

November 12, 2024



**S.P.A.G Renovation
6811 Indiana Avenue
Lubbock, Texas 79413
CHA Project #2405**

Proposals due Friday, November 15, 2024 by 2:00 p.m.

Addendum Three

1. Mechanical Specifications added.

End of Addendum Three

CONSULTANTS' PROFESSIONAL RESPONSIBILITY

The specifications sections to be authenticated by my seal and signature are limited to the following:

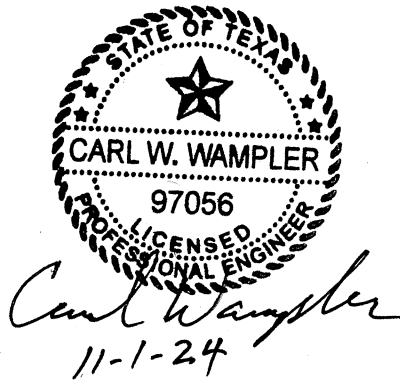
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SECTION 15010 - GENERAL MECHANICAL PROVISIONS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work covered by this section of the specifications includes the furnishing of all materials and labor as required for the installation of the plumbing, heating, ventilating and air conditioning systems, all as shown on the drawings, as herein specified, or both.

1.2 RELATED DOCUMENTS

- A. Refer to other applicable clauses and regulations for other requirements.

1.3 SUBMITTAL

- A. All submittal required by this section shall be submitted in accordance with Section 01300.
- B. This Contractor shall submit six (6) copies of all submittal data covering proposed equipment to the Architect for approval prior to installation. All equipment shall be submitted at one time in a bound folder with an index of submittal.

1.4 REGULATIONS

- A. All work shall be done in strict accordance and compliance with State and Local Laws, together with regulations of the particular Utility Companies concerned.
- B. Obtain permits as required by the local authorities.

1.5 CLARIFICATION

- A. The Engineer shall provide, with reasonable promptness, written responses to requests from the Contractor for clarification and interpretation of the requirements of the Contract Documents. However, if the Contractor's requests for information, clarification or interpretation are, in the Engineers professional opinion, for information readily apparent from reasonable observation of field conditions or a review of the Contract Documents, or are reasonably inferable therefrom, the Engineer shall be entitled to compensation from the Contractor for the Engineer's time spent responding to such requests.

1.6 DEFECTS

- A. Contractors shall promptly report to the Engineer any defects or suspected defects in the contract documents of which the Contractor becomes aware, so that the Engineer may take measures to minimize the consequences of such a defect. Failure by the Contractor to notify the Engineer shall relieve the Engineer or Owner of the costs of remedying the defects above the sum such remedy would have cost had prompt notification been given when such defects were first discovered.

1.7 COMPLETION

- A. If the Contractor asks for a final inspection and the project is not complete enough to prepare a normal punch

list as determined by the Engineer, the Engineer shall be compensated for time and travel for subsequent site visits.

1.8 DRAWINGS

- A. The drawings and the specifications are numbered consecutively. Each Contractor shall check these drawings and specifications thoroughly and shall notify the Architect of any discrepancies or omissions of sheets or pages. Upon notification, the Architect will promptly provide the Contractor with any missing portions of the drawings and/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.
- B. The plans accompanying these specifications are intended to show the general arrangement and the extent of the work contemplated. The Contractor shall inspect the site before bidding to verify the actual conditions involved as no allowance will be made for unforeseen conditions. The exact location and arrangement of all parts shall be determined after equipment has been approved by the Architect and as directed by the Architect. All materials or labor necessary to complete the work in accordance with the intent of these specifications shall be furnished by each Contractor without additional charge as if called for in these specifications or shown on the plans.
- C. Should the specific equipment which any bidder proposes to install require other space conditions, supports or clearances other than those indicated on the drawings, he shall arrange for such items 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.
- D. This Contractor shall verify all existing conditions that may affect his work including exact location and size of all plumbing lines, direction of flow, ductwork, existing equipment and connection points. Any discrepancies from conditions shown on the drawings shall be reported to the Architect before bidding and the bid price shall include the cost to correct any discrepancies to provide a complete and workable system.
- E. This Contractor shall thoroughly lay out all his work and check all conditions to ensure that the work as shown on the Drawings can be installed without modifications. No material shall be fabricated or delivered to the job until these conditions have been determined.
- F. The Owner or Owner's Representative reserves the right to make changes during construction, if required, and no allowances will be made for prefabricated material or on job materials which can not be used due to actual conditions.

1.9 APPROVAL OF MATERIALS

- A. Where manufacturer's names are mentioned in these specifications, it has been done, in most cases, to establish a standard. The products of others than the manufacturers mentioned will be acceptable, if of suitable type and construction, but any substitution must be of quality as good as, or better than, the named article.
- B. If the Contractor elects to substitute other equipment or materials for that specified by name, he shall be fully responsible for all coordination with other trades involved. Any expense incurred because of modifications to accommodate larger sizes, larger electrical service, fuel piping requirements resulting from such substitution shall be borne by the Contractor substituting other equipment.
- C. Upon being awarded the Contract for the work under one of the following sections, the Contractor shall, within thirty (30) days, submit for approval a complete list of the materials which he proposes to use. The list shall give the manufacturer's names and designations corresponding to every item and where submitted materials are different from that specified by name, the submission shall be accompanied by a complete descriptive literature and/or any supplementary data and drawings, necessary to give full and complete details for the completed installation.

- D. Any item on this list which is rejected because of unsuitability or inferior quality, must be replaced by an acceptable item within two (2) weeks following notification of the Contractor of such rejection. If no satisfactory material is submitted within two (2) weeks, then the Architect reserves the right to notify the Contractor as to the type and make of materials he will be required to furnish. Six (6) copies of the material and the equipment list shall be furnished by the Contractor in neat and firmly bound brochures for approval.

1.10 PRECEDENCE

- A. The work covered in this section shall have precedence over each other in accordance with the following sequence:
 1. Soil and waste piping
 2. Duct work
 3. Cold and hot water piping
 4. Electric wiring

1.11 COOPERATION

- A. Each contractor shall cooperate with the General Contractor and all other contractors to properly coordinate their work, to avoid interference and delays, and arrange all parts of the work so as to harmonize in service and appearance with all other parts.

1.12 INTERFERENCES

- A. The plans are generally schematic and the Contractor must harmonize the work of the different trades so that interference between piping, equipment, architectural and structural work will be avoided. All necessary offsets in piping, fittings, etc., required to properly install the work must be kept as close as possible to walls, ceiling, columns, etc., so as to take up the minimum amount of space, and all offsets, fittings, etc., required to accomplish it must be furnished and installed by the contractor without additional cost to the Owner.
- B. Exact locations of mechanical equipment may be varied a reasonable amount by the Architect before installation without additional cost to the Owner.
- C. All equipment and controls shall be so located and arranged that all parts will be available for proper maintenance.

PART 2 - PRODUCTS

2.1 MATERIALS AND WORKMANSHIP

- A. Materials shall be new, unless otherwise specified, and of the quality specified. Materials shall be free from any defects. Materials and equipment for which the Underwriters' Laboratories have established as standard, shall be listed by the Underwriters' Laboratories, Inc., and shall bear their label.
- B. Each Contractor shall be responsible for transportation of his materials to the job and shall be responsible for the storage and protection of same. This will be provided until final acceptance of the job.
- C. Each Contractor shall provide protection against weather, so as to maintain all materials and equipment free from injury and damage. All new work likely to be damaged shall be covered during the day and at the end of each day.
- D. Each Contractor will furnish all necessary scaffolding, tackle, tools, appurtenances and all labor required for

the safe and expeditious execution of this contract.

- E. The workmanship shall be in all respects, the highest grade and all construction in accordance with the best practice of the trade.

PART 3 - EXECUTION

3.1 VERIFICATION OF PLANS AND SPECIFICATIONS

- A. It shall be the responsibility of all parties concerned to carefully examine the plans and specifications relating to this work for completeness, accuracy and clarity. Any conflict, errors or clarification requests shall be immediately brought to the attention of the Engineer for written interpretation or instructions. No claims for increased compensation for additions, changes or alterations will be considered unless written authority is granted by the Engineer. Otherwise, any additional materials and/or labor due to additions, alterations and changes necessary to meet existing conditions shall be furnished under this contract.

3.2 HANGERS AND SUPPORTS

- A. The Contractor for the work covered by each section of these specifications shall furnish and install all foundations and supports required by equipment included in his work.
- B. All piping, both vertical and horizontal, shall be supported at sufficient close intervals to keep its alignment, prevent sagging and to prevent pipe from being supported by equipment or equipment connections.
- C. Vertical pipes shall be supported from floor with riser clamps sized to fit the lines and adequately support their weight. Vertical copper tubing, 1-1/4" and smaller shall be supported at 3' intervals and at the base of pipe risers, where required for proper support. Hangers shall be manufactured by Kindorff, Unistrut, Elcen or equal. Where multiple pipes are indicated, they may be supported on a continuous hanger. All hangers must meet the Architect's approval. Use of perforated straps will not be permitted.
- D. All horizontal pipes suspended with structure above shall be supported by hanger rods of the following size:
- | | |
|---------------------------------|-----------|
| 1. Pipes up to and including 2" | 3/8" rods |
| 2. 2-1/2" and 3" pipe | 1/2" rods |
| 3. 4" and 5" pipe | 5/8" rods |
| 4. 6" pipe | 3/4" rods |
- E. Soil pipe shall be supported at all turns and at intervals not to exceed 5' on centers on straight runs. The following table gives maximum hanger spacing for copper and steel lines but hangers shall be more closely spaced where necessary:

SIZE OF LINE	HANGER SPACING
3/4" and smaller	5'
1"	6'
1-1/4"	7'
1-1/2"	8'
2" to 4"	10'
Larger than 4"	12'

- F. If pipes of different Contractors can be racked on the same supporting structure, each Contractor shall cooperate with the other involved to properly locate the supporting members and shall furnish a proportionate share of the labor and materials involved in the installation.

3.3 EXPANSION AND CONTRACTION OF PIPES

- A. Swing joints, turns, expansion loops, or long offsets, shall be provided wherever shown on the drawings, and where necessary to allow for the expansion of piping within the building. Broken pipes or fittings due to rigid connection shall be removed and replaced at the Contractor's expense. Anchors shall be installed where shown or required to control expansion of piping system. Anchors shall be of the clamp type securely fastened to the building structure.

3.4 UNIONS

- A. Unions shall not be placed in any pipe in a location which will be inaccessible after completion of the building unless shown on drawings or specified. Unions shall be installed on both sides of all valves, regulators, check valves, traps, etc., so that such equipment may be readily disconnected. Where copper pipe joins iron or steel pipe, an insulation union using a "Bakelite" insulator shall be used.

3.5 ESCUTCHEONS

- A. Where exposed to view, pipes insulated or bare, passing through floors, walls, or ceilings, shall be filled with near, heavy spun or stamped steel escutcheons, firmly secured to the pipes. Escutcheons shall be of sufficient outside diameter to surround both the pipe and the sleeves. The sleeve shall have a nickel plated finish, fabricated in one piece and shall be firmly anchored in space. "Snap-on" type escutcheons will not be permitted.

3.6 UTILITY CONNECTIONS

- A. Utility connection locations, depths, sizes, characteristics and capacities shall be verified by each Contractor utilizing these items and any discrepancies from those shown on the plans shall be brought to the Architect's attention before bidding. Any and all utility connections shall be made by the Contractor, as required, with no increase to the Owner above the price indicated in the Contractor's proposal. Provide all necessary backflow prevention devices as required to comply with the City of Lubbock's backflow prevention program.

3.7 PAINTING

- A. No painting will be required under this section.

3.8 TESTING

- A. This contractor shall test all plumbing lines and equipment as described under "Testing" section of these specifications.

3.9 ELECTRICAL

- A. Electric motors shall be of the speed, phase and voltage as specified and shall be of type recommended by motor manufacturer for type of service involved.
- B. The Contractor furnishing the motor shall install it. The Contractor shall furnish such motor controls and starting equipment as specified or as required. The erection and connection of all switches, starting and control equipment, and the wiring of same, shall be done as required. Conduits from controllers to motors shall be flexible for not over three feet (3') and shall be attached to the terminal housing of the motor. All flexible conduit to motor shall be waterproof type with neoprene jacket.
- C. Where automatic controls are called for in the Plumbing, Heating and Air Conditioning specifications, the

control instruments, such as motorized damper motors, motorized valves, etc., shall be installed by the Contractor furnishing the controls. All wiring necessary shall be done by the Electrical Contractor. The Contractor furnishing the controls shall furnish a control wiring diagram to the Electrical Contractor.

- D. Starters on air cooled condensing units shall be furnished by the equipment manufacturer. Starters for Heating and Ventilating units shall be furnished by the equipment manufacturer.

3.10 PIPE SLEEVES

- A. Each contractor shall provide sleeves for service lines passing through walls, roof or floors, subject to Architect's approval and/or as shown on the Drawings. Pipes passing through interior wall sleeves shall be free to move through sleeve. Sleeves exposed to view shall be equipped with cast brass escutcheons.
- B. All sleeves installed in vertical position shall be constructed of standard weight galvanized steel pipe. All sleeves in horizontal position shall be constructed of standard weight steel or extra heavy cast iron pipe unless otherwise noted, welded to steel plate in vertical position as detailed on the drawings. Pipe sleeve diameter shall be a minimum of 2 diameters larger than the outside of pipe passing through same, and a minimum of 1" larger than pipe plus insulation. Insulation shall pass through sleeves.
- C. Where pipe extends through exterior walls below grade, oversize pipe sleeves, 2 diameters larger, made of standard weight steel pipe shall be used, and the annular space between service pipe and sleeves shall be filled with picked oakum and cement, or lead where required, to make a waterproof joint.
- D. All sleeves shall be installed flush with finished surfaces and/or as detailed on the Drawings. Copper pipes passing through steel pipe sleeves shall be installed with rubber insulation between pipe and sleeves. Isolator insulation shall be similar to Johns-Manville Aerotube.
- E. Where any pipe passes through fire walls, smoke walls, and concrete slabs between floors, the Contractor shall furnish and install fire seals, U.L. listed, type LS, link-seal, as manufactured by Thunderline Corp., or approved equal. Fire and smoke seals shall be installed in steel pipe sleeve of correct size for pipe and insulation.

3.11 INSULATING COUPLINGS

- A. This Contractor shall furnish and install insulating couplings wherever piping material changes from galvanized steel pipe to copper, or from black steel to copper, and where shown on the drawings.

3.12 INSULATION

- A. Furnish and install pipe, duct, and equipment insulation as specified under "Insulation" section of these specifications.

3.13 LABELS

- A. Mechanical equipment shall have a permanent metal tag or laminated plastic (min. thickness .093 inch) attached by riveting to identify as shown on the drawings. Letters on tag shall be 1/4" to 3/8" in height.

3.14 FLOOR AND CEILING PLATES

- A. All exposed pipes passing through floors, ceiling, or walls shall be provided with approved nickel or chromium plated cast brass ceiling plates securely attached with set screws.

3.15 DEMOLITION

- A. Each contractor shall remove those items shown on the plans to be removed for each respective trade.
- B. All items to be removed or discarded are property of the Owner and shall be stacked as directed by the Architect or Owner unless notified by the Architect to become property of the Contractor in which case all items shall be removed from the site.
- C. Contractor shall take care not to damage more of the existing facilities than is absolutely necessary. All concrete to be removed shall be cored or sawed to widths to allow the installation of pipes or conduits indicated and replaced by Contractor who occasions the work.

3.16 EQUAL MATERIAL CONSIDERATION

- A. Approval of equipment other than that specified does not relieve the Contractor from the responsibility of modifying the equipment if necessary to meet Structural, Architectural, Electrical, or Mechanical conditions as detailed and specified on the drawings.

3.17 INSTRUCTION MANUALS

- A. Furnish four (4) complete bound copies of Instruction Manuals on all operating equipment to Owner. Manuals: complete with repair instructions, replacement parts list, and complete operating instructions and wiring diagrams.

3.18 TESTS AND ADJUSTMENTS

- A. After completion of the work but before final payment is made, the Contractor shall run test over a sufficient period of time to prove the proper capacity and performance of apparatus, etc., and of system as a whole to the approval of the Architect and Engineer. See Testing section of the Specifications.

3.19 GUARANTEE

- A. This Contractor shall guarantee the workmanship and material against defects for a period of one (1) year from the date of acceptance, unless specified otherwise in other sections of this specification.

END OF SECTION 15010

SECTION 15020 – TESTING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide specified testing and commissioning, as required by the International Energy Conservation Code (IECC) and all governing authorities.

1.2 RELATED DOCUMENTS

- A. Refer to other applicable clauses and regulations for other requirements.

PART 2 - PRODUCTS

2.1 SUBMITTAL

- A. All submittal required by this section shall be submitted in accordance with Section 01300.
- B. Submit a certificate signed by the job superintendent certifying that all tests have been satisfactorily completed.

PART 3 - EXECUTION

3.1 MECHANICAL SYSTEMS

- A. All testing required under the contract of the plumbing contractor or heating and ventilating and air conditioning contractor shall be approved by the Engineer before acceptance.
- B. The contractor shall perform the various tests as specified and as required by State and Local Authorities. The Contractor shall furnish all fuel and materials necessary for making tests.
- C. Any leaks or defective material found shall be repaired and replaced, and tests shall be repeated until no further leaks or defects are indicated.
- D. Gas Piping: All gas piping shall be tested under a pressure of 15" of mercury air pressure for a period of twenty-four (24) hours and be proof tight.
- E. Air Balancing: All supply and return air registers shall be balanced by the Contractor to supply CFM shown, and results of all tests, together with type of equipment used, shall be submitted to the Architect's office at completion of the job, and if the Architect deems it necessary, this Contractor shall perform such tests as may be necessary to illustrate to the satisfaction of the Architect that equipment installed performs properly. Damper operators shall be accessible for adjustment.

END OF SECTION 15020

SECTION 15060 - PIPING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This contract shall include the furnishing and installation of all labor and material necessary to complete all plumbing and gas fitting as shown on the drawings and as herein specified.

1.2 RELATED DOCUMENTS

- A. Refer to other applicable clauses and regulations for other requirements.

1.3 SUBMITTAL

- A. All submittal required by this section shall be submitted in accordance with Section 01300.
- B. Submit manufacturer's data for approval on all materials to be furnished as part of this project.

PART 2 - PRODUCTS

2.1 PIPING GENERALLY

- A. Type of piping for the various systems shall be as specified under specific headings.
- B. Pipe ends shall be square cut. Ends of pipes shall be reamed and shall be wiped clean to remove cuttings. Before installation, pipe shall be stood on end and rapped sharply to remove cuttings and other foreign material from interior. Pipe shall be thoroughly cleaned inside and outside.
- C. Screwed joints shall be made with best linseed oil and graphite or "Jointite" used on male threads only. Omit compound on two (2) end starting threads.
- D. Pipe shall be accurately cut to fit. Bending or springing of pipe will not be permitted.
- E. The various service pipes, valves, fittings, etc., running parallel with each other and near together shall be in line with each other and shall be kept a sufficient distance from each other and other work, to permit not less than 1/2" between finished coverings on the different services.
- F. No unions are to be placed in any pipe in a location which will be inaccessible after completion of the building unless so shown on drawings or specified. Unions must be installed on each side of all special valves, regulators, etc., and one (1) side of all check valves, thermostatic traps, and at all pieces of equipment such as pumps, condensers, tanks, etc., so that such equipment may be readily disconnected.
- G. Each Contractor shall furnish all foundations, structural or pipe supports indicated or called for specifically, or that may be required to support his particular equipment and material, unless hangers are definitely indicated as being furnished by others. All horizontal runs of piping shall be securely supported by pipe hangers spaced not more than 10' apart, and closer when necessary to prevent sagging. Soil pipe shall be supported every 5'.
- H. Perforated strap hangers will not be allowed for any part of hangers.
- I. Swing joints, offsets, and anchors shall be provided in piping where required to provide for and control expansion or contraction of pipe.

- J. All piping, shall be installed above finished first floor slab, unless otherwise noted on the Drawings.

2.2 EQUAL MATERIALS CONSIDERATION

- A. Approval of equipment other than that specified does not relieve the Contractor from the responsibility of modifying the equipment if necessary to meet Structural, Architectural, Electrical, or Mechanical conditions as detailed and specified on the drawings.

2.3 MATERIALS

- A. Locations for various kinds of pipe materials shall be in accordance with the schedule following:
 1. Plastic DWV pipe and fittings:
 - a. Underground sanitary drainage piping within the building line and exterior of the building line.
 - b. Aboveground vent and drainage piping.
 2. Type L hard drawn copper with brass solder fittings:
 - a. Aboveground domestic water piping within the building 4" and smaller in size.
 - b. Drainage pipe where shown on the drawings.
 3. Standard weight black steel pipe, Schedule 40, with screwed malleable fittings:
 - a. Aboveground gas piping on roof to 3'-0" outside the building line.
 4. Schedule 40 PVC pipe and fittings:
 - a. Condensate traps discharging into drain pans on roof.
 5. AWWA C-900 PVC Class 200-DR14 water piping.
 - a. Fire protection lines.

PART 3 - EXECUTION

3.1 COPPER WATER PIPING:

- A. Pipe and tubing shall be cut accurately to measurements established at the building by the Contractor and shall be worked into place without springing or forcing. Care shall be taken not to weaken the structural portions of the building. Piping aboveground shall be run parallel with the lines of the building unless otherwise shown or noted on the drawings. Branches from service lines may be taken off top of main, bottom of main, or side of main, using such crossover fittings as may be required by structural or installation conditions. Service pipes, valves, and fittings shall be kept a sufficient distance from other work and not less than 1/2" between finished covering on the different services. No water piping shall be buried in floors unless specifically indicated on the drawings or approved. Changes in sizes shall be made with reducing fittings. The use of long screws and bushing will not be permitted. Where contractor connects copper to galvanized steel piping or hot water heaters, furnish and install insulating couplings.
- B. Drains indicated on the drawings in connection with the water distribution system shall be 1/2" brass plugs. Additional drains shall be installed at low points on the hot-water and cold-water piping, and all piping shall grade down to the drains.
- C. Allowance shall be made throughout for expansion and contraction of tubing. Horizontal runs of tubing over 50' in length shall be anchored to the wall or to the supporting construction about midway on the run to force expansion, evenly divided, toward the ends.
- D. Air chambers shall be provided on both hot and cold supplies near each faucet or control valve, as applicable, and where not definitely shown on the drawings shall consist of a 12" length of tubing of the same diameter as the branch supply, fitted with a cap. Air chambers shall be securely fastened to the building structure.
- E. Tubing shall be cut square, and burrs shall be removed. Both inside of fittings and outside of tubing shall be well cleaned with steel wool before sweating. Care shall be taken to prevent annealing of fittings and tubing when making connections. All joints shall be made with fittings. Joints for aboveground soldered fittings

shall be made with a non-corrosive paste flux and solid string silver solder, and all underground joints shall be made with silfos only. Cored solder will not be permitted. Threaded swing joints shall be provided on all branch connections to mains and risers to provide for expansion and contraction of tubing. 95-5 solder shall be used to make joints extending to fixture only.

- F. Underground piping shall be a minimum of 24" below finish and/or natural grades.

3.2 DOMESTIC HOT AND COLD WATER AND GAS VALVES AND FITTINGS

- A. Valves and fittings for all domestic cold water and hot water services shall be as follows:

1. Valves shall be ball valves.
2. Gas service stops shall be Crane No. 1228.
3. Swing check valves 3" and smaller shall be Crane No. 137. Swing checks larger than 3" shall be Crane No. 14493.
4. Lift check valves 3" and smaller shall be crane No. 366E.

3.3 GAS PIPING:

- A. Gas piping shall be installed parallel with the building and water piping. In finished rooms, piping shall be run concealed in a vented space. Gas piping shall not be run under floor slabs, unless specifically noted, and then shall be in Orangeburg or PVC airtight vented sleeves with metal fitting in an approved manner.
- B. Joints for steel pipe shall be made with graphite and oil or an approved graphite compound applied to the male thread only. After cutting and before threading, all pipe shall be reamed and shall have burrs removed. Threads shall be full cut, and not more than three (3) threads on the pipe shall remain exposed. Caulking of threaded joints to stop or prevent leaks will not be permitted. Joints for polyethylene pipe shall be made with heat fusion couplings as recommended by the manufacturer.
- C. Make final connection to all items of equipment, as shown and required, using unions and shut-off valves in each location. Provide a flexible line of minimal length at each piece of equipment.

3.2 PIPE HANGERS AND FIXTURE SUPPORTS

- A. Pipe hangers and fixture supports shall be furnished and set, and the Contractor shall be responsible for their proper and permanent locations.
- B. Horizontal runs of drainage pipes shall be supported by adjustable expansion pipe hangers having bolted hinged loops and turnbuckles, or an approved equal. Hangers on drainage and vent pipe shall be spaced not more than 10' o.c. Hanger and collars shall be of size proportionate to the weight of the pipe supported.

END OF SECTION 15060

SECTION 15250 - INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This contract includes furnishing and installing all insulation specified herein.

1.2 RELATED DOCUMENTS

- A. Refer to other applicable clauses and regulations for other requirements.

1.3 SUBMITTAL

- A. All submittal required by this section shall be submitted in accordance with Section 01300.
- B. Submit manufacturer's data for approval on all materials to be furnished as part of this project.

PART 2 - PRODUCTS

2.1 PIPE AND DUCT INSULATION

- A. All insulation required under the Plumbing contract and Heating and Air Conditioning Contract shall be equal to and as manufactured by Knauf Fiber Glass, or Johns-Manville, and shall be applied in accordance with the manufacturer's directions and recommendations.
- B. Insulation:
 - 1. Water Piping Within Building Lines - Shall be insulated with 1" thick fiber glass pipe insulation with a factory applied all service jacket with self-sealing lap.
 - 2. Pipe Fittings - Insulate pipe fittings with Manville Zestons according to manufacturer's recommendation.
 - 3. Condensate Drain Lines - Shall be insulated with Johns-Manville Aerotube, 1/2" thick, or approved equal. Secure joints with #57 adhesive.
 - 4. PVC, CPVC, or any flammable piping, shall be fully wrapped with foil face fiberglass duct wrap in installations exposed to a return air plenum.
 - 5. Overhead Heating and Air Conditioning Sheet Metal Ducts Above Ceilings - Shall be insulated with 2" fiber glass duct wrap with aluminum foil Kraft vapor barrier, and shall be secured to ductwork with an approved adhesive and be sealed and stapled in place, 3/4 lb. density.
 - 6. Contractor at his option may use interior duct liner in lieu of exterior insulation. Duct liner shall be Certainteed #150 Ultralite Duct Liner, or approved equal, 1-1/2 lb. per cubic ft. density with vinyl spray one side. All transverse joints shall be protected against air erosion by properly sealing all edges and securing with sheet metal clips. Duct liner shall be secured with mastic, 100% coverage and clips 18" on center. All exposed rectangular ducts shall be lined.
- C. Where insulation is indicated to be applied inside of ducts, exterior insulation will not be required.
- D. Where insulation occurs inside of ducts, allowance shall be made in sheet metal ductwork to accommodate the total insulation thickness. Duct dimensions indicated represent net inside clearances.

- E. Condensate lines shall be insulated with 1" thick fiber glass pipe insulation with a factory applied all service jacket with self sealing lap.

2.2 EQUAL MATERIALS CONSIDERATION

- A. Approval of equipment other than that specified does not relieve the Contractor from the responsibility of modifying the equipment if necessary to meet Structural, Architectural, Electrical, or Mechanical conditions as detailed and specified on the drawings.

2.3 SMOKE AND FLAME SPREAD

- A. All duct and pipe insulation shall have a flame spread no greater than 25 and a smoke developed rating no greater than 50.

PART 3 - EXECUTION

3.1 INSULATION

- A. All insulation shall be applied to clean surfaces and in accordance with the manufacturer's recommendations.

END OF SECTION 15250

SECTION 15400 - PLUMBING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This contract will include the furnishings and installation of all labor and material necessary to complete all plumbing and gas fittings as shown on the drawings and as herein specified as follows:
 - 1. Water supply and service.
 - 2. System of sanitary drainage, venting and connection to all fixtures as shown on the drawings.
 - 3. Gas supply system.
 - 4. Furnishing and installation of all fixtures as shown on the drawings and as herein specified.

1.2 RELATED DOCUMENTS

- A. Refer to other applicable clauses and regulations for other requirements.

1.3 SUBMITTAL

- A. All submittals required by this section shall be submitted in accordance with Section 01300.
- B. Submit manufacturer's data for approval on all materials to be furnished as part of this project.

PART 2 - PRODUCTS

2.1 EQUAL MATERIAL CONSIDERATION

- A. Approval of equipment other than that specified does not relieve the Contractor from the responsibility of modifying the equipment if necessary to meet Structural, Architectural, Electrical, or Mechanical conditions as detailed and specified on the drawings.

2.2 TRAPS

- A. Each fixture and piece of equipment requiring connections at the drainage system shall be equipped with a trap. Traps installed on hub-and-spigot pipe shall be extra-heavy cast-iron. Traps installed on threaded pipe shall be recess drainage pattern. All floor drains shall be equipped with a deep seal trap.
- B. Provide acid waste traps for all lab station sinks.

2.3 CLEANOUTS

- A. Cleanouts shall be the same size as the pipe, except that cleanout plugs larger than 4" will not be required. Cleanouts and access covers at finished walls and exterior walls shall be Wade Co. 8570-R N.B. cover and at finished floors shall be Wade Co. 8550-5 with Wade No 8300-S #2, N.B. cover, or the approved equal. Omit access covers for cleanouts in other locations. All wall covers shall be cadmium plated, and all floor cleanouts shall be polished nickel bronze flush with finish floor. Cleanouts exterior to the building shall be Wade Co. 7100-X with 9" x 9" access cover set flush with finish grade in 16" x 16" concrete pad, or as detailed on the

drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Utilities: This Contractor shall furnish and install, and shall pay for connections to gas piping, all in accordance with requirement of the local service companies concerned.
- B. Cross Connections and Interconnections: No plumbing fixtures, device or piping shall be installed which will provide a cross connection or interconnection between a distributing supply for drinking or domestic purposes and a polluted supply such as a drainage system of a soil or waste into the water supply system. Provide any and all backflow prevention devices as required by code.
- C. The Contractor shall provide all necessary material and labor to connect to the Plumbing System all fixtures and equipment shown on the drawings having plumbing connections and which are furnished and installed by others or are specified in other sections of these specifications.
- D. The Contractor shall carefully investigate the structural and finish conditions affecting all his work and shall arrange such work accordingly, furnishing such fittings, traps, valves, and accessories as may be required to meet such conditions. Where pipes extend through concrete members, this Contractor shall core all such members and slabs, unless sleeves have been provided. Chipping concrete will not be allowed, and if any coring of the concrete members is necessary, this contractor shall call it to the Architect's attention before doing same.
- E. Pipe openings shall be closed with caps or plugs during installation. Fixtures and equipment shall be tightly covered and protected against dirt, water and chemical or mechanical injury. At the completion of the work the fixtures, materials, and equipment shall be thoroughly cleaned.

END OF SECTION 15400

SECTION 15500 - AUTOMATIC FIRE PROTECTION SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section covers the materials, design, installation and testing of the automatic fire protection system as specified and shown on the drawings. Contractor shall modify the existing system in accordance with NFPA 13 for the type facility involved and ensure 100% coverage for the entire building.
- B. Referenced Standards: The following publications form a part of this specification to the extent indicated by the reference thereto:
1. National Fire Protection Association (NFPA) Standards:
No. 13 - Standard for the Installation of Sprinkler Systems
 2. Underwriters Laboratories, Inc. (UL) Publication:
Fire Protection Equipment List
 3. Factory Mutual System (FM) Publication:
Approved Guide
- C. General Requirements: The sprinkler system shall be installed in strict accordance with all mandatory and recommended provisions of NFPA No. 13 for wet pipe systems.
- D. Design: Hydraulic design, where required, shall be based on an occupancy of light hazard.
- E. Authority Having Jurisdiction: For interpretation of the NFPA Standard the "Authority Having Jurisdiction" referred to in the Standard shall be the Fire Marshal. The Contractor agrees to accept such interpretations by the same without additional cost to the Owner.
- F. Qualification of the Contractor: The Fire Protection System modifications shall be performed by an experienced firm regularly engaged in the installation and design of automatic sprinkler systems. The Contractor shall have a "Certificate of Registration" or proof of qualifications as required by the State or the Fire Marshal. The fire protection design and layout shall have the approval of the Engineer and Fire Marshal. The Engineer may reject any proposed installer who cannot show evidence of such qualifications.
- G. Materials and Equipment List and Approval: The Contractor shall submit to the Engineer for approval a complete list of all materials, equipment and accessories proposed for installation, in compliance with the drawings and specifications. This list shall include catalog identification numbers, drawings, catalog cuts, and other descriptive data and material necessary to define completely all components of the work. No consideration will be given to partial list submitted from time to time. Approval of materials and equipment will be based on manufacturer's published data, and will be tentative, subject to submission and approval of complete shop drawings.
- H. Shop Drawings:
1. The contract drawings show the areas which require sprinkler system modifications. The Contractor shall submit complete working drawings on reproducible mylars and calculations of the sprinkler system and such other descriptive data as the Engineer may require to demonstrate compliance with the contract documents.
 2. Shop drawings will be submitted at one time to demonstrate that pertinent items of equipment have been properly coordinated and will function properly with each other. No installation work will be permitted prior to approval of complete shop drawings.
 3. Submittal drawings shall be accurately drawn on blank mylar or vellum sheets. Drawings shall be identical in size, scales, and orientation as the contract drawings, and conform to the requirements established for working plans by NFPA No. 13.
 4. If departures from the contract drawings are deemed necessary by the Contractor, details of such departures, including changes in related portions of the project and the reasons, therefore, shall be

submitted with the shop drawings and hydraulic calculations. Approved departures shall be made at no additional cost to the Owner.

5. All required calculations shall be submitted for approval showing piping designs, water supplies, available pressures, residual pressures, etc. as required by NFPA for hydraulic designs.

- I. Record Drawings: Upon completion of the work, the Contractor shall revise the original shop drawings to agree with the construction as actually accomplished. These drawings shall be delivered to the Engineer.

1.2 RELATED DOCUMENTS

- A. Applicable requirements of the General Conditions, Supplementary Conditions and General Requirements apply to the work specified in this section.

1.3 EQUAL MATERIAL CONSIDERATION

- A. Approval of equipment other than that specified does not relieve the Contractor from the responsibility of modifying the equipment if necessary to meet Structural, Architectural, Electrical, or Mechanical conditions as detailed and specified on the drawings.

PART 2 PRODUCTS

2.1 GENERAL

- A. All material and equipment shall be new and the current standard products of the manufacturer. Where two or more items of equipment performing the same function are required, they shall be exact duplicates, produced by one manufacturer. However, component parts need not be products of the same manufacturer.
- B. All materials and equipment shall be UL listed and/or FM approved for systems of the type indicated on the drawings, and conform to the requirements of NFPA No. 13.

2.2 MATERIALS AND EQUIPMENT

- A. The following is a listing of materials and equipment requirements. It is not intended that all items will necessarily be required, but that those required for the work conform to this listing.

1. Pipe and Fittings: All pipe and fittings shall be non-galvanized except where galvanized is required by NFPA No. 13.

<u>ITEM</u>	<u>SIZE (INCHES)</u>	<u>SPECIFICATION</u>
Pipe	All Above ground	Schedule 40 or Schedule 10 Steel, ASTM A120-83 or A53
Fittings screwed	All	Cast iron 125 lb. on Sprinkler System
Fittings flanged	All	Cast iron 125 lb. on Sprinkler System
Fittings welding	All	Steel, Sch. 40, ANSI B16.2
Grooved Fittings	All	Malleable iron ASTM A47-77 or Ductile iron ASTM 536 500 lb.
Flanges	All	Cast iron 125 lb. on Sprinkler System

Threadolet sockolets	Through 2"	Steel, ANSI B16.11, ASTM A105
Weldolets	2" & larger	Steel, 90 deg. STD only, ANSI B16.9, ASTM A105
Unions	Through 2"	Malleable iron, 300 lb. bronze to iron ground joint
Pipe	All Below Ground	Class 150 Ductile Iron or PVC Clowe
Fittings	Below Ground	Class 150 Mechanical Joint, Trinity Valley
Sprinkler Head Type		Semi-Recessed
Vertical supports, all hangers and connections (non- seismic bracing)	All	Approved type, in accordance with NFPA No. 13 requirements
Sprinkler escutcheons		One or two-piece chrome depth as required to provide clearance in accordance with NFPA No. 13 except where otherwise specified on drawings
Sprinkler Guard		Approved guard, standard baked enamel finish

PART 3 EXECUTION

3.1 DELIVERY, STORAGE AND HANDLING

- A. Piping material, including valves and fittings shall be delivered to the site in a clean condition and protected against entry of foreign material.

3.2 CLEANING

- A. Prior to erection the interior or all piping shall be cleaned of all metal cuttings, loose scale, or other foreign materials. At the discretion of the Engineer, non-welded piping and welded piping with backing rings may require brush cleaning as above. After erection and prior to testing, all valves, caps, and plugs at all low points in the system shall be opened and the system thoroughly flushed with water.

3.3 JOINTS

- A. Joints shall be the threaded, flanged, welded, or grooved. Shop welded joints in accordance with NFPA No. 13 will be permitted. Flanged connections shall be provided where indicated on the drawings or required by NFPA No. 13.
1. Threaded Joints: Threads shall be concentric with the outside of the pipe and shall conform to ANSI B2.1. Threaded joints shall be made tight with an approved thread joint compound or tape. Joint compound shall be applied lightly but sufficiently to cover male threads only. Leaking joints shall not be repaired by peaning or packing.
 2. Flanged Joints: Flanged joints shall be faced-true, provided with non-metallic full face gaskets and made square and tight. When made up, flange bolts shall extend through nuts by at least one full thread. No flanges shall be placed in locations which will be inaccessible after erection.
 3. Welded Joints: All welding, including methods and qualifications of welders, shall be in strict accordance with the standards and requirements specified in NFPA No. 13. Welded branch connections to headers shall be made by the use of threadolet, sockolet, and weldolet.
 4. Groove Joints: All grooving shall be in accordance with NFPA No. 13.

5. Cutting: Pipe shall be cut accurately to measurements shown on the drawings and to suit field conditions, and shall be carefully worked into place without forcing or springing. All cuts shall be reamed to remove fins and burrs.

3.4 PIPE SUPPORTS AND HANGERS

- A. Special supports and hangers shall be as detailed and located on drawings. Supports and hangers not detailed on drawings shall be an approved type, installed in accordance with NFPA No. 13. Ring hangers shall be of the adjustable type. Offsets in hanger rods will not be acceptable.

3.5 PIPE SLEEVES

- A. Pipes passing through concrete or masonry walls or concrete floors shall be provided with pipe sleeves. Each sleeve shall extend through its respective wall or floor, and be of sufficient size as to provide a minimum of 1/2" all-round clearance between pipe and sleeve. Sleeves in walls shall be cut flush with the surface and sleeves in floors shall extend two inches above floor surfaces, unless otherwise shown on drawings. Sleeves in non-bearing walls, floors, or ceilings may be steel pipe, cast iron pipe, or galvanized sheet metal with lock-type longitudinal seam.
- B. Where pipes pass through fire walls, fire partitions, or floor/ceiling assemblies, the Contractor shall furnish and install fire seals, U.L. listed, type LS, link seal, as manufactured by Thunderline Corp. Fire and smoke seals shall be installed in steel pipe sleeve of correct size for pipe and insulation.

3.6 ESCUTCHEONS

- A. Pipe escutcheons shall be provided at all finished surfaces where exposed piping passes through floors, walls or ceilings. Sprinkler escutcheons shall be provided for all pendent heads through ceilings. Escutcheons shall be fastened securely to the pipe.

3.7 SIGNS

- A. All control, drain and inspector's test valves shall be provided with identification signs.

3.8 SPARE SPRINKLERS

- A. Spare automatic sprinklers with cabinets and one sprinkler wrench for each cabinet shall be furnished. The number and types of sprinklers shall be in accordance with NFPA No. 13 requirements for stock of spare sprinklers. The cabinets shall be mounted where indicated on drawings or directed by Engineer.

3.9 ELECTRICAL

- A. All electrical work in connection with the modification of the fire protection system shall be performed in accordance with Section 16010 - General Electrical Provisions, and Section 16721 - Fire Alarm and Detection System.

3.10 TESTS

- A. Upon completion and prior to acceptance of the installation, the Contractor shall subject the system to the tests required by NFPA No. 13 and furnish the Engineer with a test certificate signed by official of local fire department.

3.11 WARRANTY AND GUARANTEES

- A. All materials and workmanship shall be guaranteed for one (1) year from date of completion to be free of defects.

END OF SECTION 15500

SECTION 15650 - AIR CONDITIONING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Contractor shall furnish and install where shown on the drawings, complete Summer-Winter, indoor and outdoor mounted air conditioning systems as shown on the drawings and as herein specified.

1.2 RELATED DOCUMENTS

- A. Refer to other applicable clauses and regulations for other requirements.

1.3 SUBMITTAL

- A. All submittal required by this section shall be submitted in accordance with Section 01300.
- B. Submit manufacturer's data for approval on all materials to be furnished as part of this project.
- C. For packaged heating and air conditioning units, the submittal data must include the actual fan motor HP and fan performance tables that demonstrate that the specified performance can be obtained at a fan drive setting (or motor speed) at less than maximum.

1.4 REBATES AND INCENTIVES

- A. Any and all rebates or incentives offered by utility companies or equipment manufacturers shall go directly to the Owner.

PART 2 - PRODUCTS

2.1 AIR CONDITIONING UNITS

- A. All units shall be of the same manufacturer and shall have capacities and efficiency ratings as scheduled. Any deviations to the specified parameters shall be indicated on this Contractor's proposal when presented to the construction manager.
- B. Units shall be manufactured by Trane, as scheduled on the drawings.

2.2 GAS-ELECTRIC HEATING & AIR CONDITIONING UNIT:

- A. Furnish and install where shown on the drawings, complete summer-winter heating & air conditioning units as scheduled on the drawings. All units shall be manufactured by the same manufacturer as herein specified.
- B. Factory personnel shall be available for assistance in trouble shooting. Factory qualified personnel shall be based within a reasonable radius of the job site, to ensure a prompt response time.
- C. Mechanical contractors bidding this work shall have service facilities of their own or make arrangements with an independent service company to handle the start-up and the first year service of this installation. Cost of the first year service shall be included in this bid. Routine maintenance of this equipment such as filter changes, lubricating, tightening belts, etc. is the responsibility of the Owner after final acceptance of this job.
- D. The equipment offered shall be fully approved by an accredited agency for outdoor installation.

- E. All electrical components shall carry an Underwriters' Laboratories Listing.
- F. Cabinet Construction:
1. All components of each unit shall be contained in a single weatherproof casing factory fabricated and assembled, one piece construction, no field assemblies.
 2. The cabinet shall be constructed of heavy gauge galvanized steel. Exterior panels shall have a durable finish coat of outdoor acrylic enamel.
 3. All exterior panels of the conditioned air portion of each unit shall be lined with 1" thick fiberglass insulation. In addition the entire bottom of the unit shall be insulated with fiberglass or styrofoam.
 4. Easy access of all interior components shall be provided to facilitate service and maintenance.
 5. All condenser coils shall have hail screens. All hailscreen shall be hardware cloth or expanded metal with no openings larger than ¼".
- G. Heating Section:
1. Natural gas heating capacity as scheduled on the drawings shall be furnished in each unit. High voltage ignition and re-ignition, and all necessary operating and safety controls shall be furnished.
 2. Heating exchangers shall be aluminized steel and the entire unit shall be A.G.A. approved for firing with entering air at any temperature.
 3. Heat exchanger shall be warranted for a period of ten years.
- H. Cooling Section:
1. The cooling method shall be direct expansion coils with mechanical refrigeration. Capacity shall be as scheduled on the plans.
 2. Methods of heat transfer shall be by means of aluminum fins mechanically bonded to seamless copper tubes which are tested at the factory for 500 psi working pressure.
 3. Compressors shall be warranted for five (5) years.
 4. Condenser coils shall have hail screens.
- I. Damper Section:
1. Each unit shall have a manual outside air damper which is adjustable from 0 to 30%, unless otherwise indicated on the unit schedule.
 2. All outside air shall be filtered.
- J. Filter Section:
1. Filter media shall be one inch thick polyurethane with 20 pores per inch mounted in rugged individual galvanized frames for each handling and cleaning.
 2. Both outside and return air shall be filtered.
 3. Any unit operated during the construction period shall receive new filters at substantial completion.
- K. Blowers (Indoor Air):
1. Each unit shall be equipped with forced curved blower wheels. Units shall be direct drive, for units up to 5 ton capacity and belt or direct drive for units with a capacity greater than 5 tons.
 2. The belt tension shall be easily adjustable. Pulleys shall remain in alignment with motor and blower shafts parallel during adjustments.
 3. The motor pulley shall have an adjustable sheave so that the blower speed may be changed.
 4. Blower capacity and static pressure shall be as scheduled on the plans. Blower motor H.P. shall be as scheduled on the plans.
- L. Vibration Isolation:
1. The refrigeration compressors and the indoor fan system shall have all rotating parts spring isolated from the unit cabinet to minimize transmission of vibration. Fan motors 1/2 H.P. and under shall be resiliently mounted.

M. Basic Unit Control System:

1. Thermostats shall be equal to a Honeywell TH8320R1003. Where indicated on the drawings, provide and install remote temperature sensors. Sensor model numbers and wiring shall be as indicated on the wiring diagrams, included on the drawings.
2. Each unit shall be equipped with a positive fan start device on a call for heat.
3. The condensing units shall be furnished with time off cycle devices to prevent short cycling of the compressors. They shall also have high- low pressure cutouts, 3 leg overload protection and internal thermostats in the compressor to limit winding and discharge temperature to safe limits. Units shall be capable of cooling in low ambient conditions.
4. Refrigerant control shall be by thermostatic expansion valves.
5. In addition to the above, contactors, relays and safety devices necessary for a complete operational system shall be furnished.

2.3 WARRANTIES

- A. All heating and air conditioning equipment shall have a five year warranty on compressors, 10 years on heat exchangers and 1 year on all other parts.

PART 3 - EXECUTION

3.1 ADJUSTMENT

- A. Upon completion of work the Contractor shall balance the system so that the quantity and proper velocity of air is delivered at each outlet uniformly as indicated on the drawings to within ten percent (10%). Fan speeds shall be adjusted, as systems are selected to provide the specified air quantities with the fan speed set below maximum. Necessary adjustment shall be made to the system to produce these quantities of air, and to eliminate any objectionable drafts or noise which might exist. Balance adjustments shall be made upstream of the registers and diffusers, leaving the O.B.D. in each grille neck fully open.
- B. When balancing has been completed, the Contractor shall provide the Architect with all necessary data, readings, and velocities at each outlet to substantiate that the systems are balanced and providing the necessary quantities of air as shown on the drawings.

END OF SECTION 15650

SECTION 15840 - DUCTWORK

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work covered by this section of the specifications includes the furnishings of all material and labor as required for the installation of a complete duct system, as shown on the drawings and as herein specified.

1.2 RELATED DOCUMENTS

- A. Refer to other applicable clauses and regulations for other requirements.

1.3 SUBMITTAL

- A. All submittal required by this section shall be submitted in accordance with Section 01300.
- B. Submit manufacturer's data for approval on all materials to be furnished as part of this project.

PART 2 - PRODUCTS

2.1 LOW VELOCITY - LOW PRESSURE DUCTWORK

- A. All ductwork shall be of the sizes indicated on the drawings, shall be straight and smooth on the inside with neatly finished airtight joints. The ducts shall be installed as to be completely free of vibration. Metal duct slip joints shall be made with an inside radius of not less than the width of the duct, except that Factory Fabricated Air Turns shall be used where a sharper turn must be made or where otherwise indicated on the drawings. All takeoffs to registers shall be made with Factory Fabricated Deflectrols, or approved equal, and all major branches where noted on the plans shall have splitters with an accessible operating handle and locking device, Young Model No. 917 right angle gear and No. 1 ceiling regulator, or approved equal.
- B. All ductwork shall be constructed of galvanized iron sheets fabricated and installed in accordance with SMACNA HVAC Duct Construction Standards for Low Velocity Systems.
- C. Air turns shall be as manufactured by Barber-Colman, or approved equal. No job-built turning vanes will be used on this job. Where insulation is applied inside of ducts, turning vanes shall be installed inside of insulation.
- D. After all ducts are installed, all dirt and debris shall be removed from inside of ducts.
- E. Ductwork for round ducts shall conform to the latest edition ASHRAE guide.
- F. All duct construction seam corners and connections shall be sealed with white "Permagum Slugs" as manufactured by Virginia Chemicals, Inc.
- G. All ductwork shall be made airtight and reinforced as required for pressures as shown on the drawings.
- H. All dimensions indicated shall be sheet metal dimensions. Allowance shall be made for internal insulation as it occurs, unless otherwise noted on the drawings.

2.2 ACCESS DOORS

- A. Access doors in ductwork shall be 2" smaller in height than duct dimensions and 12" wide and located in accessible locations on both sides of all fire and smoke dampers. Doors in vertical position shall be equal to Ventlok insulated type, complete with all hinges, hardware and air seal. Doors in horizontal position shall be job built complete with sash lock, two (2) per side, and rubber air seal, all as manufactured by Ventlok, or approved equal.

2.3 ZONE VOLUME CONTROL DAMPERS

- A. Volume control dampers shall be furnished and installed where shown on the drawings for all air unit zone ducts with locking operator installed on bottom side of ducts.
- B. Dampers shall be the opposed blade type with corner bracing for stiffening as manufactured by Young Regulator Co., Model No. 817, or approved equal, of size shown on the drawings.
- C. Spin-In taps shall be equal to Dace #MSD-CO5. With ROSSI seven position manual volume control.

2.4 FIBER DUCTWORK

- A. Fiber ductwork will not be used on this job anywhere.

2.5 LOW PRESSURE FLEXIBLE CONNECTIONS

- A. Furnish and install flexible connections of 30 ounce woven glass fabric from discharge and return openings of equipment to ductwork. The flexible connections shall be of a type that is airtight, equal to Ventfabrics "Ventglas", and shall be installed in such a manner that the air flow is not restricted nor the connection leaks air. At least 1" slack shall be allowed in connection to insure that no vibration is transmitted from fans to ductwork.
- B. Fabric connections shall be UL approved.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All duct systems shall be installed in a workmanlike manner and shall provide a complete and working system.
- B. Hangers for ductwork shall be galvanized steel straps and/or electro-plated zinc or hot-dipped galvanized after threading, threaded rods, minimum of 3/8" diameter.
- C. Hangers shall be spaced a maximum of 8'-0" on center.
- D. When threaded hanger rods are used, bearing plate shall be on channel and/or angle, hot-dipped galvanized after cutting, and drilling of hanger rod holes.
- E. Hanger rods shall be secured to channels and/or angle by galvanized washer, nut, and locknut. Hanger rods shall be suspended from super-structure.

3.2 CLEANING

- A. After installation is complete, all equipment shall be thoroughly cleaned. Filters shall be cleaned and/or replaced with new. Damaged paint shall be sanded and touched-up. All damaged insulation shall be replaced.

END OF SECTION 15840

SECTION 15870 - GRILLES, REGISTERS AND CEILING DIFFUSERS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work covered by this section of the specification includes the furnishing of all labor and materials as required for the installation of a complete air diffusing system as shown on the drawings, and as hereinafter specified. All side wall grilles, supply and returns, shall comply with NFPA Standard No. 90A.

1.2 RELATED DOCUMENTS

- A. Refer to other applicable clauses and regulations for other requirements.

1.3 SUBMITTAL

- A. All submittal required by this section shall be submitted in accordance with Section 01300.
- B. Submit manufacturer's data for approval on all materials to be furnished as part of this project.

PART 2 - PRODUCTS

2.1 SIDE WALL REGISTERS

- A. All side wall registers shall be extruded aluminum with removable cores.

2.2 CEILING SUPPLY DIFFUSERS

- A. Ceiling supply diffusers, except where shown on the drawings and/or specified, shall be as shown on the drawings. All diffusers shall be equipped with deflectors and opposed blade volume controls operated from the face of the diffusers.
- B. Ceiling diffusers shall be of the removable core type for 1, 2, 3 or 4-way deflection as shown on the drawings.

2.3 CEILING RETURN AIR GRILLES

- A. Ceiling return air grilles shall be all as shown on the drawings.

PART 3 - EXECUTION

3.1 GUARANTEE

- A. This Contractor shall ensure that the grilles, registers and diffusers are recommended by the manufacturer for the installation in the surfaces as shown and the application shown.

END OF SECTION 15870