0.25	Yes	305	192
			Total Tradable Watts* =	545	622
			Total Allowed Watts =	545	
			Total Allowed Supplemental Watts** =	600	

* Wattage tradeoffs are only allowed between tradable areas/surfaces.
** A supplemental allowance equal to 600 watts may be applied toward compliance of both non-tradable and tradable areas/surfaces.

Section 3: Exterior Lighting Fixture Schedule

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixtures	D Fixture Watt.	E (C X D)
Main entry (3 ft of door width): Tradable Wattage				
LED: XA/XAE: 8" APERTURE: LED Other Fixture Unit 50W:	1	1	46	46
Other door (not main entry) (9 ft of door width): Tradable Wattage				
LED: XA/XAE: 8" APERTURE: LED Other Fixture Unit 50W:	1	4	46	184
LED: XC: WALL MOUNT: LED Other Fixture Unit 50W:	1	4	50	200
Entry canopy (1221 ft2): Tradable Wattage				
LED: XA/XAE: 8" APERTURE: LED Other Fixture Unit 50W:	1	2	46	92
LED: XD: AREA: LED Other Fixture Unit 50W:	1	1	100	100
			Total Tradable Proposed Watts =	622

Section 4: Requirements Checklist

Lighting Wattage:

❑ 1. Within each non-tradable area/surface, total proposed watts must be less than or equal to total allowed watts. Across all tradable areas/surfaces, total proposed watts must be less than or equal to total allowed watts.

Compliance: Passes using supplemental allowance watts.

Controls, Switching, and Wiring:

- ❑ 2. All exemption claims are associated with fixtures that have a control device independent of the control of the nonexempt lighting.
- ❑ 3. Lighting not designated for dusk-to-dawn operation is controlled by either a a photosensor (with time switch), or an astronomical time switch.
- ❑ 4. Lighting designated for dusk-to-dawn operation is controlled by an astronomical time switch or photosensor.
- ❑ 5. All time switches are capable of retaining programming and the time setting during loss of power for a period of at least 10 hours.

Exterior Lighting Efficacy:

- ❑ 6. All exterior building grounds luminaires that operate at greater than 100W have minimum efficacy of 60 lumen/watt.

Exceptions:

- ❑ Lighting that has been claimed as exempt and is identified as such in Section 3 table above.
- ❑ Lighting that is specifically designated as required by a health or life safety statue, ordinance, or regulation.
- ❑ Emergency lighting that is automatically off during normal building operation.
- ❑ Lighting that is controlled by motion sensor.

Section 5: Compliance Statement

Compliance Statement: The proposed exterior lighting design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed lighting system has been designed to meet the 2009 IECC requirements in COM*check* Version 4.0.5.1 and to comply with the mandatory requirements in the Requirements Checklist.

Name - Title	Signature	Date

COM*check* Software Version 4.0.5.1

Mechanical Compliance Certificate

Section 1: Project Information

Energy Code: **2009 IECC**
Project Title: New Fire Station #4 San Angelo Fire Dept.
Project Type: New Construction

Construction Site:
3415 Edgewood Drive
San Angelo, TX 76903

Owner/Agent:
Brian Dunn
Fire Chief
306 W. 1st St.
San Angelo, TX 76903
325.657.4335
support@safiredept.com

Designer/Contractor:
Paul Wilkerson
PowerSystems
Firm #F-6257
P.O. Box 2863
San Angelo, TX 76902
325.659.2235

Section 2: General Information

Building Location (for weather data): San Angelo, Texas
Climate Zone: 3b

Section 3: Mechanical Systems List

Quantity **System Type & Description**

1 HVAC System #1-3 ton (Single Zone) :
Heating: 1 each - Central Furnace, Gas, Capacity = 60 kBtu/h
Proposed Efficiency = 95.00% Et, Required Efficiency = 80.00% Et
Cooling: 1 each - Split System, Capacity = 34 kBtu/h, Air-Cooled Condenser, No Economizer, Economizer exception: None
Proposed Efficiency = 14.00 SEER, Required Efficiency: 13.00 SEER
Fan System: FAN SYSTEM 1 -- Compliance (Motor nameplate HP method) : Passes

Fans:
FAN 1 Supply, Constant Volume, 1200 CFM, 0.8 motor nameplate hp

1 HVAC System #2 4 ton (Single Zone) :
Heating: 1 each - Central Furnace, Gas, Capacity = 100 kBtu/h
Proposed Efficiency = 95.00% Et, Required Efficiency = 80.00% Et
Cooling: 1 each - Single Package DX Unit, Capacity = 43 kBtu/h, Air-Cooled Condenser, No Economizer, Economizer exception: None
Proposed Efficiency = 14.50 SEER, Required Efficiency: 13.00 SEER
Fan System: FAN SYSTEM 2 -- Compliance (Motor nameplate HP method) : Passes

Fans:
FAN 2 Supply, Constant Volume, 1600 CFM, 1.0 motor nameplate hp

1 HVAC System #3 4.5 ton (Single Zone) :
Heating: 1 each - Central Furnace, Gas, Capacity = 120 kBtu/h
Proposed Efficiency = 95.00% Et, Required Efficiency = 80.00% Et
Cooling: 1 each - Single Package DX Unit, Capacity = 53 kBtu/h, Air-Cooled Condenser, No Economizer, Economizer exception: None
Proposed Efficiency = 14.00 SEER, Required Efficiency: 13.00 SEER
Fan System: FAN SYSTEM 3 -- Compliance (Motor nameplate HP method) : Passes

Fans:
FAN 3 Supply, Constant Volume, 2000 CFM, 1.0 motor nameplate hp

2 HVAC System #4 2.5 ton (Single Zone) : Split System Heat Pump
Heating Mode: Capacity = 29 kBtu/h,
Proposed Efficiency = 9.60 HSPF, Required Efficiency = 7.70 HSPF
Cooling Mode: Capacity = 28 kBtu/h,
Proposed Efficiency = 16.00 SEER, Required Efficiency: 13.00 SEER

Fan System: FAN SYSTEM 4 -- Compliance (Motor nameplate HP method) : Passes

Fans:
FAN 4 Supply, Constant Volume, 1200 CFM, 0.5 motor nameplate hp

1 HVAC System #6 3 ton (Single Zone) : Split System Heat Pump
Heating Mode: Capacity = 36 kBtu/h,
Proposed Efficiency = 9.80 HSPF, Required Efficiency = 7.70 HSPF
Cooling Mode: Capacity = 35 kBtu/h,
Proposed Efficiency = 16.00 SEER, Required Efficiency: 13.00 SEER
Fan System: FAN SYSTEM 5 -- Compliance (Motor nameplate HP method) : Passes

Fans:
FAN 5 Supply, Constant Volume, 1600 CFM, 0.8 motor nameplate hp

1 Storage Water Heater 1:
Gas Storage Water Heater, Capacity: 75 gallons, Input Rating: 75 Btu/h w/ Circulation Pump
Proposed Efficiency: 0.50 EF, Required Efficiency: 0.48 EF

Section 4: Requirements Checklist

Requirements Specific To: HVAC System #1-3 ton :

❑ 1. Equipment minimum efficiency: Central Furnace (Gas): 80.00 % Et (or 78% AFUE)
❑ 2. Equipment minimum efficiency: Split System: 13.00 SEER

Requirements Specific To: HVAC System #2 4 ton :

❑ 1. Equipment minimum efficiency: Central Furnace (Gas): 80.00 % Et (or 78% AFUE)
❑ 2. Equipment minimum efficiency: Single Package Unit: 13.00 SEER

Requirements Specific To: HVAC System #3 4.5 ton :

❑ 1. Equipment minimum efficiency: Central Furnace (Gas): 80.00 % Et (or 78% AFUE)
❑ 2. Equipment minimum efficiency: Single Package Unit: 13.00 SEER

Requirements Specific To: HVAC System #4 2.5 ton :

❑ 1. Equipment minimum efficiency: Heat Pump: 7.70 HSPF 13.00 SEER

Requirements Specific To: HVAC System #6 3 ton :

❑ 1. Equipment minimum efficiency: Heat Pump: 7.70 HSPF 13.00 SEER

Requirements Specific To: Storage Water Heater 1 :

❑ 1. Water heating equipment meets minimum efficiency requirements: Gas Storage Water Heater efficiency: 0.48 EF
❑ 2. All piping in circulating system insulated
❑ 3. Hot water storage temperature controls that allow setpoint of 90°F for non-dwelling units and 110°F for dwelling units.
❑ 4. Automatic time control of heat tapes and recirculating systems present
❑ 5. Controls will shut off operation of circulating pump between water heater/boiler and storage tanks within 5 minutes after end of heating cycle

Generic Requirements: Must be met by all systems to which the requirement is applicable:

❑ 1. Plant equipment and system capacity no greater than needed to meet loads
Exception(s):

- ❑ Standby equipment automatically off when primary system is operating
- ❑ Multiple units controlled to sequence operation as a function of load

❑ 2. Minimum one temperature control device per system
❑ 3. Minimum one humidity control device per installed humidification/dehumidification system
❑ 4. Load calculations per ASHRAE/ACCA Standard 183.
❑ 5. Automatic Controls: Setback to 55°F (heat) and 85°F (cool); 7-day clock, 2-hour occupant override, 10-hour backup
Exception(s):

- ❑ Continuously operating zones

❑ 6. Outside-air source for ventilation; system capable of reducing OSA to required minimum
❑ 7. R-5 supply and return air duct insulation in unconditioned spaces
R-8 supply and return air duct insulation outside the building
R-8 insulation between ducts and the building exterior when ducts are part of a building assembly
Exception(s):

- ❑ Ducts located within equipment

- ❑ Ducts with interior and exterior temperature difference not exceeding 15°F.

❑ 8. Mechanical fasteners and sealants used to connect ducts and air distribution equipment

❑ 9. Ducts sealed - longitudinal seams on rigid ducts; transverse seams on all ducts; UL 181A or 181B tapes and mastics

❑ 10. Hot water pipe insulation: 1.5 in. for pipes <=1.5 in. and 2 in. for pipes >1.5 in.
Chilled water/refrigerant/brine pipe insulation: 1.5 in. for pipes <=1.5 in. and 1.5 in. for pipes >1.5 in.
Steam pipe insulation: 1.5 in. for pipes <=1.5 in. and 3 in. for pipes >1.5 in.
Exception(s):

- ❑ Piping within HVAC equipment.
- ❑ Fluid temperatures between 55 and 105°F.
- ❑ Fluid not heated or cooled with renewable energy.
- ❑ Piping within room fan-coil (with AHRI440 rating) and unit ventilators (with AHRI840 rating).
- ❑ Runouts <4 ft in length.

❑ 11. Operation and maintenance manual provided to building owner

❑ 12. Thermostatic controls have 5°F deadband
Exception(s):

- ❑ Thermostats requiring manual changeover between heating and cooling
- ❑ Special occupancy or special applications where wide temperature ranges are not acceptable and are approved by the authority having jurisdiction.

❑ 13. Balancing devices provided in accordance with IMC 603.17

❑ 14. Demand control ventilation (DCV) present for high design occupancy areas (>40 person/1000 ft2 in spaces >500 ft2) and served by systems with any one of 1) an air-side economizer, 2) automatic modulating control of the outdoor air damper, or 3) a design outdoor airflow greater than 3000 cfm.
Exception(s):

- ❑ Systems with heat recovery.
- ❑ Multiple-zone systems without DDC of individual zones communicating with a central control panel.
- ❑ Systems with a design outdoor airflow less than 1200 cfm.
- ❑ Spaces where the supply airflow rate minus any makeup or outgoing transfer air requirement is less than 1200 cfm.

❑ 15. Motorized, automatic shutoff dampers required on exhaust and outdoor air supply openings
Exception(s):

- ❑ Gravity dampers acceptable in buildings <3 stories

❑ 16. Automatic controls for freeze protection systems present

❑ 17. Exhaust air heat recovery included for systems 5,000 cfm or greater with more than 70% outside air fraction or specifically exempted
Exception(s):

- ❑ Hazardous exhaust systems, commercial kitchen and clothes dryer exhaust systems that the International Mechanical Code prohibits the use of energy recovery systems.
- ❑ Systems serving spaces that are heated and not cooled to less than 60°F.
- ❑ Where more than 60 percent of the outdoor heating energy is provided from site-recovered or site solar energy.
- ❑ Heating systems in climates with less than 3600 HDD.
- ❑ Cooling systems in climates with a 1 percent cooling design wet-bulb temperature less than 64°F.
- ❑ Systems requiring dehumidification that employ energy recovery in series with the cooling coil.
- ❑ Laboratory fume hood exhaust systems that have either a variable air volume system capable of reducing exhaust and makeup air volume to 50 percent or less of design values or, a separate make up air supply meeting the following makeup air requirements: a) at least 75 percent of exhaust flow rate, b) heated to no more than 2°F below room setpoint temperature, c) cooled to no lower than 3°F above room setpoint temperature, d) no humidification added, e) no simultaneous heating and cooling.

Section 5: Compliance Statement

Compliance Statement: The proposed mechanical design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 2009 IECC requirements in COM*check* Version 4.0.5.1 and to comply with the mandatory requirements in the Requirements Checklist.

Name - Title	Signature	Date

Section 6: Post Construction Compliance Statement

❑ HVAC record drawings of the actual installation, system capacities, calibration information, and performance data for each equipment provided to the owner.

❑ HVAC O&M documents for all mechanical equipment and system provided to the owner by the mechanical contractor.

❑ Written HVAC balancing and operations report provided to the owner.

The above post construction requirements have been completed.

Principal Mechanical Designer-Name	Signature	Date