FINAL ACCEPTANCE OBSERVATION

A. Contractor shall carefully read all applicable sections of these specifications and prepare and assemble necessary test reports, maintenance manuals, certificates, guarantees, letters of instruction, etc. that are required. See Section 15995 for pump start-up/commissioning forms.

B. These documents shall be delivered to the Architect's / Engineer's office at least 48 hours before requesting final acceptance observation for work covered under this division of the specifications.

C. Contractor's representatives responsible for work under this division shall be present at time of acceptance observations and shall furnish required mechanics, tools and ladders to assist in the inspection.

D. A list of items to be corrected as a result of acceptance observation will be furnished to the contractor. Notify Architect / Engineer in writing of any items appearing on list of correction that are disputed by Contractor. When ready, request in writing a re-observation of work.

PROTECTION

A. In addition to provisions and stipulations set forth in other Sections of these Specifications provide various types of protection as follows:

1. Protect finished floors from chips and cutting oil by use of metal chip receiving pan and oil-proof floor cover.
2. Protect equipment and finished surfaces from welding and cutting spatters with baffles and spatter blankets.
3. Protect equipment and finished surfaces from paint droppings, insulation adhesive, etc., by use of drop cloths.

B. All pumps, motors, fans and other rotating equipment shall be stored at Site with openings, bearing, etc., covered to exclude dust and moisture; all stockpiled conduit shall be placed on dunnage, and protected from weather, from entry of foreign materials.

END OF SECTION

.

MECHANICAL CONTRACTOR'S QUALIFICATION FORM

INSTRUCTIONS: COMPLETE THIS FORM AND SUBMIT WITHIN 24 HOURS OF THE BID OPENING.

1. Contractor's name and Address

_____

_____

_____

2. Contractor's Person to Contact
   Name:_____
   Phone Number:_____
   Fax Number:_____

3. Mechanical Contractor's License Number:_____

4. Mechanical Contractor's Experience Project Examples:

_____

_____

PROJECT A - Project Title:_____
Location:_____

General Contractor:_____
Address:_____
Phone Number:_____
Contact:_____

Project Type: Educational_ Industrial___ Commercial ____ Health Care____

Size: Sq. Ft._____Construction Cost: $_____ Construction Duration_____

Completed on Schedule: YES__ NO____

Brief Project Description:_____

_____

_____

_____

Owner's Representative: Name_____
Phone Number:_____

PROJECT B - Project Title:_____
Location:_____

General Contractor:_____
Address:_____
Phone Number:_____
Contact:_____

Project Title:_____
Location:_____
Project Type: Educational_ Industrial___ Commercial ____ Health Care____

Size: Sq. Ft._____Construction Cost: $_____ Construction Duration_____

Completed on Schedule: YES__ NO____

Brief Project Description:_____
_____
_____
_____

Owner's Representative: Name_____
Phone Number:_____

PROJECT C - Project Title:_____
Location:_____

General Contractor:_____
Address:_____
Phone Number:_____
Contact:_____

Project Type: Educational_ Industrial___ Commercial ____ Health Care____

Size: Sq. Ft._____Construction Cost: $_____ Construction Duration_____

Completed on Schedule: YES__ NO____

Brief Project Description:_____
_____
_____
_____

Owner's Representative: Name_____
Phone Number:_____

SECTION 15041

CHLORINATION OF DOMESTIC WATER LINES

PART 1 - GENERAL

WORK INCLUDED

A. Disinfection of all water piping which shall carry potable water or any other piping connected thereto which is not separated by a backflow preventor.

PART 2 - PRODUCTS

MATERIALS

A. Disinfection shall be chlorine, either in the form of hypochlorite solution or in the form of compressed gas applied through an approved chlorinator.

PART 3 - EXECUTION

PREPARATION

A. After completion of all tests, replacement, and repairs, all water supply systems shall be thoroughly flushed with water to remove sediment and/or debris.

B. Begin disinfection only after flushing system.

INSTALLATION

A. The system shall be filled with a solution containing 50 parts per million available chlorine and allowed to stand for twenty-four hours, or as required by local authorities, whichever is greater.

B. During Chlorination all valves and equipment shall be operated to insure that chlorine reaches all parts of the system.

C. Following disinfection all treated water shall be flushed from the system through its extremities until the quality of water delivered is comparable with the quality of the public water supply and satisfactory to the public health authority having jurisdiction.

D. Disinfection and flushing shall be repeated if samples taken daily over a period of three days show that water quality is not being maintained.

E. Samples shall be taken only from taps located and installed in such a manner that they will not contribute any contamination.

F. Samples shall not be drawn from hydrants or through unsterilized hose.

FIELD QUALITY CONTROL

A. If disinfection and flushing has been repeated three times and water quality cannot be maintained, the Architect shall have the authority to require disassembly of piping as he shall deem necessary to determine the cause of contamination.

1. Any disassembly, cleaning or repair shall be at no additional expense to the Owner.

2. Disinfection, flushing and testing shall be repeated upon reassembly of the piping.

END OF SECTION.

SECTION 15043

BALANCING OF AIR SYSTEMS

PART 1 - GENERAL

WORK INCLUDED
A. Balance and adjust each air distribution system shown on the Drawings.

RELATED WORK
A. Section 15042: Testing

QUALITY ASSURANCE
A. Perform work in accordance with procedures and standards described in SMACNA "Balancing and Adjustment Manual."
B. Balancing shall be done by a certified balancing firm independent of the Mechanical Contractor.

PROJECT RECORD DOCUMENTS
A. Reports shall be made on SMACNA forms.
B. Submit five (5) copies for approval and record.

PART 2 - PRODUCTS

PART 3 - EXECUTION

INSPECTION
A. Examine HVAC units to see that they are free from obstructions.
B. Open all dampers and grilles.
C. Check lubrication of all moving equipment.
D. Check for proper installation of filters.
E. Perform other inspection and maintenance activities necessary for proper operation of systems.
F. Fuse sizes and thermal overload heaters shall be checked against each motor nameplate.
G. The amperage shall be read at each electrical motor to determine the load imposed on it.

PREPARATION
A. Perform equipment safety checks as specified in Section 15010 before beginning work.

INSTALLATION

A. Adjustment and Balance:

1. Adjust variable type pulleys, volume dampers, control dampers, etc. to provide correct volumes to main trunk lines.
   a. After pulleys are adjusted the adjustable pulley shall be removed and a fixed pulley of the appropriate size shall be installed.
2. Check and adjust outside air quantities as required.
3. Adjust air extractors and manual balancing dampers to supply correct air volume to each main branch duct from main trunk lines.
4. Adjust manual balancing dampers to supply correct volume to each individual branch duct.
5. Use terminal registers only for minimal adjustment of air flows, i.e. less than 5% of air volume.
6. Adjust grilles and diffusers for proper air flow patterns.
7. Air conditioning units shall be placed in operation and both wet and dry bulb temperature taken at one-hour intervals to determine the amount of cooling being accomplished and to indicate adjustments needed.
8. After spaces have been brought down to design temperatures and equipment is functioning properly, air shall be rebalanced if necessary by means of calibrated thermometers placed in each room and in open spaces, not over 20' apart. There shall be no deviation in temperature of more than 3 F. throughout the space cooled.
9. A thorough check shall be made, with an anemometer, of air motion in the occupied space. Any air motion exceeding 50 fpm shall be remedied.

END OF SECTION

SECTION 15060

PIPE AND FITTINGS

PART 1 - GENERAL

SYSTEM DESCRIPTION

A. Domestic Water – Hot and Cold
   1. Flow Guard CPVC per Section 15064
      a. Fixture stub-outs – Hard Drawn Copper Type L.
B. Sanitary Waste / Vents
   1. Plastic per Section 15064
C. Refrigerant Piping
   1. Copper per Section 15063
D. Condensate Piping
   1. Plastic per Section 15064
E. Fire Protection
   1. Steel per Section 15061
F. Natural Gas
   1. Above Grade -Steel per Section 15061
   2. Below Grade – Plastic per Section 15064
   3. Below Slab - Steel flexible per Section 15061

QUALITY ASSURANCE

A. Domestic Water, Drainage, and Vent Piping (Plumbing)
   1. Install in accordance with applicable code.
   2. All installers shall be licensed or certified as required by the State or local government having jurisdiction over the work.
   3. All work shall be done under the supervision of a Master Plumber.

REFERENCES

A. American Society for Testing and Materials. (ASTM)

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS

A. Any manufacturer engaged in the production of pipe, fittings and associated materials and who test, inspect and certify that said materials meet or exceed the ASTM designation for that material shall be acceptable.

MATERIALS

A. Refer to individual specification section.

PART 3 - EXECUTION

INSPECTION

A. Underground Piping:
   1. Examine areas to receive underground piping for:
      a. Complete excavation to elevations and slopes indicated.
      b. Obstructions which would interfere with drainage system installation.
   2. Begin work only when conditions are satisfactory.

B. Above-Ground Piping:
   1. Examine areas to receive piping for:
      a. Obstructions.
      b. Work to be done prior to other construction.
      c. Work of other trades in other areas.
   2. Begin work only when conditions are corrected satisfactorily.

PREPARATION

A. Ream pipes and tubes.
B. Clean off scale and dirt, inside and outside, before assembly.
C. Remove welding slag or other foreign matter from piping.

INSTALLATION

A. Underground Piping
   1. Excavation:
      a. Excavate trenches of sufficient width for proper installation of pipe.
      b. Sheet and brace trenches as necessary to protect workmen and adjacent structures.
      c. Comply with current OSHA standards.
   2. Final grading of trench:
      a. Perform final grading of trench bottoms by hand tools; carry machine excavation only to such depth that soil bearing for pipes will not be disturbed.
      b. Grade bottom of trenches evenly to insure uniform bearing for all piping.
      c. Cut holes as necessary for joint making.
      d. Keep trenches free from water while construction is in progress.
      e. Use surveyor's level to establish elevations and grades.
      f. Machine excavation shall be held a sufficient distance from foundations and footings.
      g. Provide and maintain barricades and temporary bridges around excavations as required for safety.
      h. Water lines may be benched above sanitary lines in same trench if they are 18 inches or more above the sanitary line.
      i. Minimum bury depth for water piping shall be 24 inches.
      j. Grade horizontal drainage 1/8 inch per foot minimum.

k. Install same type material specified for the inside building to 8 feet outside building.

3. Backfill:
   a. Backfill for all sewer lines shall be placed in accordance with manufacturer's printed instructions.
   b. Backfill trenches only after piping has been inspected.
   c. The backfill below paved areas and walks shall be brought to within 6 inches of finished grade; the remaining six inches shall be backfilled with clean topsoil.
   d. The backfill below sodded or seeded areas shall be brought to within 6 inches of finished grade; the remaining six inches shall be backfilled with clean topsoil.
   e. Provide and place any additional fill material from off the site as may be required for backfill.

B. Above-Ground Piping:
   1. Pipe supports.
      a. Support piping as specified in Section 15094 for permanent installation.
      b. Pipe shall be adequately supported during construction with blocking or slings to prevent injury to personnel or damage to equipment or materials.
   2. Exposed piping.
      a. Run exposed piping true and level.
      b. Run vertical exposed piping plumb.
      c. Run exposed piping with as few elbows and bends as possible.
      d. Group piping wherever practical at common elevations.
      e. Install concealed pipes close to building's structure to keep furring to a minimum.
      f. Slope water piping 1 inch in 40 feet and arrange to drain at low points.
      g. On closed systems, equip low points with 3/4 inch drain valves and hose nipples.

END OF SECTION.

SECTION 15061

STEEL PIPE AND FITTINGS

PART 1 - GENERAL

SYSTEM DESCRIPTION

A. Fire Protection Piping.
   1. Smaller than 4 inches
      a. Schedule 40
      b. Carbon Steel, black
   2. 4 inch and larger
      a. Schedule 10
      b. Carbon Steel, black
   3. Fittings
      a. Threaded
      b. Welded
      c. Victaulic Couplings – 4" and larger

B. Natural Gas – Above Grade
   1. Corrugated Series 300 Stainless Steel ASTM A420
   2. Yellow, Polyethylene, Marked for Gas Service
   3. Joints
      a. Flared metal to metal seats
      b. Threaded
   4. Fittings
      a. Yellow brass with Series 300 stainless steel insert
   5. Equal to Trac Pipe FGP-SS4

C. Natural Gas – Below Grade or Slab
   1. Same as (B) above, except Polyethylene Vented Jacket.
   2. Install per Manufacturers instructions.
   3. Equal to Trace Pipe, PS 11 FPG.

END OF SECTION

SECTION 15063

COPPER PIPE
PART 1 - GENERAL
SYSTEM DESCRIPTION

A. Domestic Water Supply Stub outs For Fixtures
   1. Type L, Hard copper
   2. Joints
      a. Solder using lead-free solder and non-corrosive flux
   3. Fittings
      a. Wrought copper or cast brass
      b. Steel fittings prohibited.

B. Refrigerant
   1. ACR Copper
   2. All refrigerant pipe and fittings having an external or internal working pressure greater than 15 psig shall comply with ANSI Code for Pressure Piping where applicable.
   3. Joints
      a. Solder using Silver solder or "Sil-Fos."
      b. Compression fittings may be used at equipment connections.
   4. Fittings
      a. Wrought copper
      b. Approved compression type brass.

END OF SECTION

SECTION 15064

PLASTIC PIPE AND FITTINGS

PART 1 - GENERAL

SYSTEM DESCRIPTION

A. Vent piping (Above grade).
   1. Piping shall be PVC
   2. Polyvinyl Chloride (PVC) - ASTM D-1784-60T
      a. Schedule 80
      b. Type 1, Grade 1
      c. Pipe shall bear NSF seal and ASTM designation
   3. Joints
      a. Bonded joints using adhesive per manufacturer's recommendations
   4. Fittings
      a. PVC - ASTM D-2665-69.
      b. ABS - ASTM D-2661-69.

B. Sanitary piping (Below Grade).
   1. PVC
      a. Schedule 40.
      b. Type 1, Grade 1.
      c. Pipe shall bear ASTM designation and NSF seal
   2. Joints
      a. Bonded joints using adhesive per manufacturer's recommendations
   3. Fittings
      a. PVC - ASTM D-2665-69

C. CPVC Pipe: ASTM F442/F442M, SDR 13.5.
   1. Fittings: ASTM F438 schedule 40, or ASTM F439 schedule 80, CPVC.
   2. Joints: ASTM F493, solvent weld.

D. Air Conditioning condensate drains
   1. PVC - ASTM D-1784-60T
      a. Schedule 40.
      b. Type 1, Grade 1.
   2. Joints
      a. Bonded joints using adhesive per manufacturer's recommendations
   3. Fittings
      a. PVC - ASTM D-2665-69

E. Fire Protection (below grade).
   1. PVC
      a. Class 150 pipe
      b. NSF, FM and UL approved

c. AWWA C-900

2. Joints
   a. Ring-tite.
3. Pipe equal to Johns-Manville Blue Brute.

END OF SECTION

SECTION 15085

TRAPS

PART 1 - GENERAL

WORK INCLUDED

A. All traps for plumbing fixtures shown on the Drawings which are not an integral part of the fixtures.

SYSTEM DESCRIPTION

A. General
   1. All fixtures shall be trapped according to the Florida Building Code 2004 w/ 2005 and 2006 Revisions.
   2. All traps shall be the same size as the pipe in which they are installed or as sized on the Drawings.
   3. All traps above grade shall have a clean-out plug in the bottom of the trap.
   4. All traps above grade shall be cast brass with chrome finish.
   5. All traps below grade shall be cast iron.
   6. No trap below grade shall be less than 2 inches.
   7. No fixture shall be double trapped.

SHOP DRAWINGS AND PRODUCT DATA:

A. Submit Shop Drawings and Product Data on Any Traps which are Specified Under Section 15450, Plumbing Fixtures and Trim.

B. Submittals are not required for cast iron traps.

END OF SECTION

SECTION 15087

SHOCK ABSORBERS

PART 1 - GENERAL

WORK INCLUDED
A. Installation of shock absorbers on domestic water system.

SYSTEM DESCRIPTION
A. Install shock absorbers on all domestic water piping as shown on the drawings, and/or specified in this section.

SHOP DRAWINGS AND PRODUCT DATA
A. Submit shop drawings and product data sheets in accordance with the General and Special Conditions.
B. Submit the recommended sizing guide for manufacturer submitted.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS
A. Wade
B. Josam

MATERIALS
A. Description
   1. Heavy duty casing
   2. Minimum burst pressure - 4500 psig.
   3. Nested bellows with built in stop.
   4. Operating temperature 100 to 300 degrees F.
   5. Permanently sealed charge of non-combustible gas.
   6. All stainless steel.
   7. Designed and built in accordance with plumbing and drawing standard PDI-WH201.
   8. Must be rated maintenance free and certified for use in totally concealed spaces.

B. Model Numbers (Wade numbers used for reference only)
   1. WSS-1, Model W-5
   2. WSS-2, Model W-10
   3. WSS-3, Model W-20
   4. WSS-4, Model W-50
   5. WSS-5, Model W-75
   6. WSS-6, Model W-100

PART 3 - EXECUTION
END OF SECTION

SECTION 15094

PIPE HANGERS AND SUPPORTS

PART 1 - GENERAL

WORK INCLUDED

A. All piping shall be supported by pipe hangers, clamps, clips or supports as specified in this Section.

SYSTEM DESCRIPTION

A. All clevis type hangers shall have a minimum of 1 1/2 inches of vertical adjustment by using turnbuckles and/or threaded rods.
B. All adjustments shall be positively secured by a locknut or setscrew.
C. Hangers shall support the pipe size for which they are manufactured.

SHOP DRAWINGS AND PRODUCT DATA

A. Submit Shop Drawings and/or product data sheets in accordance with the General Conditions for all pipe hangers to be used.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS

A. Grinell
B. Fee and Mason

MATERIALS

A. All clamps, hangers, clevis, etc. shall be steel.
B. Pipe hangers in direct contact with copper shall be copper or lead plated, or of an approved dielectric material.

PART 3 - EXECUTION

INSTALLATION

A. General:
    1. All piping shall be supported from structural building members, i.e. block, beams, columns, purlins, floor joists, etc.
    2. Piping shall not be supported from ceiling tile or grids, conduit, mechanical equipment, ductwork or non-structural steel.
    3. Perforated strapping may be used only for piping 3/4 in. or smaller and only when concealed in walls or ceilings.
    4. Hangers for piping run flush along the walls shall be stamped steel straps similar to conduit straps for pipe sizes two (2) inches and smaller.
    5. Hangers for piping run flush along the walls shall be steel wall brackets with steel clevis type hangers and threaded rod supports for pipe over two (2) inches.

6. Hangers for piping not run along walls shall be clevis type hangers with threaded rod supports for all piping over 3/4 inches.

B. Spacing:

1. Vertical runs of piping not over 15 feet long shall be supported by hangers placed not over one foot from elbows or connecting horizontal run.
2. Hangers shall be placed so as to prevent sag and permit proper drainage.
3. Hangers shall not be placed at more than the maximum distances shown on the Table below

Pipe Size	Max. Span - Ft.
1/2 and 3/4	6
1 and 1-1/4	8
1-1/2, 2, 2-1/2	10
3 and 4	12
5 and 6	14
8 and larger	16

4. Concentrations of valves and fittings will require closer spacing.

C. Hanger Attachments:

1. Pipe hangers shall be attached to structural steel by heavy steel clamps.
   a. Clamps shall be bolted to steel or welded.
2. Pipe hangers or clamps shall be attached to walls by means of expansion bolts (shields).

END OF SECTION

SECTION 15099

UNIONS

PART 1 - GENERAL

SYSTEM DESCRIPTION

A. Size
   1. All unions shall be the same size as the line in which they are installed unless noted otherwise.

B. Location
   1. Unions shall be located between the shut-off valve and each of the following:
      a. Inlet and outlet to all water heaters
      b. Lavatories and sinks
      c. Water coolers
      d. Water closets and toilets
      e. Inlet and outlet of cooling coil
      f. Inlet and outlet of pumps
   2. Where final fixture connection is made by compression-type fitting, unions shall not be required.
      a. This exception does not apply to water heater.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS

A. Crane
B. Jenkins
C. Vogt
D. Stockman

MATERIALS

A. Unions for 2-1/2 inches and smaller copper
   1. Brass ground joints, brass body
   2. 150# rated
   3. Sweat to threaded to match the system in which they are installed

PART 3 - EXECUTION

GENERAL

A. Install in locations where wrenches can be used on each half of the union with enough clearance for at least 180 degrees of rotation on a 6" pipe wrench.

END OF SECTION

SECTION 15100

VALVES, COCKS AND FAUCETS

PART 1 - GENERAL
WORK INCLUDED
A. Gate Valves
B. Check Valves
C. Plug Cocks
D. Drain Valves
E. Hose Bibbs

RELATED WORK
A. Section 15122 Pressure Relief Valve

SYSTEM DESCRIPTION
A. Provide valves, stops, hose bibs, wall hydrants, check valves as shown on drawings or as required by code on all potable water systems and mechanical systems.
B. All water shutoff valves shall be ¼ turn brass ball valves unless noted otherwise.

SHOP DRAWINGS AND PRODUCT DATA
A. Submit copies of valve ordering schedule for approval before ordering valves.
B. Submit detailed Shop Drawings in accordance with General and Special Conditions.
C. Clearly indicate make, model, location, type size and pressure rating.

PART 2 PRODUCTS

GENERAL
A. Provide valves of same manufacturer throughout where possible
B. Provide valves with manufacturer's name and pressure rating clearly marked on outside of body

ACCEPTABLE MANUFACTURERS
A. Crane
B. Vogt
C. Sterling
D. Nibco

MATERIALS
A. Bronze gate valves:
    1. 3 inch and smaller
        a. Rising stem, wedge disc gate, bronze body
        b. 200 psi, water, oil, gas

c. Stuffing, box and brass gland, screw-in bonnet
d. Threaded ends
e. Model equal to Nibco T-111

B. Bronze Globe Valve
1. 3 inch and smaller
a. Rising stem, bronze only
b. 150 psi, water oil gas
c. Stuffing box, brass gland, screw-in bonnet
d. Threaded ends

C. Bronze Ball Valve
1. 3 inch and smaller
a. Stainless steel ball, ¼ turn.
b. 150 psi, water oil gas
c. Threaded ends

D. Hose Bibbs
1. 3/4" Female thread inlet
2. 3/4" Male thread hose outlet
3. Rough chrome plated
4. Loose-key type
5. Provide with vacuum breaker
6. Model
a. Equal to T & S Brass Model B-0722
7. Provide with vacuum breaker.

E. Check Valve
1. Swing check valve
2. Screwed ends and cap
3. Bronze ground disc
4. 200 lb WOG
5. NIBCO T413 or equal

END OF SECTION

SECTION 15122

PRESSURE - TEMPERATURE RELIEF VALVE

PART 1 - GENERAL

WORK INCLUDED
A. Supply a pressure relief valve on each hot water heater.

SYSTEM DESCRIPTION
A. Valve size, pressure, and temperature rating shall be as specified by the tank manufacturer, except that in no case shall the valve be smaller than 3/4 inches inlet and outlet.
B. Valve shall have a handle for manual operation and testing.

PART 2 - PRODUCTS

MATERIALS
A. Valve shall be cast brass or bronze.

PART 3 - EXECUTION

INSTALLATION
A. Pipe the outlet of the pressure-temperature relief valve to outside of building and terminate 2" above grade.

END OF SECTION

SECTION 15150

COMPRESSED AIR SYSTEM

PART 1 – GENERAL

DESCRIPTION

A. Furnish and install a complete compressed air system as shown on the drawings including but not necessarily limited to an air compressor, compressed air piping, quick connect outlets and valves.

SUBMITTALS:

A. Submit the manufacturer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow.

GUARANTEE AND INSTRUCTIONS:

A. Contractor shall furnish written guarantee covering all materials and workmanship for a period of one (1) year after final acceptance of work, and shall repair or replace faulty work without coast to the Owner during the guarantee period. Service and adjustment shall also be provided during this period without charge.

B. Contractor shall instruct operating personnel in care and operation of all equipment furnished by him and shall furnish operating manuals and instructions on equipment items.

PART 2 – EQUIPMENT

AIR COMPRESSOR

A. General Specifications:

1. Tank mounted two stage cast iron compressor
2. Capacity 18.2 CFM at 175 psi
3. 80 Gallon storage tank
4. Steel Belt guard
5. Dry type air intake filter
6. Synthetic Lubricant
7. Adjustable Pressure Switch
8. Air Gauge
9. Dual safety valves
10. 5 H.P., 230 Volt, three phase
11. Magnetic Motor Starter, prewired and mounted
12. On/Off Toggle switch mounted on starter box

B. Model number
1. Unit shall be a Curtis Model 5EH2HT8-3 – No substitutions

2. Vendor – Air Compressor Equipment Inc
5281 Eldgewood Court
Jacksonville, Florida 32254

COMPRESSED AIR PIPING:

A. Galvanized Steel, schedule 40

VALVES:

A. Brass ball valves

QUICK CONNECT FITTING:

A. Provide female quick connect air line fittings as shown on the drawings. Contractor shall coordinate exact fitting size with the owners equipment.

PART 3 EXECUTION

COMPRESSOR

A. Install air compressor on concrete housekeeping pad 4" larger in each dimension than the compressor. Compressor shall be bolted to the pad and have rubber in sheer vibration isolators installed between the feet and the pad.

COMPRESSED AIR PIPING

A. Install compressed air piping in accordance with the piping provisions of Section 15010 and 15100.

END OF SECTION

SECTION 15170

ACCESS PANELS

PART 1 – GENERAL

WORK INCLUDED

A Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-15 Specification sections, apply to work of this section.

B This section is a Division-15 Basic Mechanical Materials and Methods section, and is part of each Division-I5 section making reference to or requiring access panels specified herein.

C Acceptable Producers: Milcor, Jay R. Smith, Zurn, BOICO, Elmdor, or approved equal.

D Submittals: Submit product data sheets for access doors.

PART 2 - PRODUCTS

A General: Where floors, walls and ceilings must be penetrated for access to mechanical work, provide types of access doors indicated. Furnish sizes indicated or, where not otherwise indicated, furnish adequate size for intended and necessary access. Furnish manufacturer's complete units, of type recommended for application in indicated substrate construction, in each case, complete with anchorages and hardware.

B Access Door Construction: Except as otherwise indicated, fabricate wall/ceiling door units of welded steel construction with welds ground smooth; 16-gage frames and 14-gage flush panel doors; 175 swing with concealed spring hinges; flush screw-driver-operated cam locks; factory-applied rust-inhibitive prime-coat paint finish.

C Locks: Where indicated, provide 5-pin or 5-disc type cylinder locks, individually keyed unless otherwise indicated, 2 keys.

D Fire Rated Access Doors: Where required furnish with 20-gage insulated sandwich panel, automatic closing mechanism, cylinder type lock (self-latching with inside release mechanism), and continuous concealed steel hinge pin. Access doors shall carry the UL 1-112 hour 'B' label.

PART 3 - EXECUTION

A Access panels shall be installed to operate and service all mechanical equipment including valves, dampers, etc. and other items requiring maintenance that are concealed above or behind non-accessible construction to include walls, ceilings, etc. Access panels to be sized and located as required to provide proper service access in accordance with the manufacturer's recommendations for all devices and equipment. Access doors are not required in accessible suspended ceiling systems. Access doors shall have factory applied protective phosphate coating and baked enamel primer suitable for field painting.

B Access doors may be installed under another Division. However, responsibility for location is part of this Division's work. The style of access door shall be suitable for construction into which installed. Access doors shall be sized and located as required to provide proper service access in accordance with the equipment manufacturer's recommendations.

END OF SECTION

SECTION 15176

STEEL TANKS

PART 1 - GENERAL

WORK INCLUDED

A. Expansion Tank:

SYSTEM DESCRIPTION

A. Furnish and install expansion tank(s) as shown on the Drawings.

QUALITY ASSURANCE

A. Tank shall be permanently stamped as complying with all applicable sections of the ASME Boiler & Pressure Vessel Code.

SHOP DRAWINGS AND PRODUCTS DATA

A. Summit Shop Drawings and/or product data in accordance with the General Conditions for each tank to be furnished.

PART 2 - PRODUCTS

A. Tank:
   1. Carbon steel construction with two 1/2 gauge glass tappings
   2. Four 3/16 inch telltale holes.
   3. Maximum operation temperature 375 degrees F.
   4. Maximum working pressure 125 psig.
   5. Sight glass
   6. Drain valve
   7. Size per drawings.

END OF SECTION

SECTION 15181

INSULATION

PART 1 - GENERAL

WORK INCLUDED

A. Hot Water
   1. 1" Fiberglass above grade.
   2. 1" Closed cell rubber below grade
B. Condensate
   1. ½" Closed cell rubber
C. Refrigerant Suction
   1. ¾" Closed cell rubber

SYSTEM DESCRIPTION

A. Refer to Piping Schedule.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS

A. Johns-Manville
B. Certainteed

MATERIALS

A. Fiberglass Insulation
   1. Rigid lightweight heavy density fiberglass with jacket, min R4 per inch.
   2. Temperature applications to 650 F.
   3. Insulation, jacket, and adhesive shall be tested under procedure ASTM E-84, NFPA 255, and UL 723, not exceeding
      a. Flame spread - 25.
      b. Smoke developed - 50.
   4. Equal to Johns-Manville Micro-Lok 650 AP-T.
B. Closed Cell Rubber Insulation
   1. Closed cell, elastomeric tubular pipe insulation, min R4 per inch.
   2. Tested under procedure ASTM E-84, NFPA 255, and UL 723 not exceeding
      a. Flame spread - 30.
      b. Smoke density - 100.
   3. Adhesive
      a. Air drying contact cement
      b. Equal to Johns-Manville "Aerotube Elastomeric Pipe Insulation."

PART 3 - EXECUTION

INSPECTION

A. Install insulation only after pipe has been thoroughly inspected and tested and accepted by the Architect, Engineer and State or local inspectors.

PREPARATION

A. All surfaces to receive insulation shall be cleaned of all dirt, grease, and moisture prior to installing any insulation.

INSTALLATION

A. Fiberglass Insulation:
   1. All insulation shall be continuous through wall and ceiling openings.
   2. Vapor barrier jackets shall be used on piping except domestic hot water.
   3. Hangers, supports, anchors, etc., that are secured directly to cold surfaces must be adequately insulated and vapor sealed to prevent condensation.
   4. Metal shields shall be applied between hangers or supports and the pipe insulation.
   5. Shields shall be formed to fit the insulation and shall extend up to the centerline of the pipe and a minimum of 9 inches long.
   6. Shields shall be 16 gauge aluminum.
   7. Fittings shall be covered equivalent density insulation and covered with preformed PVC insulation fitting covers.
      a. Wrap fittings with insulation.
      b. Pop the preformed cover in place, tape or tack.

B. Closed-Cell Rubber:
   1. Make all cuts neatly with a razor blade or sharp knife.
   2. All longitudinal cuts shall be sealed with adhesive.
   3. All butt joints shall be made neatly and sealed with adhesive.
   4. Tape shall not be allowed on joints or seams.
   5. Insulation shall be applied in a relaxed state, not stretched or crushed.
   6. Fittings shall be insulated by fabricating tees, elbows or crosses as required from the tube insulation as described in manufacturer's literature.
   7. Valves shall be insulated up to the packing nut.
   8. All insulation on exposed piping shall receive two (2) coats of paint, the same color as the wall against which it is mounted.
   9. Joints shall be sealed with adhesive as recommended by the manufacturer.
   10. Provide shields as described in part A above.

END OF SECTION

SECTION 15421

FLOOR AND SHOWER DRAINS

PART 1 - GENERAL

WORK INCLUDED
A. Floor drains.
B. All shower drains not supplied as part of prefabricated showers.

RELATED WORK
A. Section 15450: Plumbing Fixtures and Trim.

SHOP DRAWINGS AND PRODUCT DATA
A. Submit Shop Drawings in accordance with General Conditions for all floor and shower drains to be supplied.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS
A. Wade
B. Josam
C. Zurn
D. Properly submitted & approved equal.

MATERIALS
A. Floor Drains:
   1. Cast Iron floor drain with integral clamping collar.
   2. Seepage openings.
   3. Heavy duty grate, with vandal proof screws.
   4. Square top, polished brass.
   5. Adjustable top.
   6. 4-inch outlet unless otherwise noted on Drawings.
   7. Model - equal to Wade, Series W - 1390.

B. Shower Drains:
   1. Cast iron floor drain with integral clamping collar.
   2. Seepage openings.
   3. Heavy duty grate, with vandal proof screws.
   4. Square top, polished brass.
   5. Adjustable top.
   6. 4-inch outlet unless otherwise noted on Drawings.
   7. Model - equal to Wade, Series W - 1390.

C. Hub Drains:
   1. Cast iron floor drain with integral clamping collar.
   2. Sized as noted on Drawings.

D. Trench Drains:
   1. Equal in all respects to Wade Model 2920, cast iron multiple section trench drain (12" wide x 4'-0" long), flange and special duty (Over 10,000 lbs.) ductile iron loose set grates. Provide sediment bucket.

PART 3 - EXECUTION

INSTALLATION

A. Floor drains shall be installed in the locations show on Plans.
B. Care shall be taken that rim of floor drain is not higher than finished floor in order to prevent "Puddling" of water around the drain.
C. Floor drain top shall be flush with finished floor.
D. Hub drains shall extend 1 inch above finished floor per details.
E. Slop floor to floor drains.

END OF SECTION

SECTION 15423

CLEANOUTS AND ACCESS COVERS

PART 1 - GENERAL

WORK INCLUDED
A. Floor cleanouts.
B. Crawl space or above ceiling cleanouts.

SYSTEM DESCRIPTION
A. Provide cleanouts as shown on the Drawings or as required by Florida Building Code – Plumbing 2004 w/ 2005 and 2006 Revisions.

SHOP DRAWINGS AND PRODUCT DATA
A. Submit Shop Drawings and/or Product Data in accordance with General Conditions for each different type of cleanout shown on the Drawings.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS
A. Wade
B. Josan
C. Zurn
D. Properly submitted approved equal

MATERIALS
A. Floor Cleanouts:
   1. Same size as drain pipe through 4 inches.
   2. Adjustable housing to match finished floor.
   3. Heavy duty top.
   4. Nickel brass secured cover.
   5. Ferrule as required to match soil pipe.
   6. Cast iron.
   7. Cover shall be marked "C.O."
   8. Model Number:
      a. Synthetic floor covering:
         (1) Wade W-7030-D Series or equal
      b. Finished slab - no covering:
         (1) Equal to Wade W-7030 Series
      c. Terrazzo finish:
         (1) Wade W-7010-U Series, or equal.

B. Concealed Cleanouts:
   1. Cleanouts in crawl space or in unfinished mechanical rooms.
   2. Cast iron cleanout tee on T-wall with ferrule fitting and neoprene seal raised plug head.

3. Same size as drain pipe through 4 inches.
4. Position cleanout plug for easy access by electric eel.
5. Model Number:
   a. Cleanout ferrule.
      (1) Wade W-8530-B Series or equal.

C. Exposed Wall Cleanouts
   1. Same size as pipe.
   2. Polished chrome cleanout cover over wall opening.

PART 3 - EXECUTION

INSTALLATION

A. Install all cleanouts and cover plates flush with the finished floor in which they are installed.
   1. Any cleanout which presents a tripping hazard due to improper installation shall be removed and reinstalled.

END OF SECTION

SECTION 15424

DOMESTIC WATER HEATERS - ELECTRIC

PART 1 - GENERAL

WORK INCLUDED
A. Water Heaters

REFERENCE STANDARDS
A. Water heaters shall be UL listed, ASME constructed, and meet ASHRAE 90-80 energy efficiency standards.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS
A. A.O. Smith
B. Lochinvar
C. Teledyne Laars

HEATERS
A. Electric Water Heaters
   1. Glass lining fused to steel tank
   2. Screw-in type, direct immersion
   3. Working pressure - 150 PSI
   4. Fully automatic thermostat controls with high temperature limit safety shutoff
   5. Screw-in anode corrosion protection
   6. Three-year warranty
   7. 3/4" inlet, outlet, and relief opening
   8. Outer jacket of baked enamel finish
B. Model and Capacity
   1. WH-1 - 50 gallon, 240 volt, 1 ph, 6000 watts.

PART 3 - EXECUTION

INSTALLATION
A. Install per manufacturer's recommendations
B. Mount units on wall shelf where noted
C. Provide thermostatic relief valve on each unit

END OF SECTION

SECTION 15450

PLUMBING FIXTURES

WORK INCLUDED

A. TOILETS
B. LAVATORIES
C. URINALS
D. JANITOR SINKS
E. SINKS

SYSTEM DESCRIPTION

A. Furnish and install plumbing fixtures equal to the
    1. Manufacturers and Model Numbers establish quality; equivalent fixtures by other manufacturers are acceptable.

PART 2 – PRODUCTS

P-1 WATER CLOSET - ADA

A. Elongated bowl pressure assisted, tank-type, white
B. 1.6 gallon per flush
C. 16-1/2" inches to top of rim.
D. Equal to American Standard "Cadet" Model No. 2377.100
E. Seat:
    1. Open front
    2. Stainless steel check hinge
    3. Equal to Church #9500 C

P-2 LAVATORY - ADA

A. Vitreous china, Wall hung
B. Conforms to ANSI standard A112.19.2
C. Concealed arm support
D. Faucets on 12 inch centers
E. American Standard # 9140.013
F. Trim - American Standard Heritage 2238.129 faucet with 4" wrist blades
G. Drain assembly, supplies, 1 1/4 inch P-trap, Model 7723.018
H. Mounting height per handicapped code see Architectural Drawings

P-3 KITCHEN (DOUBLE BOWL) SINK

A. 18 gauge stainless steel, double bowl , self-rimming
B. Overall - 33 X 21
C. Bowl size - 13 1/2 X 16 X 8 D. each
D. Equal to Elkay LR 3321, 3 Hole Punching

E. Trim - American Standard Cadet 4160.310
   a. Clear acrylic handles - no spray

P-4 SERVICE SINK

A. Laundry Tubs
   1. Equal to Fiat Products floor mounted service sink model FL-1
   2. Molded stone tub on baked enamel angle legs.
   3. Overall dimensions of the tub (outside) 20-1/4" x 17-1/4" x 13"D
   4. Height above floor 34-3/4"
   5. Furnish with Type A-1 chrome plated deck mounted faucet.

P-5 SHOWER - STANDARD

A. See architectural specifications

B. Trim
   1. Single handle on/off control with adjustment, brass waterway and ceramic disc cartridge.
   2. Pressure/temperature balancing mechanism with adjustable hot temperature limit.
   3. Unit shall be equal to an American Standard 2000.50 supply valve with integral service stops.

P-6 EYEWASH

A. Haws model 8325, combination shower/eyewash station
B. Model 9202 Thermostatic mixing valve
C. Model 9102 Dust cover
D. Model SP220 Foot Treadle control assembly

P-7 WASHER BOX

A. Guy Gray, model B200

P-8 GARBAGE DISPOSAL

A. Insinkerator Bader 5
   1. 120 volt, ½ horsepower
   2. Galvanized grinding elements

P-9 URINAL

A. Crane model 7390
B. Vitreous China, siphon-jet urinal
C. Flushes on 1.5 gallon

D. 1 1/4" inlet spud
E. American Standard "Allbrook" #6540.017
F. Flush Valve Sloan Royal 180-1.5

P-10 ICE MAKER BOX

A. Guy Gray, model M1B- 2
   1. Powder coated, 20 ga, steel box
   2. ¼ turn CPVC valve installed

END OF SECTION

SECTION 15452

FIXTURE CARRIERS

PART 1 - GENERAL

WORK INCLUDED
A. Carriers for wall-hung lavatories, toilets, urinals

SYSTEM DESCRIPTION
A. Supply a fixture carrier for each wall-hung toilet, urinal and lavatory shown on the Drawings or specified in this Section.
   1. A single carrier may be supplied for back-to-back fixtures where applicable.
B. Submit Shop Drawings and/or Product Data for each type fixture carrier to be specified.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS
A. Josam
B. Wade
C. Zurn
D. Properly submitted and approved equal

MATERIALS
A. Lavatory carrier:
   1. Designed to support lavatories independent of finished walls
   2. Floor mount, concealed arms
   3. 1-1/4 inch pipe uprights
   4. Block feet
   5. Provide carrier with arms appropriate for the lavatory type being used
   6. Model Number:
      a. Arm type - Equal to Josam 17105

B. Urinal carrier
   1. Designed to support urinals independent of finished walls.
   2. Floor mount, concealed arms
   3. ¾ inch pipe uprights
   4. Block feet
   5. Provide carrier with arms appropriate for the lavatory type being used
   6. Model Number:
      a. Arm type – Equal to Josam 17820

PART 3 - EXECUTION

INSTALLATION:

A. Carriers shall be installed in walls or chases
B. Support pipes, feet, etc. shall be concealed
C. Only mounting bolts, sanitary connection, lavatory arms, or support plates shall be exposed through finished walls
D. Upon mounting fixture or carrier, only these portions of carriers designed to be exposed shall be.
E. Carriers shall be installed during wall construction and plumbing rough-in.
F. Carriers shall be adjusted to proper heights for fixtures as specified in Section 15450.

END OF SECTION

SECTION 15500

FIRE PROTECTION

PART 1 - GENERAL

SUMMARY

A. Furnish and install complete automatic wet pipe Fire Sprinkler system as shown on Drawing FP-1.

B. The Fire Sprinkler Contractor shall provide Engineered Shop Drawings

And Hydraulic Calculations signed and sealed by a Florida Registered Professional Engineer.

SYSTEM DESCRIPTION

A. Automatic Sprinkler System

1. Completely piped wet-pipe system with all valves, alarms, sprinkler heads, test valves, labels, signage, to provide a complete working system.
2. Living / Work areas shall have semi-recessed, sprinkler heads, chrome heads and white escutcheons.
3. Apparatus and storage shall be brass upright heads.

SUBMITTALS

A. Shop Drawings: Indicate detailed, pipe layout, supports, components, accessories, sizes, and hydraulic calculations, signed and sealed by a Florida Registered Professional Engineer.

A. Product Data: Submit data for pipe materials used, valves, manufacturer's catalog sheet for equipment indicating rough-in size, finish, accessories and requirements.

CLOSEOUT SUBMITTALS

A. Project Record Documents: Detailed “as-builts” of the Sprinkler System.

B. Operation and Maintenance Data: Submit description of components of system, servicing requirements, record drawings, inspection data, and parts lists.

QUALITY ASSURANCE

A. The system shall be installed by a state licensed Fire Sprinkler Contractor

Whose primary place of business is within 100 miles of the site.

WARRANTY

A. Furnish one year warranty on all parts and labor as well as, manufacturer warranty for equipment.

PART 2 PRODUCTS

PIPE AND TUBE

A. Manufacturers:
   1. Automatic Sprinkler Corp.
   2. Grinnell Corp.
   3. Reliable Sprinkler Corp.
   4. Substitutions: Permitted with pre-bid approval.

B. Steel Pipe: ASTM A53, ASTM A135, or ASME B36.10M, Schedule 10 or 40 black and/or galvanized.
   1. Steel Fittings: ASME B16.9, wrought steel, butt welded; ASME B16.25, butt weld ends; ASTM A234/A234M, wrought carbon steel and alloy steel; ASME B16.5, steel flanges and fittings; ASME B16.11, forged steel socket welded and threaded.
   2. Cast Iron Fittings: ASME B16.1, flanges and fittings; ASME B16.4, threaded fittings.
   3. Malleable Iron Fittings: ASME B16.3, threaded type; ASTM A47
   4. Mechanical Grooved Couplings: Malleable iron housing, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

GATE VALVES

A. Manufacturers:
   5. Kennedy
   6. Nibco
   7. Milwaukee
   8. Substitutions: Permitted with pre-bid approval

B. Up to and including 2 inches : Bronze body and trim, rising stem, hand wheel, solid wedge or disc, threaded ends.

C. Over 2 inches : Iron body, bronze trim, rising stem pre-grooved for mounting tamper switch, hand wheel, OS&Y, solid bronze or cast iron wedge, flanged or grooved ends.

BUTTERFLY VALVES

A. Manufacturers:
   9. Kennedy
   10. Nibco
   11. Milwaukee
   12. Substitutions: Permitted with pre-bid approval.

B. Bronze body, stainless steel disc, resilient replaceable seat, threaded ends, extended neck, hand wheel and gear drive and integral indicating device and built-in tamper switch.

C. Iron body, iron or bronze disc, EPDM seat, wafer, lug, or grooved ends, extended neck, hand wheel and gear drive, integral indicating device and built-in tamper switch.

C. Check Valves

D. Manufacturers:
   1. Kennedy
   2. Nibco
   3. Milwaukee
   4. Substitutions: Permitted with pre-bid approval.

E. Up to and including 2 inches : Bronze body and swing disc, rubber seat, threaded ends.

F. Over 2 inches : Iron body, bronze trim, swing check with rubber disc, renewable disc and seat, flanged ends [with automatic ball check.

DRAIN VALVES

A. Manufacturers:
   1. Kennedy
   2. Nibco
   3. Milwaukee
   4. Substitutions: Permitted with pre-bid approval

B. Brass ball valve with cap and chain, 3/4 inch hose thread.

SPRINKLERS

A. Manufacturers:
   5. Tyco
   6. Reliable
   7. Viking
   8. Substitutions: Permitted with pre-bid approval

B. Suspended Ceiling Type: Semi-recessed pendant type with white finish, and matching escutcheon.

C. Exposed Area Type: Standard upright type with brass finish.

D. Guards: Finish to match sprinkler head.

SPRINKLER PIPING SPECIALTIES

A. Water Flow Switch: Vane type switch with two contacts.

FIRE DEPARTMENT CONNECTION

A. Type: Flush mounted wall type with brass finish

B. Outlets: One way with thread size to suit fire department hardware; threaded dust cap and chain of matching material and finish.

C. Drain: 3/4 inch automatic drip, to outside.

D. Label: Fire Department Connection

PART 3 EXECUTION

INSTALLATION

A. Install in accordance NFPA 13.

B. Ream pipe and tube ends to full inside diameter. Remove burrs and bevel plain end ferrous pipe.

C. Remove scale and foreign material, inside and outside, before assembly.

D. Install sleeves where penetrating footings, floors, or walls. Seal pipe and sleeve penetration to maintain fire resistance equivalent to fire separation of footings, floors, or walls.

E. Install pipe runs to minimize obstruction to other work. Offset around ductwork.

F. Install piping in concealed spaces above finished ceilings.

G. Install gate valves for shut-off or isolating service.

H. Install drain valves at main shut-off valves, low points of piping and apparatus.

I. Connect system to water source ahead of domestic water connection with double check valve back flow preventer assembly.

J. Install heads to coordinate with reflected ceiling plan. Center in ceiling tiles.

K. Protection:
   1. Apply temporary tape or paper cover to sprinkler heads to protect from painting.
   2. Protect concealed sprinkler head cover plates from painting.

L. Interface sprinkler system with building fire alarm system.

M. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent Siamese connectors to allow full swing of fire department wrench handle.

N. Flush entire piping system of foreign matter.

O. Hydrostatically test entire system. Schedule test to be witnessed by authority having jurisdiction, Owner's insurance underwriter if applicable, Architect and Engineer.

END OF SECTION

SECTION 15771

SPLIT SYSTEM HEAT PUMP AIR CONDITIONING UNITS

PART 1 - GENERAL

WORK INCLUDED

A. Split System Heat Pump units:
   1. Direct expansion cooling and heating with auxiliary electric strip heat.

SHOP DRAWINGS AND PRODUCT DATA

A. Submit Shop Drawings and/or product data in accordance with General Conditions for all heating and cooling units to be supplied.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS

A. American Standard
B. Trane
C. Carrier

SPLIT - SYSTEM AIR CONDITIONERS

A. Indoor Unit:
   1. Airflow as indicated on drawings.
   2. Fan shall be direct - drive, forward-curved, double inlet, statically and dynamically balanced.
   3. Fan motor shall be resiliently mounted and shall be easily removable for service. Fan motor shall be multiple-speed; permanent -split-capacitor type with integral overload protection.
   4. Cooling coil shall have aluminum fins mechanically bonded to copper tubing. Coil shall have factory installed refrigerant metering devices.

B. Outdoor Unit
   1. Outdoor unit shall be designed for use with Refrigerant 410A and contain sufficient charges (R410A) for complete system. Brass service valves with refrigerant line fittings and service ports shall be located on exterior of unit.
   2. Outdoor coil shall be constructed with aluminum fins mechanically bonded to non-ferrous tubing. Factory installed coil refrigerant metering device shall be mounted on unit liquid service valve. Metering device internal components shall be removable for cleaning or replacement.
   3. Outdoor unit fan shall be propeller type, direct driven, and arranged for vertical air discharge. Fan motor shall be factory lubricated, inherently protected and resiliently mounted.

4. Compressor shall be of the welded-hermetic type with internal vibration isolation and shall be covered with a shield to muffle operating sound. Compressor motor shall have both thermal and current -sensitive overload device. Compressor shall be equipped with a crank-case heater and have internal high-pressure protection.
5. Unit shall be equipped with a refrigerant reversing valve.
6. Controls shall be factory wired and located in a readily accessible location. Controls and protective devices shall include a liquid line low pressure switch, suction line accumulator and pressure relief device. Control wiring terminal board shall be designed to match indoor unit terminal board and accessory thermostat terminals for standardized point-to-point connection.

C. Resistance Heater:
1. Heaters shall be wired for the number of stages of operation indicated on the Drawings. Minimum number of stages shall be two.
2. Heaters shall be equipped with thermal and current overload devices as required by equipment listings and applicable codes.

D. Performance and electrical parameters shall be as indicated on the Drawings. Capacities shall be rated in accordance with ARI test standards.

MODEL NUMBERS

A. Refer to Mechanical Equipment Schedule.

END OF SECTION

SECTION 15829

EXHAUST FANS

PART 1 - GENERAL

WORK INCLUDED

A. All exhaust fans mounted in the ceiling inside the building and ducted to the outside.

SYSTEM DESCRIPTION

A. Exhaust fans shall be located as shown on the drawings.
B. Meet the specification for air delivery at static pressure as specified on the Equipment Schedule.
C. Meet the noise criteria (if specified on Schedule).
D. Be of the manufacture and model number specified in the Equipment Schedule or equal.
E. Shall be UL listed.

SHOP DRAWINGS AND/OR PRODUCT DATA

A. Submit Shop Drawings and/or Product Data for all exhaust fans listed on the Equipment Schedule.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS

A. Penn ventilator
B. Carnes
C. Properly submitted or approved equal

MATERIALS

A. General
    1. Acoustically insulated steel housing
    2. Baked enamel finish on housing
    3. Adjustable mounting brackets
    4. Automatic back draft damper at the discharge duct
    5. Lifetime lubricated motor
    6. Terminal box on housing with cord, plug and receptacle inside the housing.
    7. Fan motor and wheel shall be removable without removing entire fan housing.

END OF SECTION

SECTION 15841

DUCTWORK AND ACCESSORIES

PART 1 GENERAL

SYSTEM DESCRIPTION

A. All supply and return ductwork from HVAC units shall be low pressure sheetmetal ductwork.
   1. External insulation shall be installed on all concealed duct, 2" fiberglass ductwrap.
   2. Exposed duct in Mechanical Rooms shall be rigid fiberglass 2" thick.

B. All general exhaust ductwork in both buildings shall be low pressure sheet metal.
   1. Insulation not required

C. Outdoor air ductwork in both buildings shall be low-pressure metal.
   1. Insulation not required

REFERENCES

A. General
   1. Ductwork installation shall conform to latest publications of the Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)
   2. Ductwork shall be installed in accordance with all applicable codes.

RELATED WORK

A. 15848 - Duct Insulation
B. 15849 - Duct Hangers
C. 15860 - Duct Accessories

LOW - PRESSURE SHEETMETAL DUCTWORK

A. General:
   1. Except as otherwise specified or detailed on the Drawings, all ductwork shall be constructed in accordance with the Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)
   2. Duct systems shall be complete, including all duct fittings, turning vanes, transverse reinforcing hangers, suppoorts, etc., as detailed on the Drawings or in the standards.
   3. Provide and install balancing dampers or adjustable splitters at all branch ducts, and where required for balancing the system.
   4. Each damper shall be adjustable with an approved

guardant or regulator. Dampers to be opposed blade type for ducts over 12" in any dimension, for ducts 12" single blade is acceptable except for outdoor air intakes which shall be low-leakage opposed blade.

5. Dimensions shown are net inside dimensions (including insulation).
6. Galvanized sheet metal duct shall conform to the following thicknesses

a. Largest dimension	Gauge
0-30 inches	24
30-54 inches	22
55-84 inches	20
over 84 inches	18

B. These references shall be used by the Engineer for required sheet metal thicknesses and final acceptance of methods of fabricating, hanging, accessories, etc. All equipment furnished by manufacturers shall be installed in strict accord with their recommended methods.

FLEXIBLE DUCT

A. General
1. Flexible metal with factory applied external insulation.
2. Thermal conductivity .25 @ 75 deg. F.
3. Meets NFPA 90A and 90B
4. Flame spread -25 / Smoke developed 50.
5. Meets UL 181 Class 1
6. Fasten with galvanized steel bands.

PLENUMS

A. Design, construct and test in accordance with SMACNA Standards

FLEXIBLE CONNECIONS

A. Provide between duct system and air moving equipment
B. Connection shall be made with not less than 4" wide flexible collar using "Ventglas" 30-ounce neoprene coated glass fabric.

PART 3 EXECUTION

INSTALLATION

A. Where construction methods for various items are not indicated on the Drawings or specified herein, all such work shall be fabricated and installed in strict accordance with the recommended methods, metal gauges, hanging

procedures, access door and accessory installation, etc., as outlined, the latest edition of SMACNA'S Duct Manual and Sheet Metal Construction for Ventilating and Air Conditioning System.

B. Install all ductwork generally as shown on the drawings and as required by SMACNA Manual.

C. Sheetmetal
   1. Low pressure ductwork and fittings shall be made tight for minimum air leakage.
   2. Duct tape shall not be used to seal joints.
   3. All ductwork, except in equipment rooms shall be concealed in construction spaces above ceilings, in partitions, chases, etc.
   4. Ducts shall be constructed to provide specified air through building without adding noises to the air stream by sudden contractions as sharp edges.
   5. Ducts shall be securely fastened to the structure with hangers..
   6. Connections:
      a. Ducts shall be air tight braced and reinforced to prevent vibration and breathing
      b. Seal supply, return, exhaust and outside air ductwork with adhesive sealing compound
      c. Exterior ductwork to be housed with metal cover, galvanized or aluminum, or weather proofed using felt and AB 20 and asphalt mastic (bull).
      d. Rectangular duct connections shall be made with pocket slip or Bar-s slip not more than 8 ft. apart up to 24 in. largest dimension and not more than 4 ft. apart above 24 in. largest dimension

D. Leakage:
   1. Contractor shall make necessary repair and shall make duct system ready for a leakage test.
   2. Test shall be performed by Test and Balance Contractor.
   3. Leakage shall not exceed 1% leakage for high pressure duct and 5% for low pressure duct construction.

END OF SECTION

SECTION 15845

METAL DUCTWORK-LOW PRESSURE

GENERAL

A Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-i Specification sections, apply to work of this section.

B Division-15 Basic Mechanical Materials and Methods Sections apply to work of this section.

C Extent of HVAC metal ductwork is indicated on drawings and in schedules, and by requirements of this section. Refer to Division-15 Section "Chemical Fume Exhaust Duct System' for special ductwork.

D Refer to other Division-15 sections for exterior insulation of metal ductwork.

E Refer to other Division-15 sections for ductwork accessories.

F Codes and Standards:

1 SMACNA Standards: Comply with SMACNA's "HVAC Duct Construction Standards, Metal and Flexible" Latest Edition for fabrication and installation of metal ductwork.

2 NFPA Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems".

G Submittals:

1 Product Data: Submit manufacturer's technical product data and installation instructions for duct liner, adhesive, sealants, and factory-fabricated ductwork.

.2 Shop Drawings: Submit scaled layout drawings of metal ductwork and fittings including, but not limited to. duct sizes, locations, elevations, and slopes of horizontal runs, wall and floor penetrations. and connections. Show interface and spatial relationship between ductwork and proximate equipment. Show modifications of indicated requirements, made to conform to local shop practice, and how those modifications ensure that free area, materials, and rigidity are not reduced.

3 Record Drawings: At project closeout, submit record drawings of installed metal ductwork and ductwork products, in accordance with requirements of Division 1.

H Acceptable Producers: As listed for each product.

PRODUCTS

A Ductwork Materials:

1 Exposed Ductwork Materials: Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections including pitting, seam marks, roller marks, stains and discolorations. and other imperfections, including those which would impair painting.

2 Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ASTM A 527, lock forming quality; with G 90 zinc coating in accordance with ASTM A 525; and mill phosphatized for exposed locations. Stamp gauge and manufacturer's identification on each sheet. Break sheets so that identification is exposed.

B Miscellaneous Ductwork Materials:

1 General: Provide miscellaneous materials and products of types and sizes indicated and, where not otherwise indicated, provide type and size required to comply with ductwork system requirements including proper connection of ductwork and equipment.

2 Duct Sealant: Non-hardening, non-migrating mastic or liquid elastic sealant, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork.

3 Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork. For exposed stainless steel ductwork, provide matching stainless steel support materials.

4 Flexible Ducts: Fiberglass cloth fabric liner, galvanized steel helix, with factory applied 1" thick external insulation and vapor barrier, fire retardant reinforced aluminum outer jacket, complying with UL 181. Provide Twistez fittings with damper for all flexible duct take offs. Flexmaster 4M and Thermaflex M-KC.

5 Spin-In Fittings: Provide Twistez' type spin-in fittings with damper for all round duct takeoffs. Fittings shall be conical and damper shall have 2" extended shaft with locking quadrant.

6 Flexible Fiberglass Insulation: ASTM C553, Type I, Class B-3. Duct wrap shall be 1 pcf density with a flame spread rating of 25 or less and a smoke developed rating of 50 or less. Provide UL rating and aluminum foil vapor barrier (FSK).

C Fabrication:

1 Shop fabricate ductwork in 4, 8, 10 or 12-ft lengths, unless otherwise indicated or required to complete runs. Preassemble work in shop to greatest extent possible, so as to minimize field assembly of systems. Disassemble systems only to extent necessary for shipping and handling. Match-mark sections for reassembly and coordinated installation.

2 Shop fabricate ductwork of gages and reinforcement complying with SMACNA 'HVAC

Duct Construction Standards".

3 Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to 1-1/2 times associated duct width; and fabricate to include double turning vanes in elbows where shorter radius is necessary. Limit angular tapers to 300 for contracting tapers and **200** for expanding tapers.

4 Fabricate ductwork with accessories installed during fabrication to the greatest extent possible. Refer to Division-iS section "Ductwork Accessories" for accessory requirements.

EXECUTION

A General: Examine areas and conditions under which metal ductwork is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

B Installation Of Metal Ductwork:

1 General: Assemble and install ductwork in accordance with recognized industry practices which will achieve air-tight *(5%* leakage for systems rated 3" and under; and noiseless (no objectionable noise) systems, capable of performing each indicated service. Install each run with minimum number of joints. Seal all joints and seams with duct sealant. Align ductwork accurately at connections, within 1/8" misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling. Support vertical ducts at every floor.

2 Supports: Install concrete inserts for support of ductwork in coordination with formwork, as required to avoid delays in work. Install self-drilling screw anchors in prestressed concrete or existing work.

3 Field Fabrication: Complete fabrication of work at project as necessary to match shop-fabricated work and accommodate installation requirements. Seal joints in round or ductwork with hard cast or shrink bands, and sheet metal screws, or with duct sealant.

4 Routing: Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details and notations or, if not otherwise indicated, run ductwork in shortest route which does not obstruct useable space or block access for servicing building and its equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Limit clearance to 1/2" where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1" clearance outside of insulation. Wherever possible in finished and occupied spaces, conceal ductwork from view, by locating in mechanical shafts, hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.

5 Electrical Equipment Spaces: Do not route ductwork through transformer vaults or other electrical equipment spaces and enclosures.

6 Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1-112". Fasten to duct and substrate. Where ducts pass through fire-rated floors, walls, or partitions, provide firestopping between duct and substrate.

7 Coordination: Coordinate duct installations with installation of accessories, dampers, coil frames, equipment, controls and other associated work of ductwork system.

8 Installation: Install metal ductwork in accordance with SMACNA HVAC Duct Construction Standards.

C Installation Of Flexible Ducts:

1 Maximum Length: For any duct run using flexible ductwork, do not exceed 6' - 0" extended length. Use flexible duct only as detailed on the drawings.

2 Installation: Install in accordance with Section III of SMACNA's "HVAC Duct Construction Standards, Metal and Flexible". Support flexible ducts to eliminate pinching and kinking which would restrict flow.

3 Seal inside of flexible duct connections to sheet metal ducts, boots and terminals. Additionally secure connection with strap clamp. Provide outer coat of sealant and insulate joint with foamed rubber insulation to avoid condensation. Seal all duct joints and connections to equipment.

D Installation of Flexible Insulation: Insulate round stackheads for air outlets and inlets and transitions to equipment where indicated, with duct wrap using 100% coverage of approved insulation adhesive. Lap all joints 2" and vapor seal with staples and vapor barrier sealant. Seal all punctures.

E Leakage Tests: After each duct system is completed, test for duct leakage in accordance with Sections 3 and S SMACNA HVAC Air Duct Leakage Test Manual. Repair leaks and repeat tests until total leakage is less than 5% of system design air flow.

F Equipment Connections: Connect metal ductwork to equipment as indicated, provide flexible connection for each ductwork connection to equipment mounted on vibration isolators, and/or equipment containing rotating machinery. Provide access doors as indicated.

G Clean ductwork internally, unit by unit as it is installed free of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.

H Balancing: Refer to Division-15 section "Testing, Adjusting, and Balancing" for air distribution balancing of metal ductwork; not work of this section. Seal any leaks in ductwork that become apparent in balancing process.

END OF SECTION

SECTION 15848

EXTERIOR INSULATION FOR DUCTWORK

PART 1 – GENERAL

A System Description
1. All concealed ductwork shall be insulated with 2" fiberglass duct wrap.
2. All exposed ductwork in the Mechanical Room shall be insulated with rigid fiberglass board.

B Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-15 Specification sections, apply to work of this section.

C Division-15 Basic Mechanical Materials and Methods Sections apply to work of this section.

D Acceptable Producers: Certainteed, Owens-Corning, Manville.

E Submittals: Producer's data sheet on each product.

F Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, coverings, sealers, mastics, and adhesive) with a flame-spread rating of 25 or less, and a smoke-developed rating of 50 or less, as tested by ANSI/ASTM E84.

PART 2 - PRODUCTS

A Flexible Fiberglass Insulation: ASTM *C553,* Type 100, Class B-3 (temperature less than 350 ^{0}F). Duct wrap shall be 3 pcf density with UL rated aluminum foil vapor barrier (FSK).
1. Minimum thickness = 2"
2. Minimum installed R value = 6.0
3. Equal to Johns-Manville Microlite Type 100

B Rigid Fiberglass Board
1. Inorganic glass fiber
2. Density 3.0 pcf
3. 2" thickness
4. R Value 8.7
5. ASTM C612, Type 1A, 1B
6. All service jacket
7. Equal to Owen Corning Type 703-ASJ

C Insulation Finish Cement: Manville No. 301 or Baldwin Ehert Hill No. 1.

D General Purpose Mastic: Benjamin Foster *35-00* Series, Insulcoustic VIAC Mastic or Childers CP-10.

E Vapor Barrier Sealant: Benjamin Foster 30-35, Insulcoustic IC-SOL, 3M EC-1378, or Childers CP-30.

F Adhesive: Benjamin Foster 85-20. Insulcoustic IC-205, 3M EC-35, or Childers CP-89.

G Fiber Glass Mesh: IOxIO mesh. Foster Mast-A-Fab.

PART 3 - EXECUTION

A Insulate the following ductwork:

1. Stackheads for grilles, registers, and ceiling outlets.

2. Supply and return, and fresh air ducts for air conditioning units.

3. Flexible joint connections at inlets and outlets of air handling units.

B Installation of Flexible Insulation:

1. Insulate round elbows and fittings with blanket secured in place with steel wire. Apply a smoothing coat of insulating cement and finish with a heavy coat of vapor barrier sealant. Thickness shall be equal to adjoining duct covering.

2. Clean and dry ductwork prior to insulating. Adhere insulation to ducts with 100 percent coverage using approved insulation adhesive. Lap all joints 2 inches and vapor seal with glass fiber mesh embedded with 2 coats of vapor barrier sealant. For ducts 30 inches wide and over, additionally support insulation on bottom of duct with rows of welded or adhered clips and washers on 18 inch centers.

3. Seal all punctures and breaks in aluminum vapor barrier with glass fiber mesh and vapor barrier sealant.

END OF SECTION

SECTION 15849

DUCT HANGERS AND SUPPORTS

PART 1 - GENERAL

WORK INCLUDED

A. All ductwork for air supply, return, fresh air or exhaust shall be supported by duct hangers, clamps, clips or supports.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS

A. Duct hangers may be a manufactured item or field fabricated as required.

MATERIALS

A. Galvanized steel straps
   1. Minimum 16 gauge and one inch wide

B. Trapeze hangers
   1. Ducts 20 inches to 40 inches largest dimension.
      a. Minimum 1 inch x 1 inch x 1/4 inch steel angles.
      b. Minimum 1/4 inch threaded rod
   2. Ducts above 40 inches largest dimension and plenums
      a. Minimum 1-1/2 inch x 1-1/2 inch x 1/4 inch steel angles.
      b. Minimum 3/8 inch threaded rod.

PART 3 - EXECUTION

INSTALLATION

A. Supports
   1. All ductwork shall be supported from structural building members, i.e. block, beams, columns, purlins, joists, etc.
   2. Ductwork shall not be supported from ceiling tile or grids, conduit, mechanical equipment, piping or non-structural steel.
   3. Ductwork hangers shall be attached to building steel by bolts, screws, clamps or welding.

B. Hanger Bands
   1. Horizontal concealed ductwork up to 20 inches largest dimension shall be supported by one (1) inch x 16 gauge galvanized steel straps at a maximum spacing of 10 ft. and at each

elbow or branch takeoff.

2. Bands and spacing shall be at a maximum spacing of 10 feet on horizontal runs and at each elbow or branch takeoff.
   a. No nails shall be driven through any ductwork and into floor joists, trusses, etc.
3. Vertical ductwork, all sizes, shall be supported by bands bolted or screwed to walls, studs, etc.
4. Hanger bands shall be bent over one (1) inch from end and turned under corners of rectangular duct.
5. Duct hanger bands shall be fastened with sheet metal screws at six (6) inch intervals up sides and into bottom.
   a. Sheet metal screws shall be 3/4 inch so as not to penetrate duct liner completely.

C. Trapeze Hangers

1. Horizontal ductwork larger than 20 inches largest dimension and all exposed ductwork shall be supported by trapeze type hangers.
2. Trapeze hangers shall be at a maximum spacing of 10 feet and at each elbow or branch takeoff.
3. Hanger rods shall be secured to bottom bracing angles with nuts and locknuts.

END OF SECTION

SECTION 15855

DUCTWORK ACCESSORIES

PART 1 GENERAL

A Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-15 Specification sections, apply to work of this section.

B Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.

C Extent of ductwork accessories work is indicated on drawings and in schedules, and by requirements of this section.

D Types of ductwork accessories required for project include the following:

1. Dampers.
   a. Low pressure manual dampers.
   b. Control dampers.
   c. Counterbalanced relief dampers.
2. Fire dampers.
3. Turning vanes.
4. Duct hardware.
5. Duct access doors.
6. Flexible connections.

E Refer to other Division-15 sections for testing, adjusting, and balancing of ductwork accessories; not work of this section.

F Codes and Standards:

1 SMACNA Compliance: Comply with applicable portions of both SMACNA "HVAC Duct Construction Standards, Metal and Flexible' and 'Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems."

2 UL Compliance: Construct, test, and label fire dampers in accordance with UL Standard *555* 'Fire Dampers and Ceiling Dampers'. Construct, test and label smoke dampers in accordance with UL Standard *555S* "Leakage Rated Dampers for use in Smoke Control Systems".

3 NFPA Compliance: Comply with applicable provisions of NFPA 90A "Air Conditioning and Ventilating Systems', pertaining to installation of ductwork accessories.

G Submittals:

1 Product Data: Submit manufacturer's technical product data for each type of ductwork accessory, including dimensions, capacities, and materials of construction; and installation instructions.

2 Shop Drawings: Submit manufacturer's assembly-type shop drawings for each type of ductwork accessory showing interfacing requirements with ductwork, method of fastening or support, and methods of assembly of components.

3 Maintenance Date: Submit manufacturer's maintenance data including parts lists for each type of duct accessory. Include this data, product data, and shop drawings in maintenance manual; in accordance with requirements of Division 1.

H Acceptable Producers: As listed for each product.

PART 2 - PRODUCTS

A Dampers

1 Low Pressure Manual Dampers: Provide 16 gauge dampers of single-blade type (12" maximum blade width) or multi-blade type. Damper blades to be gang-operated from a single shaft with nylon or ball bearings on each end. Provide indexed locking quadrant. Parallel or opposed blade style is acceptable. Provide 2' standoff on locking quadrant for externally insulated duct.

2 Counterbalanced Relief Dampers: Provide dampers with parallel blades, counterbalanced and factory-set to relieve at indicated static pressure. Construct blades of 16-ga. aluminum, provide 1/2 diameter ball bearings, 1/2" diameter steel axles spaced on 9" centers. Construct frame of 2' x 1/2" x 1/8" steel channel for face areas 25 sq. *ft.* and under; 4' x 1-1/4" x 16-ga. channel for face areas over 25 sq. ft. Provide galvanized steel finish on frame with aluminum touch-up.

3 Acceptable Producers: Subject to compliance with requirements, provide dampers by Air Balance, American Warming & Ventilating, Arrow Louver and Damper, Penn Ventilator Co., or Ruskin Mfg. Co.

B Turning Vanes: Provide manufactured or fabricated single wall turning vanes and vane runners, constructed in accordance with SMACNA 'HVAC Duct Construction Standards'.

C Duct Access Doors:

1 General: Provide where indicated, duct access doors of size indicated, or as required for duty indicated.

2 Construction: Construct of same or greater gage as ductwork served, provide insulated doors for insulated ductwork. Provide flush frames for uninsulated

ductwork, extended frames for externally insulated duct. Provide one side hinged, other side with one handle-type latch for doors 12" high and smaller, 2 handle-type latches for larger doors.

3 Acceptable Producers: Air Balance, Inc., Duro Dyne Corp., Ruskin Mfg. Co., or Ventfabrics, Inc.

D Flexible Connections:

1 General: Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibrations of connected equipment.

2 Acceptable Producers: Duro Dyne Corp., Flexaust (The) Co., or Ventfabrics, Inc.

PART 3 - EXECUTION

A Examine areas and conditions under which ductwork accessories will be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

B Installation of Ductwork Accessories:

1 Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.

2 Install balancing dampers at all main ducts adjacent to units in return air, outside air and where indicated.

3 Install control dampers in the outside air duct for each air handler. Damper operator provided by control contractor.

4 Install turning vanes in square or rectangular 90 deg. elbows in supply, return, and exhaust air systems, and elsewhere as indicated.

5 Install access doors to open against system air pressure, with latches operable from either side, except outside only where duct is too small for person to enter. Install on entering air side of reheat coils and at fire dampers and smoke dampers. Opening size shall be per NFPA 90A for servicing fire and smoke dampers. Provide label with 1-1/2" letters to indicate location of fire protection devices.

6 Coordinate with other work, including ductwork, as necessary to interface installation of ductwork accessories properly with other work.

C Operate installed ductwork accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories as required to obtain proper operation and leakproof performance.

D Adjusting And Cleaning:

1 Adjusting: Adjust ductwork accessories for proper settings, install fusible links in fire dampers and adjust for proper action.

2 Final positioning of manual dampers is specified in Division-I5 section "Testing, Adjusting, and Balancing". However, the system shall be left functional with all dampers open or throttled.

3 Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

4 Furnish extra fusible links to Owner, one link for every 10 installed of each temperature range; obtain receipt.

END OF SECTION

SECTION 15860

DUCT ACCESSORIES

PART 1 - GENERAL

WORK INCLUDED
A. Air Turns
B. Manual Volume Control Dampers
C. Volume Extractors

RELATED WORK
A. Section 15840: Ductwork
B. Section 15863: Volume Dampers
C. Section 15864: Fire & Smoke Dampers

SYSTEM DESCRIPTION
A. Air distribution system shall be furnished complete with duct accessories necessary to allow complete air balancing and adjusting of flow and volume.
B. All square duct corners and "T" connections shall be fitted with turning vanes.
C. All branch duct takeoffs shall be fitted with nonadjustable air turning vanes AND manual volume control dampers, OR adjustable volume extractors which are adjustable from outside the duct.
D. Each grille and diffuser shall be fitted with a manual volume control register at the face of the grille and adjustable from the face of the grille without requiring removal of the grille.

SHOP DRAWINGS AND/OR PRODUCT DATA
A. Shop drawings and/or product data in accordance with the general conditions for all devices to be furnished.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS
A. Barber Colman
B. Titus
C. Properly submitted approved equal

MATERIALS

A. Air turning vanes:
   1. Multiple radius vanes
   2. Steel construction
   3. Electrocoated white finish
   4. Maximum pressure loss = 20% of velocity head
   5. Model number - equal to Barber Colman Models AOOA and AOOF

B. Volume Control Damper:
   1. Opposed blade non-directional volume control
   2. Bottom or side operated from outside duct
   3. Steel construction

C. Volume Extractors:
   1. Gang operated parallel blade
   2. Fully adjustable from wide open to full closed
   3. Supply with supporting foot as required for branch takeoffs not in the same plane as trunk lines.

PART 3 - EXECUTION

INSTALLATION

A. All duct turns shall be installed at an angle of 20 to 40 deg. to approaching air for elbows and "T" connections.

B. All duct turns shall be installed at an angle of 15 deg. to the approaching air in the trunk duct.

C. All dampers or adjustable air volume extractors shall be installed so that the operators are accessible from outside the duct.

END OF SECTION

SECTION 15863

VOLUME DAMPERS

PART 1 - GENERAL

WORK INCLUDED
A. Return Air Dampers
B. Fresh Air Intake Dampers

RELATED WORK
A. Section 15860: Duct Accessories

SYSTEMS DESCRIPTION
A. All return air and fresh air dampers shall be parallel blade pivot dampers with motorized control.
B. All balancing dampers shall have manual control dampers with positive position locking.

SHOP DRAWINGS AND PRODUCT DATA
A. Submit Shop Drawings and/or product data sheets in accordance with the General Conditions for each type of damper to be supplied.
    1. Submittals shall include air leakage and pressure drop tables for substituted equipment.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS
A. Prefco Manufacturing Co.
B. Properly submitted and approved equal

MATERIALS
A. Parallel Blade Pivot Dampers:
    1. Low leakage non-degradable
    2. Friction free metal to metal seals incorporated into the blade and frame shapes
    3. Galvanized steel frame, 16 gauge
    4. Galvanized steel blades, 22 gauge with double-wrapped center and edge forming
    5. Maximum leakage - 11 CFM per sq. ft. @ 1 inch S.P.
    6. The static pressure loss shall not exceed 0.7" W.G. @ 2000 FPM and 50% modulation
    7. Model Number
        a. Equal to Prefco Model 5150

END OF SECTION

SECTION 15868

DUCT ACCESS PANELS AND TEST HOLES

PART 1 - GENERAL

WORK INCLUDED

A. All access panels required for resetting and maintenance of fire and smoke dampers and inspection and cleaning of volume control dampers.
B. Test holes required for air measurement.

SYSTEM DESCRIPTION

A. Provide an access panel at each return air and/or fresh air damper which will allow for inspection and cleaning of dampers.
    1. Where return and fresh air dampers are located adjacent, one access door is sufficient, providing each damper is accessible.
B. Provide an access panel at each fire damper for resetting and maintenance of each fire and smoke damper.
C. Provide any additional access panels as shown on the Drawings.
D. Provide test holes for measurement of air flow, on each branch duct and main trunk line or plenum.

SHOP DRAWINGS AND PRODUCT DATA

A. Submit Shop Drawings and/or product data sheets in accordance with the General Conditions for each type panels and access hole to be supplied.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS

A. Penn Ventilator Co.
B. Properly submitted and approved equal

MATERIALS

A. Access Doors:
    1. Insulated hinged duct access door
    2. Standard gauge galvanized steel
    3. Continuous piano hinge
    4. Gasketed at door frame surface and at frame to duct surface
    5. Positive acting cam latch handle
    6. Doors shall be of sufficient size to allow

access to both sides of dampers

7. If duct width is greater than 36 inches, provide access doors on each side of duct for access to entire dampers.
8. Exception:
   a. Where access door must be installed in such a position that hinged opening is not possible, provide door that is completely removable.
   b. Removable door shall have cam-locks on both sides
9. Model Numbers:
   a. Hinged doors shall be equal to Penn Ventilator Model DAD
   b. Non-hinged removable door shall be equal to Penn Ventilator Model DAD-RP.

B. Test Holes
   1. Provide a capped access hole in each trunk line or branch duct for insertion of air-flow pitot for flow measurement.

END OF SECTION

SECTION 15870

GRILLES. REGISTERS AND CEILING DIFFUSERS

GENERAL

A Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-i Specification sections, apply to work of this section.

B Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.

C Extent of air outlets and inlets work is indicated by drawings and schedules, and by requirements of this section.

D Refer to other Division-15 sections for ductwork and duct accessories required in conjunction with air outlets and inlets and for balancing of air outlets and inlets; not work of this section.

E Codes and Standards:

1 ADC Compliance: Test and rate air outlets and inlets in certified laboratories under requirements of ADC 1062 'Certification, Rating and Test Manual". Provide air outlets and inlets bearing ADC Certified Rating Seal.

2 NFPA Compliance: Install air outlets and inlets in accordance with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems".

F Submittals:

1 Product Data: Submit manufacturer's technical product data for air outlets and inlets including the following:

Data sheet for each type of air outlet and inlet, and accessory furnished; indicating construction, finish, and mounting details.

Performance data for each type of air outlet and inlet furnished, including aspiration ability, temperature and velocity traverses, throw and drop, and noise criteria ratings. Indicate selections and data.

2 Maintenance Data: Submit maintenance data, including cleaning instructions for finishes, and spare parts lists. Include this data and product data in maintenance manuals; in accordance with requirements of Division 1.

G Acceptable Producers: Titus, Anemostat, Metalaire, Krueger or approved equal.

PRODUCTS

A General:

1 Except as otherwise indicated, provide manufacturer's standard grilles, registers, and ceiling diffusers where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.

2 Performance: Provide grilles, registers and ceiling diffusers that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device equal to the basis of design.

3 Ceiling and Wall Compatibility: Provide grilles, registers and diffusers with border styles that are compatible with adjacent wall and ceiling systems, and that are specifically manufactured to fit into ceiling module or wall with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems and walls which will contain each type of ceiling diffuser, grille, or register.

4 Appearance: All grilles and registers shall be aluminum construction and all diffusers shall be steel or aluminum construction, unless otherwise noted, with uniform matching appearance for each type of outlet. Ceiling mounted grilles and registers shall be set to be sight tight from the predominant exposure.

5 Finish: All ceiling mounted grilles, registers, and diffusers shall be finished with baked white enamel. Wall and door mounted grilles and registers shall be finished with clear anodized finish.

B Return or Exhaust Registers: Provide return and exhaust registers with one set of 30 degree, fixed louvers, spaced at ½", parallel to the long dimension. Provide opposed blade damper, screwdriver operated from the face. Provide mounting frame for all wall and plaster ceiling installations. Basis of design: Titus 25 *RL* with frame as required.

C Return. Exhaust or Transfer Grilles: Same as return and exhaust registers except no damper. Basis of design: Titus 25 RL with frame as required.

D Door Grilles: Provide steel door grilles with V-core, fixed louvers, spaced 1/2", flanged frame, and telescoping auxiliary flanged frame. Provide prime coat ready for field painting. Basis of design: Titus T 700L.

E Square Ceiling Diffusers: Provide square face, adjustable, 360 degree pattern diffusers with one-piece stamped cones, no corner joints. Provide lay-in panel as required. If square neck diffusers are submitted, provide square-to-round adaptors as required. Basis of design: Titus TDC-AA

F. Sidewall Supply Registers: Rectangular with two sets of adjustable louvers, rear horizontal, front vertical with front parallel to short dimension. Opposed blade damper, screw driver adjustable from face. Provide mounting frame for wall. Basis of design; Titus 272 RS.

G. Rectangular Ceiling Diffusers: Flanged mounted in ceiling gypsum board or tile. Provide with opposed blade damper screw driver adjustable from face. Multiple adjustable louvers parallel to long dimension. Basis of design; Titus 250L.

EXECUTION

A. Coordinate installation with ceiling and light fixture installation. Locate ceiling outlets as indicated n architectural "Reflected Ceiling Plans" . Unless otherwise indicated, locate ceiling outlets in the center of acoustical ceiling modules with sides parallel to the grid.

B Install air outlets and inlets in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve intended functions.

C. Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of air outlets and inlets with other work.

D. Set air volumes **to** values shown on the drawings so that the system is functional. Leave ready for test and balance contractor.

E. Furnish to Owner, with receipt, 3 operating keys for each type of outlet and inlet that require them.

END OF SECTION

SECTION 15876

WALL LOUVERS

PART 1 - GENERAL

WORK INCLUDED

A. Intake and exhaust louvers as shown in the drawing schedule.

RELATED WORK

A. Section 15841 - Ductwork

SHOP DRAWINGS AND/OR PRODUCT DATA

A. Submit Shop Drawings and/or product data for all general conditions.

PART 2 - PRODUCTS

WALL LOUVERS

A. Wall louvers shall be heavy-gauge extruded-aluminum type with multiple breaks or ridges to prevent water from traveling up the blade. Blade depth shall be 4 in., unless shown otherwise on the drawings.

B. Blade shall slope at approximately 45 deg. and shall be reinforced on the outer and inner edges with a reinforced lip.

C. Louvers shall bear the AMCA Seal as having been rated in accordance with Standard 500 for air performance and moisture penetration.

D. Finish shall be factory-anodized aluminum color, unless specified otherwise. If specific color is required, a sample of the required color will be furnished.

E. Louver shall be designed for flange mounting against the face of the building.

AUXILIARY EQUIPMENT

A. Louvers shall be provided with an aluminum bird screen in a removable frame on the inside. Insect screen, if shown on the drawings for intake louvers, shall be aluminum in an aluminum frame and shall be mounted on the exterior of the louver.

B. For larger-size louvers, provide mullions to provide rigidity and allow expansion.

C. See drawings for duct connections, dampers, etc., that attach to the louver.

PART 3 - EXECUTION

INSTALLATION

A. Install the louver in the masonry opening with the flange extending around the perimeter of the louver and 1/4 in. away from the wall to allow caulking. Secure the louver in such a way to prevent entry into the building.

B. Caulk the perimeter of the louver at the junction of the wall with polyurethane caulk, Type D, 7900.3, ASTM C920 applied as recommended by the manufacturer. Allow room for expansion and contraction without damage to the caulking.

END OF SECTION.

SECTION 15881

DISPOSABLE FILTERS

PART 1 - GENERAL

WORK INCLUDED

A. Air Handling Unit Filters
B. Hinged return air filter grilles

PART 2 - PRODUCTS

MATERIALS

A. Duraflex pleated media in water proof cardboard carrier.
B. Size as per manufacturer's specified size or per grille size
C. One inch thick, MERV 7 rating, UL Class 2
D. ASHRAE 52.1 efficiency 25 – 30%
E. Equal to American Air Filter "Perfect Pleat"

END OF SECTION

SECTION 15900

CONTROL SYSTEM

PART 1 - GENERAL

DESCRIPTION
A. All Units
   1. Furnish and install all electrical controls and components for all mechanical systems as listed below.
      a. Split system heating and cooling

SHOP DRAWINGS
A. Furnish shop drawings on all control components and wiring diagram if required for installation.

DIVISION OF WORK
A. The mechanical contractor is totally responsible for all controls including required conduit and wiring between thermostat, condensing unit and air handler.

PART 2 - PRODUCTS

THERMOSTATS
A. A low voltage electronic programmable thermostat shall be included in each unit.
   1. Thermostat shall be electronic with separate heat/cool set points for each use period.
   2. Thermostat shall have a minimum of four independent use periods perday.
   3. Thermostat shall have seven day independent programming capability with four separate set point use periods per day a "weekday / weekend programmable unit is not acceptable.
   4. The Thermostat shall have automatic Heat/Cool changeover.

FIRE STATS
A. Provide fire stats on each unit as required by code.
   1. Fire stat shall shut down all unit components including fans, compressors, etc.

PART 3 - SEQUENCE OF OPERATION

SPLIT SYSTEM
A. Room thermostat shall cycle compressor to maintain temperature.
B. Air handler fan shall cycle with compressor.

END OF SECTION

SECTION 16010

GENERAL PROVISIONS

PART 1 - GENERAL

DIVISION OF WORK

A. Division 16 Specifications define the Electrical Systems. Materials and labor to be performed and furnished as part of the General Construction Contract of which they are a part.

B. It is not the intent of Division 16 to define a contractual relationship between the General Contractor and Subcontractor ,

C. It is the responsibility of the General Contractor to provide all materials and labor to perform the work, and sub contractual relationships are his responsibility.

WORK INCLUDED

A. All labor, materials, fixtures, equipment, tools and service necessary for installation, testing and adjusting of all electrical systems shall be furnished and installed in compliance with the Drawings, Specifications, and any Addenda thereto.

B. Drawings and Specification shall be understood to cover, according to their intent and meaning, complete electrical systems. Work shown and not specified, or work specified and not shown shall be performed as though mentioned in both.

C. Minor items and accessories reasonably inferred as necessary for the complete and proper operation of any system shall be provided by contactor or subcontractor for such system whether or not they are specifically called for.

D. The Electrical Contractor shall include in his bid the cost of furnishing installing, maintaining and removing all material and equipment required to provide temporary lights and power to perform the work of all trades during construction and until work is completed. Adequate lighting and receptacle outlets for operation of hand tools shall be provided throughout the project, including shanties, trailers, field offices, temporary toilet enclosures, and shall be extended as construction progresses.

COORDINATION WITH POWER COMPANY

A. Before submitting a bid, the Electrical Contractor is to coordinate with the electric power company to ascertain, in detail, the division of work, and the extent of performance by the Power Company shall be furnished and performed by the Electrical Contractor.

ELECTRICAL CONTRACTOR QUALIFICATIONS

A. The Owner intends to award this contract to a Bidder whose subcontractors are competent to perform and complete the work in a satisfactory and timely manner. All Bidders and subcontractors must be qualified at the time of bid opening.

B. Electrical Contractor must have a current Florida Electrical Contractor's license and been in business for a minimum of 5 years.

C. The Electrical Contractor shall demonstrate experience on new construction projects, by submitting three projects completed within the last 3 years each having a minimum mechanical construction value of $100,000. Submit forms at the end of this section within 24 hours of the bid opening.

D. The Electrical Contractor's permanent home office shall be located within 150 miles of the project site.

E. The Architect/Engineer shall reserve the right to disqualify any Subcontractor who does not, in their sole opinion, meet the above minimum requirements. The Contractor shall provide qualified Subcontractors as part of his bid.

CODES

A. All work shall be performed or installed in strict accordance with all applicable rules, regulations and codes of local, state, and Federal Governments having lawful jurisdiction, and each contractor and subcontractor shall be responsible for such compliance.
   1. Code requirements shall be considered as minimum allowable.
   2. Were quantities, sizes, etc., shown on the Drawings or Specifications are in excess of code Requirements, the Drawings or Specifications shall take precedence.
   3. Any quantities, size, etc., shown less than code minimum shall be increased to meet code.

B. All work shall be in accordance with the National Electrical Code 2002

TECHNICAL DEFINITIONS

A. Specific items of terminology, as used herein, shall have the following meanings:
   1. "Work" includes all materials, labor, equipment and operation required for complete and proper installation.
   2. "Piping" shall mean pipe, fittings, flanges, valves, controls, hangers, traps, drain, insulation, vents, and items customarily required in connection with the transfer of fluids.
   3. "Concealed" shall mean embedded in masonry or other construction, installed behind wall furring, within double partitions or hung ceilings, in crawl spaces, in shafts.
   4. "Exposed"' shall mean not concealed.
   5. "By Other Trades" shall mean by persons or parties responsible for work at the project other than the party or parties who have been duly awarded the contract for the work of this trade. In the event that this document is used to acquire work as part of a general construction contract the words "by other trades" shall mean by persons or parties who are not anticipated to be the subcontractor for this trade working together with the General Contractor. In

this context the words "by other trades" shall not be interpreted to mean not included in the overall contract.

6. "Demolition" shall be the removal of any existing equipment, and the capping or plugging of any existing services to that equipment. Removal shall include the proper evacuation of all environmentally hazardous gases, refrigerants or liquids and proper disposal in accordance with all applicable codes and standards.
7. "OPCI" shall mean the Owner will purchase this equipment and have it delivered to the site. The Contractor is responsible for protection and installation.

INTERPRETATION OF THE DRAWINGS AND SPECIFICATIONS

A. As used in the drawings and specifications, certain non-technical words shall be understood to have specific meanings as follows:
   1. "Furnish" shall mean purchase and deliver to the project site complete with every necessary appurtenance and support.
   2. "Install" shall mean unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project.
   3. "Provide" shall mean "furnish" and "install".

B. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item, in the drawings or specifications or both, carries with it the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated as part of the indication or description.

C. It shall be understood that the specifications and drawings are complementary and are to be taken together for a complete interpretation of the work. Exceptions are those notes on the drawings, which refer to an individual element of work, take precedence over the specifications where they conflict with same.

D. No exclusions from, or limitations in, the language used in the drawings or specifications shall be interpreted as meaning that the appurtenances or accessories necessary to complete any required system or items of equipment are to be omitted.

E. The drawings of necessity utilize symbols and schematic diagrams to indicate various items of work. Neither of these items have any dimensional significance nor do they delineate every item required for the intended installations. The work shall be installed, in accordance with the diagrammatic intent expressed on the electrical and mechanical drawings, and in conformity with the dimensions indicated on final architectural and structural working drawings and on equipment shop drawings.

F. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for complete work are excluded.

G. Certain details appear on the drawings that are specific with regard to the dimensioning and positioning of the work. These details are intended only for the purpose of establishing general feasibility. They do not obviate field coordination for the indicated work.

H. Information as to the general construction shall be derived from structural and architectural drawings and specifications only.

I. The use of the word in the singular shall not be considered as limiting where other indications denote that more than one item is referred to.

J. In the event that extra work is authorized, and performed by this trade, work shown on drawings depicting such work, and/or described by addendum is subject to the base building specification in all respects.

DRAWINGS AND SPECIFICATIONS

A. It is the intent of drawings and specifications to obtain a complete and satisfactory installation.

B. Separate divisional drawings and specification shall not relieve the contractor from full responsibility of compliance with the work indicated on any of the drawings or in any division of the specification.

C. Each subcontractor shall carefully examine the architectural, structural, electrical and mechanical drawings and specifications prior to submitting bid.

D. The subcontractor will be required to furnish, install and connect with appropriate services all items shown on any of the drawings without additional expense to the Owner.

E. The Architect/Engineer shall be notified of any discrepancies, omissions, conflicts or interferences which occur between drawings or between drawings and specifications. If such notification is received in adequate time additional data or changes will be issued by addendum to all bidders.

F. Architectural and structural drawings take precedence over mechanical drawings with reference to building construction.

G. Electrical drawings are diagrammatic but shall be followed as closely as actual construction of the building and the work of other trades will permit.

APPROVED MATERIALS

A. Materials or products specified herein and/or indicated on drawings by trade name, manufacturer's name and/or catalog number shall be provided as specified.

Substitutions will not be permitted except as described herein in Supplementary and General Conditions.

B. For approval of products other than those specified, bidders shall submit to the architect a request in writing at least ten (10) days prior to bid date and hour. Requests received after this time will not be reviewed or considered regardless of cause. Requests shall clearly define and describe the product for which approval is requested. Requests shall be accompanied by manufacturer's literature, specifications, drawings, cuts, and performance data list of references or other information necessary to completely describe the item. Approval will be in the form of an addendum to the specifications issued to all prospective prime contract bidders on record. The addendum will indicate the additional products that are approved for this project.

C. A list of all materials and equipment that the Contractor proposes to furnish shall be submitted for approval within ten (10) days after the contract has been let. Data shall be complete in all respects.

D. Where such approved substitution or deviation requires different quantity or arrangement of foundations, supports, ductwork, piping, wiring, conduit, and any other equipment or accessories normal to this equipment, Contractor shall furnish said changes and additions and pay all costs for all changes and additions and pay all costs for the changes to the work and the work of others affected by this substitution or deviation.

E. Deviations mean the use of any listed Approved Manufacturer other than those on which the drawings are based.

FEES - PERMITS

A. Fees for permits will be paid by the general contractor.

IDENTIFICATION

A. All panel boards, disconnects, relays, magnetic contractors and time clocks shall be labeled with the same designation shown on the Drawings.
B. Labels shall be laminated plastic engraved, with minimum 3/4 inch width, minimum letter size 3/8 inch.
C. Embossed labels shall not be acceptable.
D. Mount a typewritten directory behind glass or plastic on the inside of each panel door, showing circuit number and complete description of all outlets on each circuit.

TESTS AND INSPECTIONS

A. All electrical systems shown on the Drawings.
B. Call for appropriate inspections during construction as required by local agencies having jurisdiction over electrical construction.
C. Costs of inspections shall be paid by the Contractor.

D. Furnish all equipment and personnel and conduct all test required securing approval of the installation.
E. Any repairs or changes required to secure the approval of the installation shall be done at no additional expense to the Owner.

QUALITY ASSURANCE

A. Safety Tests
   1. All systems shall test free from short circuits and grounds, shall be free from mechanical and electrical defects and shall show and insulation resistance between phase conductors and ground of not less than that required by the National Electrical Code.
   2. All systems shall show proper neutral connections.

CODE TESTS

A. All work shall be installed in accordance with the National Electrical Code and satisfy the local inspectors having jurisdiction.

OPERATIONAL TESTING

A. Upon completion of each part of the electrical system, the contractor shall demonstrate to the Engineer that each item on that system is installed with proper covers, safeties, controls, etc., and that all are in proper working order.
B. Each switch, control circuit, etc., shall properly operate the device intended.

AS BUILT INFORMATION

A. A set of "red-lined" electrical drawings shall be carefully maintained at the job site. Actual conditions are to be put on the drawings in red on a daily basis so the drawings will continuously show locations and routings of cable trays, conduits, pull boxes, circuit numbers, and other information required by the Engineer.

EQUIPMENT AND MATERIALS

A. Meet or exceed specification requirements.
B. New, unused, of best quality and grade.
C. Current model for which replacement parts are available.

CATALOG AND MODEL NUMBER

A. Intended for use as guidelines.
B. Do not take precedence over specific ratings or duty.
C. Are not intended to give priority of one manufacturer over another providing "or equal" requirements are net.

USE OF EQUIPMENT OTHER THAN BASIS OF DESIGN

A. The mechanical drawings indicate equipment in the schedules as basis of design. Other manufacturers are listed in the specification sections. All other manufacturers must be submitted to the Engineer for review prior to bid. Any proposed substitution must follow Div 1 requirements. All costs for reviewing

substituted equipment will be paid by the contractor. Engineering costs related to the substitution will be paid by the contractor at $125.00 per hour.

B. The drawings (electrical, structural, architectural, etc) are based upon the products listed in the mechanical schedules (basis of design). Any product provided other than the basis of design may impact the requirements of other disciplines. The mechanical contractor is responsible for (and shall include in the base bid price) any and all costs related to the substituted equipment. These costs may include engineering review, construction document modifications (supplemental instructions), Div 16 construction costs, and other subcontractor costs. Engineering costs will be paid by the contractor at the rate of $125.00 per hour. Coordinate with other sub contractors regarding impact of substituted equipment prior to bid.

C. The construction documents contain design intent that may or may not be immediately apparent. All other intended physical and aesthetic requirements (stated or not) of the construction documents shall apply to the equipment intended for use. This includes appearance, clearance, access, and concealment requirements.

UNACCEPTABLE EQUIPMENT

A. Equipment and material may be judged unacceptable for the following reasons.
   1. Equipment was not submitted for prior approval ten (10) days in advance of bid date.
   2. There is a history of poor performance, poor response to service and/or warranty issues on previous school projects.

"OR EQUAL"

A. Equipment and material shall be judged "equal" or on the basis of the following:
   1. Meets or exceeds performance specifications for rating duty, etc.
   2. Is comparable size to specified unit, (dimensions, weight, etc.).
   3. Has similar appearance and is aesthetically acceptable (not applicable to equipment which is concealed in mechanical rooms, etc.).
   4. Has exact voltage and phase characteristics as specified.
   5. Does not exceed power consumption of specified equipment by more that 10%.
   6. Is submitted and approved by Architects.

B. Equipment may be judged "unequal" if:
   1. Installation of such equipment will cause excessive changes in associated equipment, wiring structures, etc.
   2. Such equipment will require basic design changes with regard to system operation or performance.

UNACCEPTABLE EQUIPMENT

A. Equipment and material may be judged unacceptable for the following reasons.
   1. Equipment was not submitted for prior approval ten (10) days in advance of

bid date.

2. There is a history of poor performance, poor response to service and/or warranty issues on previous school projects.

MAJOR EQUIPMENT SUBSTITUTION COST

A. If equipment furnished or substituted differs in physical character from that specified and requires increased services and/or facilities of other trades, and such substitution is acceptable to the Architect, the Contractor shall bear the costs of any or all of the following charges caused by such substitution:
   1. Cost of modifying product to fit conditions.
   2. Cost of modifying building to receive product.
   3. Cost of increased services and/or facilities.
   4. Cost of additional Architectural and/or Engineering Services required to modify such services, facilities, building, etc.

B. Minor deviations:
   1. Dimensions and ratings of equipment herein specified or indicated on Drawings are intended to establish desired outlines and characteristics of such equipment minor deviations will be permitted or allow manufacturers specified to bid on their nearest stock equipment.

COORDINATION OF ELECTRICAL WORK

A. Refer to Division 1 for general coordination requirements. The contract documents are diagrammatic in showing certain physical relationships of the mechanical work and the interface with other work, including utilities and electrical work. Final coordination is the responsibility of the Contractor.
   1. Arrange mechanical work in a neat, well-organized manner. Piping and services shall run parallel to primary lines of the building construction, at a minimum of 7'-0" clearance.
   2. Locate operating and control equipment for ease of access. Arrange mechanical work with required clearances for access for operation and maintenance.
   3. Advise other trades of openings required in their work.
   4. Give right-of-way to piping which requires a slope for drainage.

B. Coordination Drawings: Provide 1/4" drawings indicating mechanical equipment and/or electrical work when positioned within close proximity.

C. NEC Required Clearances: The Contractor is responsible for all electrical equipment at 120v and greater (including but not limited to starters, disconnects, fuses, relays, etc.) to be installed with allowable NEC clearances. Refer to NEC for the required clearances (which are often greater than 36"). For cramped mechanical spaced with electrical panels, submit coordination drawings showing mechanical and electrical equipment and their respective service and NEC clearances.