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15000 - MECHANICAL SYSTEMS DESCRIPTION

1.1 Fire Protection Systesm: Refer to individual specification s following for detailed requirements

A. Sprinkler systems.

B. Standpipes. (For structures greater than three floors.)

C. Fire protection service per local code conforming to NFPA.

1.2 Plumbing Systems and Specialties: Refer to individual specification s following for detailed requirements.

A. Domestic water service and distribution.

B. Sanitary waste and vents

C. Storm water

D. Compressed air

E. Foodservice requirements conforming to MDPH.

F. Natural gas.

G. Lawn irrigation system.

1.3 HVAC Piping Systems: Refer to individual specifications s following for detailed requirements.

A. Hot water distribution systems.

B. Steam and condensate systems.

C. Regrigerant systems.

D. Chilled water systems.

E. Condenser water systems.

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A. Boilers

B. Heat exchangers.

C. Heaters.

D. Feedwater equiment and accessories.

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1.5 Heat Rejection Systems: Refer to individual specification s following for detailed requirements.

A. Chillers.

B. Cooling towers.

C. Condensers

1.6 Heat Transfer Systems: Refer to individual specifaction s following for detailed requirements.

A. Package units.

B. Air to air heat exhange coils

C. Humidifiers.

D. Terminal heating and cooling units.

1.7 Ventilation Systems: Refer to individual specification s following for detailed requirements.

A. Fans.

B. Ducts.

C. Terminal devices.

D. Exhaust systems for food service, kitchens and specialty areas.

1.8 HVAC Control Systems: Refer to individual specification s following for detailed requirements.

A. Direct digital control systems.

B. Electric control systems.

15050 - BASIC MECHANICAL MATERIALS

1.1 Specification Includes:

A. Basic mechanical materials including valves, pipe expansion joints, meters and gauges, supports and anchors, motors, mechanical identifcation, noise and vibration control.

1.2 Products:

A. Pipe, Fittings, and Specialties: Refer to individual piping systems specifications for materials and installation requirements.

B. Steel pipe coforming to ASTM120, A53-90b; cast iron ASTM C564-70; steel, seamless or galvanized, ASTM A120-73 ANSI B125.2 1985; copper ASTM B88-792 ANSI H23.7-1985; ductile iron, ANSI A21.52, contract, C-75 Class 5. Fittings shall conform to code regulations as stated: Cast iron ASTM A74-72, ANSI A112.5.1-1985; CI, screwed, ASME B16.3-85; copper sweat, ASME B16.22-89; welded, ASTM A234, ANSI B125.1-1985; ductile ron, ANSI A21.1. Joining types of connections: Bell joints ASTM C425-75 “Wedgeloc”. Bell joints (C.1.) Oakum and lead pack. No-hub FTG; AISI No. 301, 305 stainless with neoprene gasket. Ductile Iron; mechanical joint ANSI-A21.

1. Screwed: NPT American Standard tapered thread with compound.
2. Solder: 50/50 tin lead, 95/5 tin/antimoly solder or silfos brazing.
3. Flanged: ASME 125#-150# C.I. with gasket.

C. Valves: General duty valves, bronze, and brass, fabricated to comply with Manufactureres Standarization Society (MSS) classification listed. Gate, globe, ball, and plug valves for shutoff duty; globe, and ball for throttling duty.

1. Gate valves, 2” and smaller for condenser water, chilled water, domestic hot water, cold water, heating hot water and low pressure steam: MSS SP-80, Class 150, cast

bronze, threaded or solder ends based on service. Milwaukee, Apollo or Lunkenheimer.

2. Gate valves, 2-1/2" and larger: MSS SP-70, Class 125, iron body, flanged ends. Walworth, Jamesbury, Lunkenheimer.
3. Ball valves, 1" and smaller: Rated for 150 psi saturated seam pressure, 400 WOG pressure, 3 piece construction, bronze body, threaded or solder ends based on service. Lunkenheimer, Apollo, Milwaukee.
4. Ball valves, 1-1/4" to 2": Rated for 150 psi saturated steam pressure, 400 WOG pressure, 2 piee contruction, bronze body, threaded or solder ends based on service. Milwaukee, Appollo, Lukenheimer.
5. Plug valves, 2" and smaller: Rated at 150 psi WOG, bronze body, threaded ends. Lunkenheimer, Jamesbury, Milwaukee.
6. Plug valves, 2-1/2" and larger: MSS SP78, rated at 175 psi WOG, semi-steel body, flanged ends. Lunkenheimer, Jamesbury, Walworth.
7. Globe valves, 2" and smaller: MSS SP-80, Class 125 or 150 based on system pressure, cast bronze, threaded or solder ends based on service. Lunkenheimer, Vogt, Milwaukee.
8. Globe valves, 2-1/2" and larger: MSS SP85, Class 125, iron body, flanged ends. Lunkenheimer, Jamesbury, Walworth.
9. Butterfly valves, 2-1/2" and larger: MSS SP-67, rated at 200 psum cast iron body, field replaceable sleeve, stainless steel stem, lug or wafer type based on service. Lunkenheimer, Jamesbury, Walworth.
10. Swing check valves, 2" and smaller: MSS SP-80, Class 124# or 150# based on system pressure, cast iron body and cap, threaded or solder ends based on service. Watts, Apollo, Milwaukee.
11. Swing check valves, 2-1/2" and larger: MSS Sp-71, Class 150# (Class 175# FM for fire protection piping systems), cast iron body and cap, flanged ends. Lunkenheimer, Jamesbury, Walworth.
12. Wafer check valves: Class 250, cast iron body, to open with on foot differential pressure. Lunkenheimer, Jamesbury, Walworth.
13. Lift check valves, 2" and smaller: Class 125, cast bronze body and cap, threaded ends. Milwaukee, Apollo, Lunkenheimer.

D. Expansion Joints for Piping Systems: Joints shall provide 200 percent absorption capacity of piping expansion between anchors. ADSCO, Flexstee, Flexonics.

1. Packless expansion joints.
2. Slip joints.
3. Flexible ball pipe joints.
4. Mechanical grooved fittings.
5. Fabricated expansion loops.
6. Stainless steel flexible convolute joiner.

E. Meters and Gauges: Temperature and indicator ranges for services required. Accuracy of thermometers plus or minus 1 percent. Tretice, Dwyer, Gauge.

1. Mercury-in-glass thermometers: Die cast, aluminum finished, glass front, mercury filled tube with magnifying lens.
2. Direct mount filled system dial thermometers: Vapor actuated, universal angle, drawn steel or cast aluminum case with glass lens.

3. Remote-reading filled-system dial thermometers: Vapor actuated, drawn steel or cast aluminum case with glass lens.
4. Thermometer wells: Brass pressure rated to match piping system design pressure.
5. Pressure gauges: General use, ASME B40.1, Grade A, phosphor bronze bourdon-tube type, drawn steel or brass case, glass lens.
6. Pressure gauge accessories: Brass tubing straight coil siphon; brass snubber with disc suitable for fluid served and rated pressure.
7. Wafer orifie-type flow elements: Differential pressure type, cast iron body, brass valves with integral check valves and caps.
8. Venturi type flow elements: Differential pressure type, for installation in piping, bronze or cadmium plated steel with brass fittings.
9. Pilot tube type flow elements: Differential pressure pilot tube-type design with inserted stainless steel probe.
10. Window type flow meters: Designed for installation on hydronic piping, measure flow directly ingpm, bronze body and impact tube, integral self-closing valve with indicator valve, plus or minus 5 percent accuracy.
11. BTU meters: Turbine wheel flow meter, temperature sensors, PLC calculations with integral battery backup, bronze housing, plus or minus 1 percent accuracy.
12. Test plugs: Nickel plated brass body, self-sealing valve type core inserts.

F. Supports and Anchors: Hangers and support components: MSS SP-58, pipe and equipment hangers and supports including clamps, hanger rod attachments, saddles and shields, spring hangers, pipe alignment guides, and anchors.

G. Motors: NEMA Mg 1 motors with phase, frequency rating, voltage rating, and capacity suitable for use.

H. Mechanical Identification: ASME A13.1 as applicable, color coded, of the following types: Standard stencils, snap-on plastic pipe markers, pressure-sensitive pipe markers, plastic duct markers, plastic tape, valve tags, valve tage fasteners, access panel markers, valve schedule frames, engraved plastic laminate signs, plastic equipment markers, plastized tags suitable for use.

I. Noise Control: All mechanical equipment shall not exhibit noise beyond 80 dba levels within occupied office environment.

1. Air distribution devices at less than 24 NC.
2. Duct noise attenuators for 5db or greater low frequency reduction.
3. Inertial bases for chillers, A405 and pumps at 2 times operating weight of equipment for low frequency reduction.
4. Spring type isolators maintaining .075” deflection for medium and high frequency reduction.

J. Vibration Control: Fiberglass pads and shapes, neoprene pads, vibration isolation springs, pad type isolators, plate type isolators, double plate type isolators, all directional anchors, neoprene mountings, free standing spring isolators, housed spring isolators, vertically restrained spring isolators, thrust restraints, equipment rails, fabricated equipment bases, inertia base frames, roof curb isolators, isolation hangers, riser isolators, flexible pipe connections suitable for use.

15250 - MECHANICAL INSULATION

1.1 Specification Includes

A. Pipe insulation, equipment insulation, and external duct and plenum insulation.

1.2 Products

A. Mechanical Insulation Types:

1. Pipe Insulation: Glass fiber; cellular glass; flexible elastomeric cellular; calcium silicate; type. John/Mansville or equal.
2. Equipment Insulation: Glass fiber; cellular glass; flexible elastomeric cellular; calcium silicate: type. John/Mansville or equal.
3. Duct and Plenum Insulation: Glass fiber; cellular glass; flexible elastomeric cellular; calcium silicate blanket; type. John/Mansville or equal.

B. Mechanical Insulation Materials:

1. Glass Fiber Insulation: Inorganic glass fibers bonded with thermosetting resin; board type, ASTM C612, Class 2, semi rigid jacketed board; blankete type, ASTM C553, Type II, Class F-1, jacketed flexible blankets; preformed pipe insulation; ASTM C547, Class 1, rigid pipe insulation, jacketed.
2. Cellular Glass insulation: Inorganic, foamed or cellulated glass, annealed, rigid hermetically sealed cells, incombustible, ASTM C921, Type I facing; blocks, ASTM C552, Type I; boards, ASTM C552, Type IV; preformed pipe, ASTM C552, Type II, Class 2 (jacketed); special shapes, ASTM C552, Type III.
3. Flexible Elastomeric Cellular Insulation: Flexible expanded closed cell structure with smooth skin on both sides; tubular materials, ASTM C534, Type I; sheet materials, ASTM C534, Type II.
4. Calcium Silicate Insulation: ASTM C533, Type I, inorganic, hydrous calcium slicate, non-asbestos fibrous reinforcement, incombustible, molded.
5. Fire Performance: Flame spread smoke value less than 30 per ASTM84.
6. Vapor Barrier: Fabric or plastic, 7 mil minimum thickness, porosity at zero value, type suitable for service.
7. Insulation Accessories: Insulting cements, adhesives, jackets, glass cloth and tape, bands, wire and sealing compounds suitable for service and exposure.

15320 - FIRE PUMPS.....

1.1 Specification Includes

A. Fire pumps and pressure maintenance pumps to supply water for fire protection systems.

B. Fire suppression control and Alarm annunciation to local authority per Division 16000.

1.2 Quality Assurance

A. Compliance: ASME B31.9 for piping; NFPA 20 for centrifugal fire pumps.

B. NFPA Guidelines and FM, UL approved controls manufacturer shall establish performance quality standards.

1.3 Products

A. Fire Pump System Components:

1. Fire Pumps, General: UL 448, base-mounted, factory assembled, factory-tested, separately housed.
2. Axially-Split-Case Fire Pumps: Centrifugal, on siet, separately coupled, bronze-fitted, labeled for fire service, horizontally mounted, single stage, double suction type. Peerless, ITT-AC, United or equal.

B. Fire Pump System Motors and Controllers:

1. Electric Motors: Open drip proof, squirrel cage, induction motor type, NFPA 20 and NFPA 70, suitable for type of fire pump.
2. Full-Service, Electric-Motor-Drive Fire Pump Controllers: Combined automatic and nonautomatic operation, UL listed and FM approved, UL 508, UL 1008, type suitable for use.

C. Fire Pump System Accessories:

1. Alarm Panels: NEMA Division 2 ICS 6, Type 1 remote wall-mounting-type.
2. Horizontal Fire Pump Accessory Fittings: Automatic air release valve, casing relief valve, suction and discharge pressure gauges, reducers, hose valves, discharge cone.
3. Equipment Bases: 4000 psi concrete, reinforced.
4. Flow Measuring Systems: FM approved with sensing element and flow meter.

D. Pressure Mainenance Pumps (Jockey Pumps)

1. Pumps: Base mounted, factory assembled, factory tested regenerative turbine pressure maintenance pumps.
2. Controllers: Combined automatic and nonautomatice operation, UL listed, UL 508, NEMA Division 1, Class 2, ICS 6, Type 2, wall mounted enclosure.
3. Accessories: Casing relief valve, suction and discharge pressure gauges.

15325 - STANDPIPE AND SPRINKLER SYSTEMS

1.1 Specification Includes

A. Sprinkler System: Combined dry pipe and preaction system with automatic sprinklers.

B. Standpipe and Hose System (for structures greater than three stories):

1. Wet type with water supply valve open and pressure maintained.
2. NFPA 14 Class I classification for use by trained personnel and in compliance with local code jurisdiction.

1.2 Quality Assurance

A. Compliance: NFPA 13 for sprinkler system, NFPA 14 for standpipes; UL listed and labeled; FM approved.

B. Calculations: Hydraulic computer generated procedure for pipe sizing utilizing scheduled pipe values or hardy cross interactive method of velocity pressure and most remote nodal flow and pressure delivery.

1.3 Products

A. Pipes and Fittings:

1. Steel Pipe: ASTM A53, Schedule 50 in sizes 6 inches and small, Schedule 30 in sized 8 inches and larger, black and galvanized or copper tube: ASTM B88, Type L and M.
2. Fittings: Suitable for service 175# class and piping type; threaded, grooved-end, pressue seal types.
3. Joining Materials: Welding and gasket materials suitable for design temperatures and pressures. Victaulic materials and couplings are approved.

B. Valves and Accessories:

1. General Duty Valves: Gate valves, swing check valves.
2. Specialty Valves: Alarm check valves, dry-pipe valves suitable for system use.
3. Control Panels: NEMA ICS 6 Type 1 enclsoure per Division 16000.
4. Water Meters: AWWA C700 series as applicable.
5. Backflow Preventers: ASME, sized for maximum flow rate and maximum pressure loss.
6. Fire Department Connections: UL405, exposed, wall type unit, connections and finish suitable for use.
7. Pressure Gauges: UL 393.

C. Sprinklers, Hose Racks and Accessories:

1. Automatic Sprinklers: Fusible link type; upright pendant, and sidewall styles; concealed, flush, and recessed styles; wall-mounted sprinkler head cabinet and wrench, suitable for service required.
2. Sprinkler Fittings: UL listed and FM approved, UL 213.
3. Nonadjustable Hose Valves: UL 668.
4. Pressure Regulating Hose Valves: UL 1468.
5. Hose Racks and Hoses: Shall be provided as required by local jurisdiction.
6. Fire Hose: Shall not be installed.

15410 - PLUMBING PIPING AND SPECIALTIES

1.1 Specification Includes

A. Plumbing piping systems within the building including the following:

1. Potable water distribution, including cold and hot water supply and hot water circulation.
2. Drainage and vent systems, including sanitary and storm
3. Engineered drainage systems including combination waste and vent systems; copper piping single-stack systems; cast iron piping single stack system; reduced size venting systems; and controlled flow storm drainage system.

B. Plumbing specialiteis for water distribution systems; soil, waste, and vent systems; and storm drainage systems.

1.2 Quality Assurance

A. Compliance: ASME B31.9.

1.3 Products

A. Piping System Working Pressure Ratings:

1. Water Distribution Systems, Below Ground: 150 psig.
2. Water Distribution systems, Above Ground: 125 psig.
3. Soil, Waste, and Vent Systems: 10 foot head of water pressure withheld at joinings of fittings.
4. Sanitary Sewage, Pumped Piping Systems: 125 psig.
5. Storm Sewage, Pumped Piping Systems: 125 psig.

B. Pipes and Tubes:

1. Hard Copper Tube: ASTM B88, Types K, L, and M, water tube, drawn temper.
2. Soft copper Tube: ASTM B88, Types K and L, water tube, annealed temper.
3. Copper Drainage Tube: ASTM B306, Type DWV, drawn temper.
4. Steel Pipe: ASTM A53, Type S, Grade A, Schedule 40, galvanized, plain ends.
5. Ductile Iron Pipe: AWWA C151, Classes 50 and 51, mechanical joint and push-on joint, with AWWA C104 cement-mortar lining.
6. Flanged Ductile Iron Pipe: AWWA C115, ductile-iron barrel, Class 150 or 300 iron-alloy threaded flanges, with AWWA C104 cement-mortar lining.
7. Hub and Spigot, Cast Iron Soil Pipe: ASTM A74, service class.
8. Hubless, Cast Iron Soil Pipe: CISPI 301.
9. ABS Plastic Pipe: ASTM D2661, Schedule 40, pain ends.
10. ABS Cellular Core Plastic Type: ASTM F628, Schedule 40, plain ends.
11. CPVC Plastic Pipe and Tube: ASTM D2846, SDR 11, plain ends.
12. CPVC Plastic Pipe: ASTM F441, Schedules 40 and 80, plain ends.

C. Fittings and Valves:

1. Pressure and Drainage Fittings for Pipe and Tubes: Suitable for working pressure, pipe, tube, and service.
2. Joining Materials: Solder, brazing and welding filler metals; couplings.
3. Valves: Gate, globe, ball, butterfly, and check valves suitable for service.

D. Plumbing specialties:

1. Water Meters: AWWA C700-C710 series; type as required for service, register in gallons or cubic feet as required.
2. Backflow Preventers: ASME reduced pressure principle backflow preventers for flow rate and maximum pressure loss required, 150 psig minimum working pressure.
3. Water Pressure Regulators: ASME 1003, initial working pressure 150 psig minimum.
4. Water Filters: Cartridge-type with housing fittings, cartridges, end caps, suitable for potable water.
5. Thermotstatic Water Mixing Valves: ASME 107, manually adjustable.
6. Water Tempering Valves: Manually adjustable, thermostatically controlled.
7. Miscellaneous Piping Specialties: Strainers, hose bibs, wall hydrants, post hydrants, sanitary hydrants, hose-end drain valves, stop and waste darin valves, water hammer arresters, trap seal primer valves, horizontal backwater valves, drain outlet backwater valves, air-admittance valves, stack flashing fittings, vent caps, vent terminals, roof flashing assemblies.
8. Cleanouts: Cast iron cleanouts, ASME A112.36.2M.
9. Floor Drains: Cast iron Floor darins with bronze heel proof grate, ASME A112.21.1M; cast iron trench drains, ASME A112.21.1M; cast iron open drains; cast iron deep seal traps; related fittings.

10. Roof Drains: Cast iron body, ASME A112.21.2M with combination flashing ring and gravel stop.
11. Interceptors: Grease, grease recovery, oil, and solids types suitable for service.
12. Sleeve Penetration Systems: UL 1479, through penetration firestop assembly.

15440 - PLUMBING FIXTURES

1.1 Specification Includes

A. Plumbing fixtures and trim, fittings, and related accessories and appliances.

1.2 Quality Assurance

A. Compliance: ANSI A117.1; applicable accessibility regulations.

1.3 Products

A. Plumbing Fixtures:

1. Water Closets: Minimum consumption per flush cycle, vitreous chine material, elongate bowl type, wall hung mounting, flush valve type, trim suitable for service required. American Standard or equal.
2. Urinals: Minimum consumption per flush cycle material, wall hanging type, trim suitable for service require. American Standard.
3. Lavatories: Vitreous chine material, wall and counter top mounting, fittings without pop-up and accessories suitable for service required. American Standard or equal.
4. Conference Room Sinks: Material, self rimming type, counter top mounting type, fittings and accessories suitable for service required. American Standard or equal.
5. Service Sinks: Material of enameled cast iron, trap standard or floor mounting, fittings suitable for service required. American Standard or equal.
6. Mop Basins: Cast stone materials and fittings suitable for service required.
7. Drinking Fountains: Stainless steel material, type, wall hung, conforming to ADA standards, fittings suitable for service required. Hausley Taylor or equal.
8. Water Coolers: ARI 100, ADA conforming type, capacity, and fittings suitable for service required.
9. First Aid Room Emergency Equipment: Eyewash and shower stations as required for special function.
10. Toilet Seats: Compatible with water closet and conform to ADA standards. Olsenite.
11. Flushometers: Electronic or infrared annunciated, for water closet and urinal types. Sloan.
12. Commercial Faucets: Cast brass faucets.
13. Fittings, Except Faucets: Supplies, stops, traps, continuous wastes, and escutcheons. Delta or equal.
14. Supports: ASME A112.6.1M, categories and types as required for fixtures required, including wall reinforecemnt, carriers, miscellaneous structural elements.

15450 - PLUMBING EQUIPMENT

1.1 Specification Includes

A. Water storage tanks for use in plumbing water supply system.

B. Commercial water softeners for use in building water supply system dependent on water analysis.

C. Commercial water heaters for potable water heat systems.

1.2 Quality Assurance

A. Compliance, Storage Tanks: ASME 125# code; AWWA standards for pressure tanks.

B. Compliance, Water Softeners: ASTM Code; NSF 44.

C. Compliance, Water Heaters: UL 174, 732, 778, 1261, 1453; NSF 5; ASME code compliance.

1.3 Products

A. Water Storage Tanks and Accessories:

1. Water: Potable.
2. Pressure Rating: 125 psig.
3. Plain Steel, Pressure Water Storage Tanks; Horizontal, steel construction tank of suitable size and capacity.
4. Steel, Pre-charged Water Storage Tanks: Butyl rubber bladder operation, ASTM code steel construction of suitable size and capacity.
5. Construction: Nontoxic welded joints; interior lining suitable for service.
6. Accessories: Manholes, tappings, valves, gauges, controls, compression stops, concrete base.
7. Insulation for energy conservation and anti-sweat.

B. Water Softener Equipment:

1. Softener Tanks; 316 stainless steel tanks, hydrostatically tested at 150 psig; 50 percent freeboard for backwash expansion.
2. Softener Tank Distribution Systems: Single point upper distribution system of schedule 40 galvanized steel pipe and fittings; lower distribution of Scheudle 40 PVC pipe with PE strainers.
3. Chemicals: High-capacity exchange resin of sulfonated polystyrene; high purity pellet salt.
4. Brine Tanks: Double brine measuring and dry salt storage tank for maximum 4 regenerations at full salting.
5. Controls: automatic multiport main operating valve meter, meter controls.
6. Accessories: Pressure gauges, sampling cocks, position indicator, concrete base.
7. Water Testing Sets: Complete for harness tests, wall mounted.

C. Water Heaters:

1. Natural Gas Fired Boilers or Self Contained, Gas Fired, Water Heaters: Automatic type with 150 psig rated storage tank, integral controls, relief valve. Lochinvar, Bradford White.
2. Accessories: Valves, gauges, concrete base, Type B flues, drains relief, circulation pump and aquastat..

15453 - PLUMBING PUMPS

1.1 Specification Includes

A. Centrifugal pumps for water distribution systems for recirculating or boosting pressure, and sump pumps for drainage water piping systems.

B. Hot water recirculation for instantaneous end of main fixture service.

1.2 Quality Assurance

A. Compliance: UL 778, AWWA and FM approved for style and service.

1.3 Products

A. Plumbing Pumps:

1. Base Mounted, Separately coupled, End Suction Pumps: Centrifugal, single stage, all bronze, radially split case type. ITT, Bell & Gosset, Gould, Peerless.
2. Submersible Sump Pumps: Simplex, vertical centrifugal, direct connected, end suction, single stage, bronze fitted with integral inlet strainer, controls and sump cover. Weil, Gould, Peerless.
3. Inline Pump: Close coupler casing volute type, vertically split, impeller; single open end sing suction, statically balanced. Mechanical seal, carbon and ceramic face, viton seal, Type 316 stainless steel. Machined fit adaptor motor; explosion proof, TEFC. All wetted parts shall be 316 stainless steel materials of construction.
4. Water Pressure Booster: Factory tested, skid mounted, multiple pumps and pressure control package B&G or equal.

15488 - NATURAL GAS SYSTEMS

1.1 Specification Includes

A. Natural gas systems within the building

1.2 Quality Assurance

A. Compliance: NFPA 54.

1.3 Products

A. Piping System Working Pressure:

1. Low Pressure Natural Gas Piping Systems: 1 psig or less will be allowed within the structure.
2. Natural Gas Service: 60 psig as defined by utility.

B. Pipe, Fittings and Specialties:

1. Steel Pipe and Tubes: ASTM A53, Type E welded or Type S seamless, Grade B, Schedule 40, black.
2. Fittings and Valves: ANSI B31.16, ASTM Class 150# for piping type and service class.
3. Gas Meter and Pressure Regulator: Diaghragm type meter and single stage gas pressure regulator if not provided by gas supplier; pressure regulator at device for less than 7” w.c. supply.

4. Piping Specialties: Flexible connectors, strainers.
5. Protective Coating: Corrosion resistant polyethylene for use in corrosive atmosphere.

15510 - HYDRONIC PIPING

1.1 Specification Includes

A. Piping Systems for hot water heating, chilled water cooling, condenser water, makeup water, and drain piping.

1.2 Quality Assurance

A. Compliance: ANSI and ASME code, ASME B31.9

1.3 Products

A. Pipes and Fittings:

1. Steel Pipe: ASTM A53, Schedule 40, black steel pipe.
2. Fittings: Suitable for piping type and service class.
3. Joints: Solder, gaskets and fittings suitable for service.
4. Copper Pipe: Type K or L with 50-50 solder or victaulic fitting coupling.
5. Grooved mechanical joints and fittings suitable for this service for chilled water and condenser water systems <145°F temperature range.

B. Valves:

1. General Duty Valves: Gate, globe, check, ball and butterfly valves suitable for use.
2. Special Duty Valves: Calibrated plug valves, pump discharge valves, pressure reducing valves, safety relief valves, combined pressure/temperature relief valves, automatic flow control valves, and triple duty discharge valves.

C. Specialties:

1. Manual Air Vents: Bronze body, nonferrous internal parts.
2. Automatic Air Vents: Float principle air vent, bronze body, nonferrous internal parts.
3. ASME 125# Steel Compression Tanks: Suitable for working pressure and operating temperature, pressure tested.
4. Air Separator; Welded black steel.
5. Pump Suction Diffusers: Cast iron Body, threaded or flanged. Connections for working pressure required.
6. Chemical Feeder: Bypass type chemical feeder, welded steel construction.
7. Diverting Fittings: Cast iron body.
8. Y Pattern and Basket Strainers: Cast iron body, ASTM A126, Class B.

15540 - HVAC PUMPS

1.1 Specification Includes

A. Centrifugal pumps used in hot and chilled water systems.

B. Condensate pumps and receiver sets.

C. Condenser pumps for heat rejection system.

D. Chemical feed water pumps for boiler or cooling tower service.

E. Primary circulation pump for heating boilers.

1.2 Quality Assurance

A. Compliance: UL778; Hydraulic Institute standards, ITT B&G equipment specification performance criteria.

1.3 Products

A. HVAC Pumps and Accessories:

1. Base Mounted, Separately coupled, Double Suction Pumps: Centrifugal single stage axially split case design, cast iron casings, balanced closed overhund double suction impeller, replaceable wear rings, steel pump shaft and sleeve bearings, mechanical seals, flexible pump couplings, frame mounted motor, ITT B&G, Gould, Peerless.

B. Condensate Pumps and Receiver Sets:

1. Pump: Close coupled, vertical design, permanently aligned, bronze fitted, with enclosed bronze case ring and mechanical shaft seal, and drip proof motor. ITT, B&G, peerless.
2. Receiver: Cast iron with externally adjustable 2 pole float switch.
3. Accessories: Gauges, strainer, float switch, control panel.

15555 - BOILERS AND ACCESSORIES

1.1 Specification includes

A. Boilers and accessories for HVAC systems.

B. Boilers for potable water heating.

1.2 Quality Assurance

A. Compliance: NFPA 54; ASME Code; factory mutual insurance criteria

1.3 Products

A. Fire Tube Hot Water Boilers:

1. Packaged Firetub Boilers: Gas and propane burners, factory-assembled and tested, packaged, multipass, horizontal firetube boilers for wet back type and accessories, capacity suitable for use. Lochinvar, Cleaver Brooks, Johnston.

B. Boiler Accessories

1. Boiler Valves: Stop and check valves; Y type blowdown valves.
2. Safety and Relief Valves: Steam safety valves; water relief valves.
3. Boiler control package with “fire eye” safety controls, UL and FM approved, factory mounted and tested.

C. Breechings, Chimneys, and Stacks:

1. Double Wall Metal Vents, Oil or Solid Fuel Appliances: Stainless steel inner jacket, aluminum coated steel outer jacket. Selkirk, metalbestos.
2. Accessories: Barometric dampers, cleanout doors, thermally actuated vent dampers.
3. Common breeching sized according for single roof penetration.

D. Boiler Water Treatment Systems:

1. Systems: Boiler water treatment to inhibit scale, corrosion and biological growth in hot water boiler system, steam boiler system, boiler blowdown system.
2. Equipment: Shot feeder, chemical treatment controller, chemical feeder pump, chemical solution reservoir, test kits, chemicals.

15670 - CONDENSING UNITS

1.1 Specification Includes

A. Condensing units for airconditioning systems.

1.2 Quality Assurance

A. Compliance: ARI 210, 360, ASHRAE 15; ASME code.

1.3 Products

A. Condensing Units:

1. Water Cooled Condensing Units:

a. Factory assembled, ASME 150# pressure vessel nickel-chrome tubes, dual access port headers, ASTM 31.B16 steel welded shell for refrigerant and water service. Trane or equal.

B. Accessories:

1. Discharge line muffler.
2. Gauge panel
3. Elecrtic solenoid unloading.
4. Control circuit transformer.
5. Pumpdown relay package.
6. Crankcase coverplates with equalizer connections.
7. Tube end 150# threaded, flanged or grooved connections.

15680 - CHILLERS AND ACCESSORIES

1.1 Specification Includes

A. Chillers and accessories for use with air conditioning systems.

B. Electrical or steam absorption type.

1.2 Quality Assurance

A. Compliance; ASHRAE 15, UL 465.

1.3 Products

A. Water Cooled Centrifugal Chillers:

1. Packaged Water Cooled Hermetic Centrigual Water Chillers: Factory assembled and tested, compressors, compressor motors, motor starters, evaporator, condenser, unit controls, capacity suitable for use. Trane, McQuay , Hitachi.

B. Reciprocating Chillers:

1. Water Cooled Reciprocating Chillers: Factory assembled and tested, compressors, condenser, evaporator, thermal expansion valve, unit controls, capacity suitable for use, Trane or equal.
2. Condenserless Reciprocating Chillers: Factory assembled and tested, compressors, evaporator, thermal expansion valve, unit controls, capacity suitable for use. Trane or equal.

C. Free cooling cycle with chillers shall be provided in conjunction with cooling tower and indoor sump for energy savings.

D. Absorption Chillers:

1. Trane or equal.
2. Absorption chiller shall be of two-stage lithium bromide concentrator configuration with floating tube support allowing controlled tube expansion eliminating stress cracking of tubes, longitudinal tube in shell construction, ASME 150# pressure vessel construction. Condenser and evaporator tube bundle exposed to regrigerant shall be cupronickel materials of construction for longevity of operation.
3. Modular control elements of packaged chiller shall incorporate a positive concentration limiting crystallization of media during loss of power. This allows operating personnel to determine power loss caused without first decrystalizing machine.
4. ASME 150# raised face flanges for the evaporator condenser generator and absorber water connections.
5. NEMA and standard controls package shall include PID control strategy for stable, efficient, optimal chilled water supply temepereature and complete range of standard safety controls including pump motor protection, low refrigerant water temperature cutout, low leaving water temperature cutout and interstage high pressure cutout. Controls package shall be compatible and fully interated into a specific facility management system.
6. Pump and motor assemblies shall be self-contained, hermetically sealed with refrigerant pump lubricated and cooled by pump media. Pump assembly capable of being serviced without removal of bromide or refrigerant charge with service life expectancy of greater than 50,000 hours. Purge system shall protect concentrator against reentry of non-condensable gases by use of pump discharge valve.

15710 - COOLING TOWERS AND ACCESSORIES

1.1 Specification includes

A. Cooling towers for rejecting condenser heat from water cooled air conditioning systems or process cooling water.

B. Evaporative closed circuit cooler approved in applicable systems.

1.2 Products

A. Factory Fabricated Cooling Towers:

1. Induced draft, propeller fan, crossflow cooling towers: Factory fabricated, casings, galvanized collection basin and sump, wetted surface fill, drift elinators, louvers, water distribution system, basin covers, discharge dampers, inlet screens, discharge

hoods, sound attenuators, basin heaters, rails, stain in instead of ladders, water level control, flow control valves, fans drives, motors, vibration cutouts, capacity suitable for use. Marley or equal..

B. Liquid coolers:

1. Contrifugal fan, blow through, counterflow or crossflow liquid coolers: Factory assembled and tested units, pans, fans, motors and drives, coils, water distribution unit, pumps, elminators, corrosion protection, sound attenuator, water heaters, capacity control dampers, screens, vibration isolators, discharge hoods, capacity suitable for use.
2. Axial flow fan, blow through, counterflow or corssflow liquid coolers: Factory assembled and tested units, pans, fans, motors and drives, coils, water distribution unit, pumps, eliminators, corrosion protection, sound attenuator, water heaters, capacity control dampers, screens, vibration isolators, discharge hoods, capacity suitable for use. Evapco, Baltimore Air Coil.

15810 - HUMIDIFIERS

1.1 Specification Includes

A. Piped air humidifcation equipment for use in central air systems.

1.2 Quality Assurance

A. Compliance: ARI 610, 620, 630.

1.3 Products

A. Self-Contained Steam Humidifiers: Nortec, Armstrong or equal.

1. Steam Generator: Electrode type.
2. Distribution: Stainless steel duct distribution pipes and hose.
3. Distribution: Fan distribution unit.
4. Humidistat: Sold state electronic sensor controller.
5. Cartridge: Replaceable

B. Evaporative Pan or Elctrostatic Humidifiers: Stultz, Armstrong or equal.

1. Pan: Stainless with float controlled water level.
2. Fan: Direct drive centrifugal blower.
3. Humidistat: Solid state electronic 2 position humidistat.
4. Duct Connections: Stainless steel boot and fan inlet duct collars.

15830 - TERMINAL HEAT TRANSFER UNITS

1.1 Specification Includes

A. Terminal heat transfer units for heating and cooling.

1.2 Products

A. Unit Heaters: Trane, Sterling or equal.

1. Heating Medium: Hot water.

2. Horizontal Unit Heaters: Phosphatized steel casing with baked enamel finish; motor mounted panel minimum 18 gauge steel; casing to enclose coil, louvers and aluminum fan blades.
3. Vertical Unit heaters: Phosphatized steel casing with baked enamel finish; casing to enclose fan, motor and coil, aluminum fan blades.
4. Coils; Plat type aluminum fins mechanically bonded to copper tubes.

B. Unit Ventilators; Nesbitt, Trane, Sterling or equal.

1. Heating Medium: Hot water.
2. Cooling Medium: Chilled water cooling.
3. Cabinets; 14 gauge furniture steel with removable front, baked enamel finish.
4. Dampers: Dual blade mixing dampers for modulation of return and outside air.
5. Fan Board Assembly: Fans, fan housings, bearings, fan shaft.
6. Motors: Split phase start, capacitor run constant speed motors.
7. Coils: 5/8” copper tubes with plate type aluminum fins.
8. Refrigeration: Direct expansion coils of two row copper tubes and aluminum fins, ARI 210, expansion valve, refrigerant filter/dryer, holding charge.
9. Accessories: Throwaway filters, condensate pan, wall louvers, unit shelving, crossover piping, auxialiary radiation.

C. Fan Coil Units: Trane, Sterling or equal.

1. Heating Medium: Hot water.
2. Cooling Medium: Chilled water cooling.
3. Chassis: Galvanized steel with flanged edges.
4. Insulation: Faced heavy density glass fiber.
5. Cabinet: 18 gauge steel removable panels, 16 gauge front, insultion over entire coil .
6. Coils: 5/8” seamless copper tubes mechanically bonded to configured aluminum fins.
7. Auxiliary Heating Coils: 7/16” seamless copper tubes mechanically bonded to configured aluminum fins.
8. Drain Pans: Stainless steel, insulated.
9. Fans: Centrifugal forward curved double width wheels in galvanized steel fan scrolls.
10. Motors; Integral thermal overload protection type.
11. Filters: Throwaway type.
12. Dampers: 18 gauge steel damper blades.
13. Accessories: Wall boxes, discharge grille panels, sub bases, extended oilers, recessing flanges.

D. Fin Tube Radiation: Vulcan, Sterling, Trane.

1. Heating Medium: Hot water heating.
2. Cabinets: 18 gauge cold rolled steel full backplate, 16 gauge front.
3. Elements: Copper tube and aluminum fins, with tube mechanically expanded into fin collars.
4. Accessories: End panels, inside and outside corners, enclosure extensions, access panels, factory mounted dampers, sill extensions, mullion channels, pilaster covers.

15850 - AIR HANDLING

1.1 Specification Includes

A. Fans, ventilators, air handling units, and air filters for building mechanical systems

1.2 Products

A. Centrifugal Fans: Trane, Chicago, Woods, Twin City.

1. Centrifugal Fans for Indoor Installations: Belt driven with housing, wheel, fan shaft, bearings, motor and disconnect switch, A/C inverter motor capability drive.
2. Tubular or vaneaxial Fans: Tubular or vaneaxial inline belt driven with housing, whell, outlet guide vanes, fan shaft, bearings, drive assembly, motor, mounting brackets, A/C inverter motor capability accessories.
3. Inline Centrifugal Fans: Inline belt driven with housing, wheel, outlet guide vanes, fan shaft, bearings, drive assembly, motor and disconnect switch, mounting brackets, accessories.

B. Power Ventilators: Penn, Greenheck, Acme.

1. Centrifugal Roof Ventilators: Belt driven or direct drive types, centrifugal type with housing, wheel, fan shaft, bearings, motor and disconnect switch, A/C inverter motor capability drive assembly, curb base, accessories.
2. Centrifugal Wall Ventilators: Belt driven or direct drive, centrifugal fans with housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, accessories.
3. Utility Set Centrifugal Ventilators: Belt driven fans with housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, accessories.

C. Central Station Air Handing Units: Trane, Mamoth, or Heat Transfer Specialities.

1. Variable Air Volume, Central Station Air Handling Units for Indoor Installations: ARI 4430, NFPA90A; draw through type.
2. Components: Motors, coils, dampers, steam humidifiers, and filters.

D. Air Filters:

1. Air Filters: ASHRAE 89, ARI 850, NFPA 90A, 90B.
2. Replaceable (Throwaway) Panel Filters: Flat panels, interlaced glass fiber media, 20 gauge galvanized steel frame, 20 gauge galvanized steel duct holding frame for 10% through 25% filtration.
3. Cleanable Panel Filters: Flat panels electroplated steel, 18 gauge galvanized steel duct holding frames.
4. Extended Surface Disposable Panels Filters: Fibrous material media in deep pleats, galvanized steel frame, holding frames for 30% to 45% filtration.
5. Extended Surface Non-Supported Media Filters: Fibrous material with flexible internal supports, galvanized steel frame, duct holding frames.
6. Front and Rear Access Filter Frames: Aluminum framing members, prefilters, access doors, sealers.
7. Filter Gauges: Diaphragm type with suitable filter gauge range, manometer type filter gauge or Dwyer pressure transmitter each side of filter pack for DDC preventative maintenance controls.

15890 - AIR DISTRIBUTION

1.1 Specification Includes

A. Air distributions systems including ductwork, duct systems, HVAC casings, duct accessories, air outlets and inlets, and air terminals.

1.2 Quality Assurance

A. Compliance: NFPA 90A, 96. ASHRAE89 medium velocity pressure ratings, SMACNA guidelines for medium pressure class ductwork.

1.3 Products

A. Metal Ductwork: United Sheet Metal

1. Types: Rectangular, spiral, and flat-oval metal ducts and plenums for HVAC systems in pressure classes from negative 2" to positive 4" water gauge.
2. Galvanized sheet Steel: Lock forming quality, ASTM A527 G90, spiral wound or longitudinal seam.
3. Duct Liner: Ductliner shall not be used. Insulate duct on outside of duct.
4. Sealing Materials: Joint and seam sealants, tapes and mastics.
5. Firestopping: Fire resistant sealant.
6. Hangers and Supports: Concrete inserts, powder actuated fasteners, structural steel fasteners suitable for use; galvanized sheet steel hangers; duct attachments; trapeze and riser supports.
7. Fabrication: SMACNA HVAC duct construction standards for medium pressure class system velocity of 2500-3500 FPM.

B. HVAC Casings: Trane, United Sheet Metal, Titus.

1. Types: Field erected sheet metal casings used as equipment enclosures and plenums.
2. Plenum Equipment Casings: Double wall insulated, pressurized type, galvanized steel exterior shell, solid or perforated galvanized steel interior shell.

C. Duct Accessories: Greenheck, Louvers and Dampers, AWV.

1. Backdraft Dampers: Galvanized steel frame, blades, blade seals, and axles.
2. Manual volume control Dampers: Galvanized steel standard volume, low leakage volume, and high performance volume control dampers; galvanized steel jackshaft; damper control hardware.
3. Fire Dampers: UL555 with galvanized steel frame, mounting sleeve, blades, horizontal dampers, fusible link.
4. Ceiling Fire Dampers: UL listed and labeled galvanized steel frame, volume control adjustement, replaceable fusible link.
5. Smoke Dampers: UL555 and UL555S, galvanized steel frame, blades and mounting sleeve, replaceable fusible link.
6. Acuators: Damper motors for smooth modulating or 2 position action.
7. Turning Vanes: Manufactured and acoustic turning vanes.
8. Duct mounted access doors and panels.
9. Flexible Connectors: UL181, Class 1, flame retardant or noncombustible fabrics.
10. Flexible Ducts: UL181, Class 1 insulated types. Uninsulated type shall not be used.
11. Accessory Hardware: Instrument test holes, splitter damper accessories, flexible duct clamps, adhesives.

D. Air Outlets and Inlets: Tittus, Kreugar, Metalaire

1. Ceiling Air Diffusers: Diffuser faces, mountings, patterns, dampers, accessories, and finishes suitable for service, use, and location.
2. Wall Registers and Grilles: Materials, faces, patterns, dampers, suitable for service, use, and location as selected.

E. Air Terminals:

1. Central Air Terminals: Materials, dampers, heating coils, remote diffuser air outlets, hardward suitable for use.
2. Integral Diffuser Terminals: Galvanized steel lined plenum with extruded aluminum or sheet steel diffuser, with fixed or variable geometry suitable for use.
3. Fan Powered VAV Terminals: Galvanized steel plenum, heating coils and filtration suitable for use.

15970 - HVAC CONTROL SYSTEMS

1.1 Specification Includes

A. Direct digital control systems used for building HVAC lighting, fire, security and other environmental control systems. Fire and security are stand alone systems and not fully integrated.

B. Control System Operation: Temperature control contractor shall provide project specific piping and instrumentation diagrams as well as AHU flow and control diagrams.

C. Chilled water flow and control diagram shall indicate clearly all valves, pipe sizes, flow meters, 4-way reversing valves, pumps, flex connectors, isolation valves, expansion tank, makeup water, pressuer switches, pressure sensors, pressure gauges, flow switches, thermometers, temperature sensors, strainers, bypass valves, differential pressure sensors/switches, gauge cocks, check valves, all actuators, control system transmitters, control system transducers, pot-type chemical feeders, blancing valves, air separate, all air vents, and miscellaneous control items.

D. Condenser water flow and control diagram shall indicate clearly the quipment specified and the design of the system. Diagram should indicate flow meteres, check valves, pumps, strainers, isolation valves, flex connectors, triple duty or balancing valves, differential pressure sensors/switches, temperature sensors, control system transducers, all actuators, water meters, overflow piping, draining piping, makeup water piping, chemical injection tanks and chemical injectors.

1.2 Work Scope Definition:

A. Contractor shall design, furnish, install, commission and train the owner and representatives on the complete installation of a direct digital control and energy use monitoring system for new multistory office facility.

1.3 Quality Assurance:

A. Temperature control contractor shall be well versed in DOC installations of similar type, have factory trained technicians with minimum five year experience in comparable installation, fully competent to provide instruction and routine maintenance and emergency on site within 24 hours upon receipt of request.

1.4 Electrical Interlock Requirements:

A. All wiring and devices incidental to the control system shall be furnished and installed by the control contractor. All terminations shall be numbered in orderly fashion and shall correspond to piping and instrumentation diagrams and be in agreement with specified sequence of operations.

1.5 Guarantee

A. The direct digital control system designated on the drawings and plans and specified herein shall be warranted and guaranteed free from defect in both material and workmanship for a period of two heating or cooling seasons, whichever comes first.

1.6 Acceptable Manufactureres:

A. Honeywell Excel DDC

B. Johnson Controls Metasys Systems

C. Barbara Coleman DDC

D. Landis Gyr/Powers

1.7 Products:

A. Acceptable Manufacturers:

1. Honeywell
2. Johnson Controls
3. Barbara Coleman
4. Landis Gyr/Powers

B. Central Hardward:

1. Building front end EMS shall consist of latest state-of-the-art personal computer with 133 megahertz clock speed, 32 megabyte RAM and advanced Pentium processor based with building graphics and all P.I.D. layouts superimposed on floor plans and equipment layouts for a self-diagnostic system wide preventative maintenance program development by the building owner.

C. General Conditions:

1. The direct digital control system shall be fully integrated and installed as a complete package of temperature controls and instrumentation. The DDC system shall function as a stand along unit or by addition of communication board, be interfaced to ahost computer by modem for integrated facility management. The facility management EMS programming shall incorporate direct digital control, energy mangement functions, state-of-the-art technology, simple operation, high reliability and modular construction.

D. Logic Control Functions:

1. Scheudled time of day start/stop
2. Duty cycle optimization
3. Lead-lag sequencing
4. Event initiated command
5. Time-based command
6. Equipment restart

7. Analog and digital base control
8. PI&D closed control looop
9. Direct and indirect (reversed) action
10. Square root and error squared control
11. Cascade and feed forward control
12. Enthalpy economizer optimization
13. Occupied/unoccupied setback and dead band
14. Temperature, humidity and O.A. setpoint reset
15. Heat/cool differential control and lockout
16. Status indication on/off, temperature, humidity, pressure
17. Manual override transfer
18. Deviation alarm
19. Smoke evacuation and pressurization/exhaust zone control.

E. Control Panels and Field elements:

1. Premanufactured elements shall meet all NEMA Class 2, Divion 2 standards of construction with all power terminations, transformations and dead end connections meeting 1996 NEC requirements and local code jurisdiction.

15990 - TESTING, ADJUSTING AND BALANCING

1.1 Specification includes

A. Total testing, adjusting, and balancing for mechanical systems to meet design specifications.

B. Complete commissioning of air and water systems' balance with impartial third party balance report issued to architect/engineer for review prior to owner acceptance

1.2 Quality Assurance

A. Compliance: Associated Air Balance Council (AABC) requirements; National Environmental Balancing Bureau (NEBB) requirements.

1.3 Products

A. Systems for Testing:

1. supply air systems, all pressure ranges; including variable volume and double duct systems.
2. Return air systems
3. Exhaust air systems
4. Hydronic systems
5. Steam distribution systems
6. Condenser systems
7. DDC temperature control system
8. Domestic water pressure and temperature

End of Specifications