

DIVISION 15 – MECHANICAL

General - Mechanical contractor to install ductwork runs, risers, drops, vent pipes & all other work required for the full performance and completion of the contract documents. Provide offsets as required to meet space requirements and to avoid interference with other trades. Each trade shall be totally responsible for coordination with other trades.

Plumbing contractors to install piping layout & all work required for the full performance and completion of the contract documents.

15200 TESTING PIPING SYTEMS

1. Test interior domestic water piping hydrostatically at 100 psi for 4 hours.
2. Test domestic water service piping hydrostatically at 100 psi. Leakage shall not exceed 120 gallons per inch diameter per mile per 24 hours.
3. Test interior soil, waste, vent, and drain piping with 10-ft. head.
4. Test gas piping at 50 psi for 4 hours
5. Test all exterior sewer piping with 10-ft. minimum head (above invert) at highest point of the sewer. Infiltration or exfiltration shall not exceed 200 gallons per inch diameter per mile per 24 hours.
6. Test exterior plastic sewer piping for deflection. Maximum deflection shall be 5% of pipe diameter.

15010 WORK INCLUDED

1. The Work to be performed shall include all labor, materials, equipment, transportation, construction facilities and incidentals necessary for the proper execution and completion of all Mechanical, Fire Protection, Plumbing, and HVAC Work as shown and indicated on the Contract Drawings, and/or herein specified with the intent that the installation shall be complete and operational in every respect and ready for use.
2. Comply with all applicable local, state and federal codes and 2006 International Building Code , 2004 Illinois Plumbing Code, 2006 International Fire Code, 2006 International Mechanical Code, 2006 International Fuel Gas Code, and 2006 International Energy Conservation Code.

15050 BASIC MECHANICAL MATERIALS AND METHODS

1. In general all materials shall be: new, U.L. listed for the specific application as specified or as required, of U.S. manufacturer, and installed per manufacturer's written instructions.
2. Maintenance Manuals: Three complete binders of product literature, operating instructions, and warranties.
3. Excavation and Backfilling: Backfill under the floor slabs, sidewalks, driveways, streets, etc., with granular backfill. Restore existing surfaces to original condition.
4. Shop Drawings: Submit 5 sets for review for all equipment, fixtures, accessories, and material prior to ordering.
5. Cutting and patching by this Division. Restore all surfaces to match existing conditions.
6. Painting: by General Contractor.
7. Access panels: Furnished and installed by the HVAC Contractor. Provide panels wherever required, 24-in.x24-in., Milcor K, DW, M or AT, as required.
8. Permits: Apply for and pay for all applicable permits, fees, etc.
9. Warranty: One year on workmanship and materials.
10. Substitutions: By addendum or voluntary alternate only.

15060 PIPES AND PIPE FITTINGS

1. Waste, and vent piping (above and below ground) - Schedule 40 PVC piping with solvent welded joints except in plenum spaces. See Plumbing Material Schedule on drawings.
2. Above slab domestic water piping- Type L hard copper, with wrought soldered fittings. At contractor's option a PEX distribution system may be substituted for above ground type L copper domestic water piping for sizes 1-1/4-inch and smaller. PEX shall be ASTM F 877, SDR 9 tubing. Fittings for PEX tube shall be ASTM F 1807, metal-insert type with copper or stainless-steel crimp rings and matching PEX tube dimensions. Manifold shall be multiple-outlet, brass assembly complying with ASTM F 877; with brass valve for each outlet.
3. Buried interior water piping - Type K soft temper copper with wrought brazed joints. Keep number of joints to minimum.
4. Buried exterior water piping - Type K hard temper copper with wrought brazed joints.
5. Gas piping (not buried) - 2 in. and smaller: Schedule 40 black steel with 125 psi malleable, screwed fittings, - 2 1/2 in. and larger: welded fittings.
6. Gas piping (buried) - PVC wrapped Schedule 40 black steel gas service piping with malleable screwed fittings, with joints and fittings taped and sealed.
7. Gas vent piping-Type L rigid copper with wrought brazed fittings or same as "gas piping (not buried)". Route all gas vents through exterior wall and terminate with insect screen.
8. Exterior sewer piping
 - a. Refer to the Site Drawings..
10. HVAC condensate drain piping - Type L rigid copper with wrought soldered fittings. Provide union and 2 in. deep trap. Construct trap with clean-out plug. Extend each drain full size to edge of concrete equipment pad for rooftop units. Extend full size through exterior wall for fan coil unit. Insulate fan coil unit condensate drain pipe with 1/2" Armaflex inside building.
11. Solder: 90% tin/ 2% silver J.W. Harris Stay Safe Bridgit
12. Brazing alloy: Stay Silv 5, Sil Fos 5.
13. Brass adapters: at all copper-ferrous junctions in "closed" systems.
14. Unions - 150# screwed, ground joint, Stockham 694.

15100 VALVES

1. Jenkins, Milwaukee, Nibco or Apollo, as follows:

TYPE

MANUFACTURER

- a. Ball
Apollo, Nibco, or Jenkins
- b. Gas - 2in. or less UL, AGA Listed ball valves
Watts, Milwaukee, Dezurik
- c. Check – Brass swing check
Jenkins
- d. Sill Cock
Woodford, polished brass
- e. OS & Y Gate (Sprinkler)
Jenkins, UL Listed

15120 PIPING SPECIALTIES

1. Backflow prevention valves - Watts, Conbraco, Wilkins, complying with ASSE 1013. Backflow prevention valves for sprinkler system shall be UL listed. Strainer on inlet (delete for fire protection service). Refer to schedules on drawings for backflow preventer data.
2. Strainers - Armstrong, Illinois, Sarco: Bronze body, stainless steel screen.

15140 SUPPORTS AND OPENINGS IN CONSTRUCTION

1. Clevis hangers, (Grinnell 260) maximum hanger spacing in accordance with MSS standards MSS SP-69 and MSS SP-89. Insulation size at insulated pipe. Copper plated where in contact with copper pipe. Provide sheet metal saddle at each hanger where piping is insulated.
2. Building attachment - Hanger rods may be attached to building rigid frame or roof trusses as allowed by truss Manufacturer (do not exceed loads allowed by truss Manufacturer). Coordinate all point loads with truss manufacturer in writing. Where loads exceed truss Manufacturer's allowance provide additional supplemental supports as follows: Provide tube columns concealed within walls with Unistrut cross bracing to hang piping & ductwork. Brace tube columns at top. Division 15 Contractor is responsible for design of support systems and coordination with truss manufacturer.
3. Pipe sleeves - Schedule 40 steel pipe at all masonry openings, 18-gauge sheet metal at other openings, cast iron through foundation walls. Provide link seal and sleeve at foundation wall penetrations.
4. Escutcheons - Grinnell #1 or 10, at all visible pipe openings, chrome plated.
5. Flash plumbing vents with performed lead or neoprene flashing.
6. Extend plumbing vents through roof manufacture's standard flashed roof jack (coordinate with general contractor).
7. Roof curbs for fans, roof hoods, etc.: Equal to Vent Products 8131S or Thycurb TC-3, 14 in. high, insulated, or equal by fan manufacturer (coordinate requirements with general contractor).
8. Concrete pads - under each piece of equipment: (reinforced with 6 in. x 6 in. w2.9 x w2.9 WWF) as follows: 4 in. high-interior, 6 in. high-exterior.
9. Sealants: Seal annular openings in pip sleeves with approved sealant. Seal annular openings in foundation walls with Thunderline Link-seals.
10. Install vinyl-coated hangers for PEX piping with the maximum horizontal spacing of **32 inches** with **3/8-inch** rod. Install hangers for vertical PEX piping every **48 inches**.

15150 METERS AND GUAGES

1. Acceptable manufacturers:
 - a. Weiss, Ametek, Terice
2. Thermometers - water - Weiss Vari-Angle 7VS3 1/2, 7 in. range 30 deg. F. to 240 deg. F.
3. Pressure gauges - Terice 500x, 4 1/2 in. face - range 0 to 100 psig.

15190 MECHANICAL IDENTIFICATION

1. Engraved laminated plastic labels or tags (black background, white letters) on all equipment, switches, controls, valves, etc. Tags may be omitted where function is obvious.

15199 STARTING OF MECHANICAL SYSTEMS

1. Chlorinate and sterilize all domestic water piping in accordance with AWWA C-601-54 Standard Procedure for Disinfecting Water Mains; and in accordance with Illinois Plumbing Code.
2. Flush with clean water.
3. Provide complete startup and testing of all HVAC systems and components per manufacturer's written installation instructions.

15250 MECHANICAL INSULATION

1. Armstrong, Owens Corning or Manville.
2. 25/50 maximum flame spread/smoke developed rating.
3. Piping: Armaflex AP elastomeric, 1-inch thick on domestic hot water and hot water recirculating piping and 1/2 in. thick on domestic cold water, continuous through sleeves, through hangers, over fittings, over valves, etc. on the following piping:
 - a. Domestic water piping (hot, cold, recirculating, above slab)
 - b. Lavatory-exposed waste and HW.
 - c. HC lavatory-exposed waste and HW. Refer to schedule on drawings for insulation covers.
 - d. Coat exterior insulation with two coats of Armaflex Finish
4. Provide sheet metal saddle at each pipe hanger
5. Installation shall be condensation-free
6. Ductwork: 2" thick, 1.0 lb./cf nominal density mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket.
 - a. Supply air and return air ductwork installed in unconditioned spaces.
 - b. Supply air ductwork above ceilings.

15411 DOMESTIC WATER SUPPLY SYSTEM

1. Piping-per 15060
2. Pay all utility company service charges, including meter charge.
3. Furnish and install meters as called for on Drawing.

15412 SANITARY SEWER PIPING SYSTEM

1. Piping- per 15060
2. Install piping smaller than 4 in. with 1/4 in. per foot slope.
3. Install 4 in. and larger piping at 1/8 in per foot slope.
4. Pay all sanitary district or city sewer department fees.

15430 PLUMBING SPECIALTIES

1. Wade, Josam, Zurn or Jay R. Smith, cast iron.
2. Refer to Schedules on Drawing for backflow preventers, sill cock, floor drain, etc.

15440 PLUMBING FIXTURES

1. Vitreous (White)
 - a. Kohler, American Standard, Gerber, Zurn
2. Stainless steel sinks
 - a. Elkay
 - b. Just
3. Faucets
 - a. Chicago
 - b. Delta
 - c. Sloan
 - d. Zurn
4. Exposed Piping- chrome plated brass

5. Loose Key stop valve in each water supply connection to each fixture, with screwed brass stub out, screwed brass inlet and compression outlet.
6. Centerline mounting height of flush valves on water closets (above the bowl) shall be: as required to meet Illinois State Plumbing Code and Accessibility requirements.
7. The following mounting height schedule is tentative and shall be verified by the contractor to meet Code and manufacturer's requirements:

FIXTURE	
ADULT	
HANDICAPPED (HC)	
Lavatory	
	31"
	29"*
Water Closet	
	15"
	18"
Urinal	
	24"
	16"
EWC	
	40"
	32"
	* clear under front apron

8. Refer to schedules on the drawings for plumbing fixtures.

15458 WATER HEATERS

1. Bradford White
2. Refer to schedules on the drawings for water heater capacities.
3. 10 year warranty on tank
4. Insulated per ASHRAE 90.1.
5. ASME rated T & P relief valve, piped to floor drain
6. Thermometer in hot water outlet.
7. Furnish and install flue gas outlet pipe for gas water heaters in accordance with manufacturers written instructions. Use manufacturer's termination kit.

15488 NATURAL GAS SYSTEM

1. Piping-per 15060
2. Pay all charges assessed by utility company for gas service and meter installation. Owner will pay meter deposits.
3. Provide concrete pads, ball valves, regulators, devices, protective enclosures, guard posts, etc. required by the utility company.
4. Install full size x 6 in. deep dirt leg at all low points and at each equipment connection.
5. Provide shut off ball valve and union at each equipment connection.
6. Make size reduction, using reducer, close to final equipment connection
7. Make final connections to equipment furnished under other sections.
8. Provide EPCO dielectric union where buried exterior piping centers building or rises above grade.
9. Install exterior buried piping 18-in. minimum below grade.

15542 HVAC SYSTEMS MAINTENANCE AND SERVICE

1. The Contractor shall perform all service, inspection, maintenance, seasonal startup, shutdown, etc. for the entire new HVAC system for the first full year of occupancy by the Owner.
2. This work may be subcontracted to an approved local "service contractor" if the headquarters of the Contractor is over 30 miles from the project.
3. This work shall include, but not limited to:
 - a. Monthly inspection of entire system
 - b. Furnishing and installing any and all repair parts and material required including at least six complete sets of air filters.
 - c. Seasonal startup and shut down of HVAC equipment.
 - d. Emergency service 24 hours per day, 7 days per week
 - e. Written report to Owner after each visit to building listing all findings and corrections made.

15530 FURNACES

1. Tempstar or equivalent
2. Natural gas-fired burner.
3. Aluminized steel heat exchanger
4. Ten year non-prorated heat exchanger warranty
5. Solid state controls
6. Matching cooling coil, with aluminum fin/copper tubes, drain pan and factory furnished insulated cabinet. R-410a refrigerant.
7. UL/AGA approved, Energy Star compliant.
8. U.L. listed disconnect switch
9. Furnace is sealed combustion type. Furnish and install combustion air intake pipe and flue gas outlet pipe in accordance with manufacturers written instructions. Use manufacturer's termination kit.
10. Refer to schedules on the drawings for additional requirements.

15543 FUEL-FIRED UNIT HEATERS

1. Reznor or equivalent
2. Aluminized steel heat exchanger
3. Ten year non-prorated heat exchanger warranty
4. Solid state controls
5. Direct ignition
6. UL/AGA approved.
7. Full fan guard
8. Ceiling suspension kit
9. Natural gas-fired
10. Unit heater is sealed combustion type. Furnish and install combustion air intake pipe and flue gas outlet pipe in accordance with manufacturers written instructions. Use manufacturer's termination kit.

15731 PACKAGED TERMINAL AIR CONDITIONERS

1. GE or equivalent
2. Vertical configuration
3. Five year non-prorated compressor warranty
4. R-410a refrigerant
5. One year parts and labor warranty

6. Low ambient compressor lockout
7. Electric resistance heat
8. Wall-mounted thermostat
9. Wall sleeve
10. Wall mounting bracket

15763 FAN COIL UNITS

1. Tempstar or equivalent
2. High-efficiency 3-speed motor
3. Five year non-prorated warranty
4. R-410A refrigerant
5. 1" thick insulation
6. Electric resistance heat
7. Wall-mounted thermostat

15762 ELECTRIC UNIT HEATER

1. Berko or equivalent
2. Heavy gauge steel with baked enamel finish
3. Five year non-prorated heating element warranty
4. Thermal overloads
5. Totally enclosed fan motor
6. Fan delay relay
7. UL Labeled
8. Wall-mounted thermostat

15769 RADIANT HEATING PANELS

1. Berko or equivalent
2. 22 gauge galvanized steel finished with high temperature silicone paint
3. UL labeled and CSA certified
4. Heating assembly of powdered graphite encapsulated in a plastic laminate with heavy duty copper buss
5. 1" thick, 1 lb. density high temperature insulation
6. Surface mounting frame
7. Wall-mounted thermostat

15856 REFRIGERATION

1. Provide complete installations including all equipment, piping, specialties, insulation, etc. as specified herein and in related sections as required to provide a complete, operating system
2. Insulation: 1/2 in. Armaflex AP, coat exterior insulation with 2 coats of Armaflex finish.

15858 CONDENSING UNITS

1. Same manufacturer as furnaces or fan coil
2. Five year compressor warranty
3. UL labeled, Energy Star compliant
4. Copeland compressor
5. Condenser coil screen guard
6. R-410A refrigerant
7. Minimum 14 SEER
8. Solid state winding thermostats in each phase

9. 5 minute time delay relay between starts
10. Head pressure control device to permit satisfactory starting and operation.
11. Direct drive condenser fan with integral protection and permanently lubricated bearings.
12. High pressure switch
13. Low pressure switch
14. Liquid and suction line service valves with gauge ports
15. Suction line accumulator
16. Vertical upward air discharge
17. Copper tube/aluminum fin condenser coil

15860 FANS

1. Greenheck, Cook, Broan
2. Factory-installed disconnect switch, factory prewired to motor
3. AMCA label
4. Ceiling fans shall have:
 - a. Extruded aluminum or white plastic eggcrate grille.
 - b. Squirrel cage fan.
 - c. Acoustically lined cabinet.
 - d. Noiseless self-acting shutter (SAS).
 - e. Cord and plug electrical disconnect.
 - f. Backdraft damper in discharge duct
5. Sidewall propeller fans shall have:
 - a. Motor side guard
 - b. Permanently lubricated motor
 - c. Aluminum propeller

15890 DUCTWORK

General - Mechanical contractor to design ductwork runs, risers, drops, vent pipes & all other work required for the full performance and completion of the contract documents. Provide offsets as required to meet space requirements and to avoid interference with other trades.

1. Per SMACNA HVAC Duct Construction Standards - Metal & Flexible - 1985 (DCS).
2. Galvanized steel G90, minimum 24 gauge
3. Sealant - H.B. Fuller/Foster 30-20 or United Sheet Metal, UL listed
4. Seal per Class A of DCS, page 1-8. Seal all transverse joints, longitudinal seams and duct wall penetrations.
5. Volume damper at each branch duct. Splitter damper at each supply duct split.
6. Elbows - radius, or square with vanes.
7. Tap branches - 45 deg. Entry type, Figure 2-8 of DCS with volume damper
8. Seal annular openings around ducts at walls, roofs, etc. with fiberglass and neat metal angles.
9. Non-metal ductwork - not permitted.

15910 DUCTWORK ACCESSORIES

1. Ventlok 609/635 or Young 656/403 damper hardware
2. Flexible duct connectors - Ventfabrics Ventglass (2 per furnace, in-line fan, etc.)
3. Duct access doors - Air Balance FSA-100, double wall, insulated (at each FD, MD), 18 in. x 10 in. minimum opening - number and size as required to service FD, etc.

4. Dampers (low leakage)- Greenheck, Ruskin or Vent Products - galvanized steel with damper seals.
 - a. Volume dampers (VD) - Greenheck VCD-1000 - 6 in. wide blade max.
 - b. Self acting shutters (SAS) - Greenheck VBD-160.
 - c. Counter balanced shutters (CBS) - Greenheck Vbd-160, 360 or 460.
 - d. Motorized dampers (MD) - Ruskin CD356 or Greenheck VCD-2000 with neoprene blade edge seals and stainless steel end seals
 - e. MD Actuators: Barber Colman or Honeywell, oil immersed, gear type, 24V 115V, spring return to close, exterior mounted by 15950.
 - f. Fire dampers - "dynamic" rated - Greenheck DFD150A (duct) - DFD110a (grille). Install FDs per UL listing and SMACNA. Provide anchored sleeves with "breakaway" duct connections.
5. Turning vanes - T & B VLR
6. Extractors (EX) - titus AG-225-#1

15936 AIR OUTLETS AND INLETS

1. Hart and Cooley, Tuttle and Bailey, Krueger, Titus or Metal-Aire
2. Refer to schedules on the drawings for details and product requirements

15950 CONTROLS

1. Description

- a. Furnish all labor, materials, equipment and service necessary for a complete and operating control system for heating, ventilating and air conditioning systems and equipment as described herein or shown on the Drawings.
 - b. NOTE: HVAC Contractor may, at his option, permit electrical contractor to run conduit and wire.
 - c. All work described in this section shall be installed, wired, circuit tested, calibrated, etc., by trained mechanics.
 - d. The Division 16 Contractor will do all line voltage power wiring to HVAC equipment, motors, etc.
 - e. The HVAC Contractor shall furnish and install all conduits, wiring, relays, etc., required to perform the control and interlock requirements specified.
 - f. All work shall conform to latest NEC.
 - g. All work shall conform to Division 16 specifications
2. Submittals: Submit customized wiring diagram specific to this project. Submit catalog cuts for all equipment and devices.
 3. Components:
 - a. Honeywell
 - b. Johnson Control
 - c. Delta
 - d. TCS Basys Controls
 4. Thermostats - Programmable
 - a. microprocessor-based programmable thermostat.
 - b. 7-day time clock
 - c. 24V with battery backup
 - d. Minimum on/off times for HVAC equipment protection
 - e. User setpoint adjustment limits
 - f. System and fan switching
 - g. Fan interlock safety
 - h. Equipment monitoring inputs and indication

- i. Separate setpoints for Heating-Day, Heating-Night, Cooling-Day, and Cooling-Night.
 - j. Deadband between Heating and Cooling setpoints
 - k. Automatic changeover from Heating to cooling.
11. Wiring: installed in conduit: where exposed to view and where required by NEC.
12. Scope of Work
- a. General - Furnish and install control wiring between thermostat, Furnace unit, condensing units as specified and recommended by manufacturer.

15990 TESTING, ADJUSTING, AND BALANCING

1. AABC or NEBB certified technician shall test, adjust and balance entire HVAC system including all furnace units, exhaust fans, condensing units, etc. Submit 6 copies of typed report on AABC or NEBB standard forms. Report shall include results of thermal, performance tests, as well as air flows.
2. Test heating system when outdoor air temperature is below 20 degrees F.
3. Test cooling systems when outdoor air temperature is above 85 degrees F.

End of Division 15