1.1 15010 MECHANICAL GENERAL

A. Reference: All portions of General Conditions apply to Mechanical and Plumbing work.

B. Guarantees: Provide written one year guarantee for all systems and equipment. Compressors shall be guaranteed for five years.

C. Codes: Comply with National, State and City codes and other applicable standards. All portions of the International Energy Conservation Code (IECC) and Current Local AHJ Commercial Energy Conservation Codes must be complied with.

D. Supervision: Provide supervisor in field for each phase of work.

E. Coordination: Coordinate all work with other trades. Provide mechanical and plumbing equipment with electrical characteristics compatible with that shown on the Electrical Drawings and described in the Electrical Division of the specifications. The engineer reserves the right to move services as required to coordinate the work, at no cost to the owner.

F. The drawings are schematic in nature, and should not be scaled, but show the various components of the systems approximately to scale and attempt to indicate how they are to be integrated with other parts of the building. Determine exact locations by job measurements, by checking the requirements of other trades, and by reviewing all Contract Documents. The drawings indicate general routing of the various parts of the systems, but do not indicate all fittings, offsets, and run outs which are required. The Contract shall include all fittings, offsets, and run outs required to fit the system into spaces allotted to them.

G. Shop Drawings and Submittal Data: PAPERLESS SUBMITTAL ONLY TO ENGINEER. All Shop Drawings and Submittal Data shall be an electronic file format only. PDF format is acceptable. All equipment and materials shall be submitted, including ductwork and equipment changes, as required. Submitted items that deviate from the drawings and specifications shall be highlighted in yellow for easy distinction. Mark all items and show that they comply with the IECC. The Engineer shall issue a letter stating the action taken on the submittal. The letter shall be copied and attached to the submittal, by the contractor, and distributed as required.

H. Record Data: Obtain, at Contractor's expense, a set of prints and keep these on the job site during construction. During construction, mark on these prints any changes that are made, noting particularly locations of those items that will need to be for servicing. Convert record data to an Electronic Format (PDF) and submit to the Architect. Furnish one set of shop drawings and maintenance manuals in brochure form. Record Brochures shall be given to the owner at completion of the work.

I. Permits, Fees: Secure and pay for all fees and charges for the work. Furnish certificates of acceptance at completion of the job from City.

J. Substitutions: No substitutions shall be made without prior approval from the Architect and Engineer.

K. Cutting and Patching: Cutting to be by this section, with patching and furring by General Contractor. Patching required after completion of work shall be paid for by Contractor.

L. Clean Up: Clean and touch-up paint all equipment at completion of work. Protect all equipment from damage during construction. Provide name plates on all equipment.

M. Tests: Tests all piping systems per local code. Sterilize all new water piping per Health Department requirements.

N. Test all equipment and prove performance results to Architect. Modify all drives, balance all air as shown on the drawings. After Owner has occupied and is using the building, make additional inspections of the system. Correct any of Owner's observed temperature imbalances. Check correct operation of equipment and verify by letter to the Architect, on each trip. List in the letter corrections made. At the opposite season of the startup inspect and verify correct operation of all systems. Tests all control systems. Test refrigerant piping per manufacture's recommendations. Furnish complete copy of all test data to Architect. Instruct owner for one day in operation of all systems. Filters shall be clean when systems are accepted by the owner. Testing Regulations must meet local City Requirements.

O. Excavating and Backfilling: Excavate to provide minimum 2 feet cover over all piping and conduit. Back fill to original compaction. Saw-cut existing finishes and patch to matching original conditions.

P. Noise and Vibration: All equipment shall operate with minimum of noise and vibration. Contractors shall rectify any objectionable conditions.

Q. Temporary Services: Furnish all temporary utility as required for new construction.

R. Equipment Connections: Provide all martial and labor for connecting of all equipment furnished in other sections or by owner. Field verify all equipment for dimensions and roughing-in. Furnish all valves, drain piping, traps, etc., as required to install the equipment.

S. Floor Drains: Final location will be determined by equipment layout and location must be field approved. Provide trap primers to all floor drains.

T. Examination of Site: The contractor is responsible for visiting the job site and confirming the location of existing conditions before bidding. If existing conditions require modification due to elevation, obstruction, size, etc., the contractor will advise in writing before beginning construction.

END OF SECTION 15010

1.1 15020 MECHANICAL SPECIFICATIONS

A. Provide all labor and materials for complete mechanical systems. Systems must comply with IECC.

B. Plates: Provide chrome plated plates over all pipes through walls, floors, and ceilings. Provide galvanized pipe sleeves for all lines through walls, floors, and roofs. Sleeves in outside walls and roof shall be water tight. Sleeves through walls above ceilings shall be air tight.

C. Piping Material:
1. Pipe handling materials to be galvanized. Separate copper pipe with insulating tape. Provide maximum headroom and clearances for access.
2. Refrigerant piping: Type "L" copper, with solder-type fittings.
3. Chilled and heating water pipes: Schedule 40 black steel.
4. Drain lines shall be provided for each air handling unit. Drains piping shall be Type "L" copper, or schedule 40 galvanized steel.
5. Joints for copper pipe shall be silver solder. Use malleable fittings for screwed joints for steel pipes 2.5" and smaller. Use welded joints for 3" and larger pipe.

D. Duct Insulation:
1. External: All ductwork shall be insulated and vapor sealed with R-8. External insulation shall comply with IECC, and be a minimum of 2" thick, with a vapor barrier applied over joints. Insulate outer cores of diffuses (externally). Insulation shall be applied per manufacture's recommendations.
2. Internal: Internal duct insulation shall be a minimum of 1-1/2" thick with R-8, and comply with IECC. Insulation shall be applied per manufacture's recommendations, with insulating pins speed washers 12" on centers on tops and sides of the duct.
3. Sanctuary ductwork shall be insulated with internally lined insulation. All other ductwork shall be externally insulated.

E. Pipe Insulation:
1. Insulate condensate drain pipe with Armaflex.
2. Insulate refrigerant suction pipe with Armaflex. Systems must comply with IECC.
3. Exposed insulation outside shall have a waterproof paint applied according to manufacturer recommendations.
4. Insulate all chilled water piping, joints with a 2" thick vapor tight foam glass insulation, self sealing with vapor dams. Outdoor piping shall have an aluminum cover. Underground piping shall be 2" foam sealed insulation. Insulate pump casing with 2" vapor seal insulation. Install all insulation per manufacturer recommendation.
5. Insulate all heating water piping, joints with a 2" thick vapor tight foam insulation, self sealing. Outdoor piping shall have an aluminum cover. Underground piping shall be 2" foam sealed insulation. Insulate pump casing with 2" vapor seal insulation.

F. Isolate air handling units with spring type isolators. Install all equipment on minimum 4" concrete pads. Equipment installed on roofs shall have approved pads. Pads and enclosure's walls are based on equipment specified. The contractor shall increase pads and enclosures wall sizes, as required, for equipment supplied, at not extra cost to contract.

G. Foundations and Isolation: Isolate chiller with double thick Shearflex pads, loaded 40 #/sq.ft.

H. Ductwork: All ductwork materials shall be galvanized steel. Gauges, bracing, and supports shall be per SMACNA Manual. Plenums shall be 18-gauge. Provide airfoil type turning vanes at all changes in direction. Extractors shall have operators. Paint flat black behind grilles. Cross-break all ducts 12 inches and wider. Duct dimensions shown on drawings are clear inside dimensions. Submit shop drawings and changes to plan layouts and to provide adequate clearances. Flexible ductwork connections shall be provided for all fan unit connections. Ventglas fabric shall be 4" wide. Support ducts a maximum of 6 feet on centers with 1" x 26 gauge hangers. Secure supports with a sheetmetal screw on bottom, and 12" centers on sides. Dampers shall have felt edges and be 16 gauge. Provide locking quadrants for dampers. Provide concealed regulators for extractors on branch ducts, on takeoffs to the ceiling diffuses. Flexible ducts shall be pre insulated type, and a maximum of 5 feet long. U.L. fire dampers with access doors shall be provided as shown on the plans or required by code. Install dampers and access doors per U.L. requirements. Units above ceilings shall have auxiliary drain pans. Auxiliary drain pans shall be a minimum 4" high and made out of sheetmetal. Pans shall have auxiliary drain and a fan float switch.

I. Motors: Shall be an NEMA Standards high efficiency motor, operating non overloaded.

J. Motor Controls and Disconnects: Furnished by Electrical Contractor. This Contractor shall furnish disconnects, thermal overloads, starters, relays and extra contacts for interlocking.

K. Electrical: Contractors shall coordinate electrical characteristics with Electrical Contractor. Before ordering any equipment, submit a list of maximum overload circuits for all equipment to the Electrical Contractor and Engineer. This Contractor shall furnish all control instruments and wiring diagrams showing terminal identification numbers.

L. Fan Coil Units: Provide electric heat and contactors in unit or ductwork as required. Units shall have cooling coil and drain pans. Units placed above the ceiling shall have an auxiliary drain pan. Pipe auxiliary drains through eaves. Mount units as shown on the drawings. Make pipe openings to unit air tight. Reference filters' specification for filter type. The following manufacturers are acceptable Carrier, Trane, York or McQuay. Systems must comply with IECC.

M. Air Cooled Condensing Unit: Provide units with refrigerant, propeller fans, vertical discharge, complete with oil failure switch, high and low pressure cut outs and necessary controls. Hermetically sealed refrigerant system shall consist of compressor, condenser, crank case heaters, refrigerant control, outdoor fans and motors. Units must operate with cooling coils. The following manufacturers are acceptable Carrier, Trane, York or McQuay. Systems must comply with IECC.

N. Air Handling Units: Provide electric heat and contactors in unit or ductwork as required. Units shall have cooling coil and drain pans. Units placed above the ceiling shall have an auxiliary drain pan. Pipe auxiliary drains through eaves. Mount units as shown on the drawings. Make pipe openings to unit air tight. Reference filters' specification for filter type. Units shall have the following features: Hinged and latches, double wall foam injected panels, stainless steel drain pans and nipples, and 6" unit base rail. The following manufacturers are acceptable Carrier, Trane, York or McQuay. Systems must comply with IECC.

O. A/C Equipment Coating: The unit's finned heat exchanger coils shall be coated with a Hemple no. 134U epoxy ester. Coating shall have a wet film thickness of 4 to 5 mils. The unit case shall be coated with 16BU to a dry thickness of 0.5 mils. An aliphatic urethane coating shall be applied to a dry film thickness of 4 to 6 mils. Match manufacturers' color. Coating, film bridging and cleaning of coil and case shall be as recommended by manufacturer. Work shall be done by Diversified Mechanical Services.

P. Air Cooled Chiller: Carrier, McQuay or Trane. Air cooled, liquid chilling packages shall be as specified. The chiller shall be charged at the factory with refrigerant. Contain all wiring and piping within the unit enclosure. Protect all electric components from the weather. Enclose Components in a galvanized steel casing. Units shall have a complete control system. Systems must comply with IECC.

Q. Rooftop A/C Unit:
1. Combination electric heating, electric cooling unit make for mounting exposed to weather. Units shall have economizers and must comply with IECC. Units shall be designed to operate at ambient temperatures of 105 degrees F, ARI rated, and approved. Casing shall be leak proof, galvanized steel, acrylic epoxy finish or bonded and coated with baked enamel. Mount units on factory roof curbs, with all duct and electrical connections inside the curb. Provide access panels. Insulate interior of casing with 1" thick matt faced glass fiber. Outside air intakes shall have motorized dampers. The hermetic compressors shall have a independent refrigeration circuits. Mount compressors on vibration isolators and provide factory-installed service valves, crankcase heaters, liquid line sight glass, filter-drier, expansion valves, low and high pressure cutouts, overload protection, and anti short cycling control. Coils to have copper tubes with aluminum coil, and minimum 1" condensate drain from evaporator drain pans. Evaporator Fans shall be centrifugal type with galvanized steel housing and adjustable pitch pulley-belt drive. Direct drive propeller-condenser fans with guard. Heaters shall be AGA and U.L. Listed, and with all necessary parts for a complete system. System shall have a thermostat, electronic ignition, safety controls, relays, disconnects, contractors, etc. and be suitable for specified voltage. Locate thermostat as directed by Architect. Heaters shall be factory installed on cooling/heating units. Heater models shall have heating elements sequenced on and off as scheduled on the drawings. Provide a 24-volt transformer. Low-voltage connections shall be point-to-point on terminal board. Reference the filter specifications for filters. The following manufacturers are acceptable Carrier, Trane, York or McQuay.
2. Combination gas heating, electric cooling unit make for mounting exposed to weather. As noted on the drawings units shall have economizers and must comply with IECC. Units shall be designed to operate at ambient temperatures of 105 degrees F, ARI rated, and AGA approved. Casing shall be leak proof, galvanized steel, acrylic epoxy finish or bonded and coated with baked enamel. Mount units on factory roof curbs, with all duct and electrical connections inside the curb. Provide access panels. Insulate interior of casing with 1" thick matt faced glass fiber. Outside air intakes shall have motorized dampers. The hermetic compressors shall have a independent refrigeration circuits. Mount compressors on vibration isolators and provide factory-installed service valves, crankcase heaters, liquid line sight glass, filter-drier, expansion valves, low and high pressure cutouts, overload protection, and anti short cycling control. Coils to have copper tubes with aluminum coil, and minimum 1" condensate drain from evaporator drain pans. Evaporator Fans shall be centrifugal type with galvanized steel housing and adjustable pitch pulley-belt drive. Direct drive propeller condenser fans with guard. Heaters shall be AGA and U.L. Listed, and with all necessary parts for a complete system. System shall have a thermostat, electronic ignition, safety controls, relays, disconnects, contractors, etc. and be suitable for specified voltage. Locate thermostat as directed by Architect. Heaters shall be factory installed on cooling/heating units. Heater models shall have heating elements sequenced on and off as scheduled on the drawings. Provide a 24-volt transformer. Low-voltage connections shall be point-to-point on terminal board. Reference the filter specifications for filters. The following manufacturers are acceptable Carrier, Trane, York or McQuay.

R. Boiler: Shall be CB packaged Boiler Clearfire CFC or equal. Construction shall be of high quality stainless steel combustion chamber and tube sheets. Aluminum alloy finned internal surface. Modulating burner with minimum 5:1 turndown. Waterside inspection. Low noise (<70dBA@3ft). Low Nox (<20PPM).

S. Filters: Provide 2" filters by American Air Filters Co. Use pleated, disposable type, and install in all air handling units.

T. Outside Air Intake: Through outside wall or roof louvers with motorized aluminum OBD dampers.

U. Pump: Manufacture end suction pumps by Aurora, B&G or Paco. Provide pumps with cast iron body, bronze fittings, bronze impeller, bronze wear rings, shaft sleeve, steel base, coupling guard, grease bearings and end suction type. Motors shall be the suitable for outdoor application and must comply with IECC. Encase pumps with sheetmetal enclosure.

V. Air Devices: Krueger, Carnes, Titus, or Metalaire. All devices shall be aluminum. Ceiling mounted outlets shall be off-white, other outlets shall be primed coated suitable for painting on the job. Operating dampers above non accessible ceiling shall have access doors or young regulators. See schedules on plans.

W. Fans: Roof mounted, ceiling mounted, wall mounted, vent sets or inline type as shown on the drawings. Provide factory curbs for all roof mounted fans or hoods. Provide aluminum discharge grilles as required. Fans shall be Greenheck, Loren Cook, Penn, or Acme.

X. Controls:
1. The system shall be a DDC Controls System. System shall have Honeywell electronic programmable type and must comply with IECC. Controls shall be electronic. Thermostats shall be a Honeywell electronic programmable type and must comply with IECC. The thermostat shall have the capability to set back and shut down the system based on day of week and time of day and provide a readily accessible manual over ride that will return to preset back or shutdown schedule without reprogramming. Programmable thermostats manufactured by the A/C unit manufacture are acceptable. Outside air dampers shall close when fan cycles off or when unit is in the off condition. Provide fire/ionization detectors in entering and leaving sides of all air discharge units. Exhaust fans shall be switched.
2. Controls: Exhaust fans shall be interlocked with CO2 sensors. Fans shall be two staged. First stage on only in winter when CO2 sensor trips. Big Ass Fans shall remain in on during occupancy during winter on VFD speed 3. Summer may vary based on occupant comfort.
3. Sequence of Operation: Start Stop: Start-stop air handling unit thought a programmable time switch located in the A/C control cabinet. Run fans continuously. Provide 60 minute after hour manual timer for each AHU and to start complete systems cooling coils: A combination cooling heating thermostat shall modulate a three-way valve to maintain supply air temperature adequate to cool the desired zone heating: A combination cooling heating thermostat shall operate two stages on the electric heating coil to maintain supply air temperature adequate to heat the desired zone. Provide fire/ionization detectors in entering and leaving sides of all air discharge units.

Y. Chiller: Furnish chillers with its own operating controls. Provide flow switches in the chilled water line to interlock with chiller controls. Provide thermostats in chilled water return line, set at 52 degrees F. interlock with chiller controls to cycle compressors. Provide an on-off switch to start the chilled water system. Interlock the chiller and chilled water pump. Verify pump flow before starting chillers. Pumps shall start automatically if outdoor temperature falls below 35 degree F. Switch exhaust fans as showed on the drawings. Outside Air Intake: Through outside wall louver or roof hood as indicated on the drawings.

Z. Room A/C Units: Furnish and install packaged terminal air conditioners units. Units shall be sizes and capacities shown on the schedule or the drawings and specifications. Units shall be designed to operate on 240 volts, 60 Hz., single phase power. Each air conditioner shall be complete and ready to operate after installation, and shall consist of the following sections and components. The unit must have hermetically sealed compressor, condenser and evaporator coils and capillary refrigerant control. Indoor and outdoor fans and motors as specified. The unit must have a cooling condensate vortex disposal system. Provide an easy accessible fresh air damper inside the chassis with manual control no. Factory installed electrical heaters as specified. U.L. listed system is accessible controls or remote control facility as described. A wraparound or similar type room cabinet, 18 gauge. Wall case shall not be less than 18 gauge steel.

AA. Radiant Floor Heating System:
1. Warranty: The Radiant Floor Heating System component manufacturer shall warrant the cross-linked polyethylene tubing to be free from defects in material and workmanship for a period of Twenty-Five (30) Years. Warranty shall be transferable and will only be issued with proof of proper Design, Installation, and Testing reports on file with the manufacturer of the tubing. Warranty shall cover incidental damages and damage to the real property. All water distribution components and controls shall be warranted for Twenty-Four (24) months and/or Two (2) heating seasons.
2. Performa Tubing: Material: All radiant floor heating tubing shall be high density cross-linked polyethylene in accordance with ASTM F876/F877 and CSA B137.5. All tubing shall be fully cross-linked using the silane production method as per specified standards prior to shipment from the manufacturing facility. Oxygen Diffusion Barrier: Tubing shall have a co-extruded oxygen diffusion barrier capable of limiting oxygen diffusion through the tube to no greater than 0.10 g/cu.m/day at 104°F water temperature in accordance with DIN 4726. Temperature and Pressure Rating: Tubing shall be rated to 160 PSI at 73°F, 100 PSI at 180°F, and 80 PSI at 200°F. Bend Radius: The minimum bend radius for cold bending of the tube shall not be less than six (6) times the outside diameter. Bends with a radius less than stated shall require the use of a bending support as supplied by the tubing manufacturer. Tubing shall have a minimum of Six (6) months UV protection.
3. Modular Brass Manifold: Manifolds shall be modular in design, allowing for 2-12 loops per manifold with the ability to fit 3/8", 1/2", 5/8" or 3/4" tubing. Manifolds shall be constructed of brass, rated at a maximum working pressure of 150 PSI and a maximum temperature of 230°F. Manifolds shall be 1-1/4" in diameter. Each supply module shall have an integral flow meter, circuit balancing valve, and positive shut off valve. Flow meters shall have the ability to be adjusted from 0.132 to 1.32 GPM. Each return module shall have mounting capabilities for either a manual stop or a zone valve actuator capable of individual loop control. Manifold modules are to be assembled with ball valves, automatic or manual air vents, supply and return thermometers, drain valves, and wall mounting brackets.
4. Fittings: Fittings shall be manufactured of brass. Fittings shall be supplied by the tubing manufacturer.
5. Accessories: Sleeves shall be provided wherever tubing leaves the floor. Bend supports for 90° bends.
6. AccuFlow Brass Manifold: Manifolds shall be preassembled, allowing for 2-12 loops per manifold with the ability to fit 3/8", 1/2", 5/8" or 3/4"tubing. Manifolds shall be constructed of brass, rated at a maximum working pressure of 150 PSI and a maximum temperature of 230°F. Manifolds shall be 1" in diameter. Each manifold circuit shall have an integral flow meter, circuit balancing valve, and positive shut off valve. Flow meters shall have the ability to be adjusted from 0.132 to 1.32 GPM. Each manifold circuit shall have mounting capabilities for either a manual stop or a zone valve actuator capable of individual loop control. Manifolds are to be assembled with ball valves, automatic or manual air vents, supply and return thermometers, drain valves, and wall mounting brackets. Manifolds shall readily accept Injecting Mixing Modules and/or Pressure By-Pass Modules.
7. Injection Mixing Brass Manifold: Manifolds shall be pre-assembled, allowing for 2-12 loops per manifold with the ability to fit 3/8", 1/2", 5/8" or 3/4"tubing. Manifolds shall be constructed of brass, rated at a maximum working pressure of 150 PSI and a maximum temperature of 230°F. Manifolds shall be 1" in diameter. Each supply header shall have an integral flow meter, circuit balancing valve, and positive shut off valve. Flow meters shall have the ability to be adjusted from 0.132 to 1.32 GPM. Each return header shall have mounting capabilities for either a manual stop or a zone valve actuator capable of individual loop control. Manifolds are to be assembled with ball valves, automatic or manual air vents, supply and return thermometers, drain valves, and wall mounting brackets. Manifolds shall have the option for a by-pass system to be attached directly to the supply and return headers. Manifold shall have an Injection Mixing System with circulator and thermostatic temperature control.

AB. Dryer Flue: Shall be Metal-Bestos, thin wall construction or equal. Provide outside aluminum Rain Hood.

AC. Kitchen Grease Exhaust Ductwork:
1. In concealed locations use minimum 16-gauge black steel or minimum 18-gauge 304 stainless steel with joints welded liquid tight or prefabricated grease duct, U.L. Inc. listed with aluminized steel shell.
2. In exposed areas, use 18-gauge or heavier 304 stainless steel with a number 3 finish and with joints welded liquid tight or prefabricated U.L. Inc. listed duct with stainless steel shell. Grind and polish welded joints and seams to a number 3 finish.
3. Provide expanded take-offs for branch duct connections or 45-degree entry fittings. Square edge 90-degree take-off fittings or straight taps will not be accepted.
4. Use elbows and tees with a centerline radius to width or diameter ratio of 1.5 wherever space permits.
5. Use shorter radius elbows in areas with limited space with prior approval of engineer.
6. No turning vanes may be used in kitchen exhaust duct.
7. Supporting steel hangers shall not be lighter than duct gauge.
8. Where using welded joints with black steel duct, coat external welded joints and seams with paint.
9. Grind and polish exposed stainless steel joints and seams to number 3 finish.
10. Apply bracing and reinforcement to outside of duct to prevent breathing, rattling, vibration, or sagging of duct.
11. Install without forming dips, sag, or traps which might collect residue by providing supports at not greater than 5-foot intervals.
12. Fasteners at hangers shall not penetrate the duct. do not use sheet metal screws on supports; use bolted, riveted, or welded connections.
13. Where ductwork is u.l. listed, install in accordance with listing.
14. Construct grease tight access doors of same material and thickness as duct and as large as possible, up to 24 inches in any dimension.
15. Locate access doors on duct sides for ease of inspection and cleaning at each change in direction, not less than every 10 lineal feet of duct, including risers, and not less than 1-1/2 inches from bottom of duct.
16. Insulation or fire protection enclosure shall be removable at each access door and clean out.
17. Pitch horizontal ducts back to hood at 1-inch per foot.
18. Grease duct to be insulated with fire stop insulation. Fire stop insulation to be noncombustible, non-asbestos, non-ceramic fiber, high temperature blanket or board fireproofing insulation, constructed of calcium silicate or calcium-magnesium-silica amorphous wool which do not exceed ASTM E119 and ASTM E814 "F" and "T" fire ratings, U.L. or equivalent third party listed and labeled. foil-scrim-polyethylene fiberglass reinforced factory applied jacket.
19. Install per code sections and nfpa 96.

AD. Kitchen dishwasher exhaust duct construction:
1. Fabricate and install ductwork in sizes indicated on drawings and in accordance with smacna recommendations, except as indicated below.
2. use 18-gauge or heavier stainless steel with seams and joints welded and ground smooth. in exposed areas, polish joints and seams to a number 3 finish, minimum.
3. Use elbows and tees as specified for appropriate duct pressure class.
4. Provide expanded take-offs for branch duct connections or 45-degree entry fittings. square edge 90-degree take-off fittings or straight taps are unacceptable.
5. Pitch duct to drain back to dishwasher hood.
6. Provide watertight drain pan at low points or at locations where moisture may collect. pipe drain pan to nearest floor drain.

AE. Boiler and Dryer Flue: Shall be Metal-Bestos, dual wall construction or equal.

AF. Heaters:
1. Base Board Heater: Heaters shall be U.L. Listed, 16 gauge painted steel cover, low profile, end caps and all necessary parts for a complete system. System shall have an enclosed thermostat, safety controls, relays, disconnects, contactors, etc. and be suitable for 230 volts, 1 phase service. Units shall be manufactured by Qmark Chromalox.
2. Wall room Heaters: BERKO - HT. Fast heat response. Programmable touch screen built-in thermostat. Built-in fan delay operates when unit is turned off after heating to prolong element life. Built-in power disconnect switch.

AG. Unit Heaters:
1. Electric Unit Heaters: Heaters shall be U.L. Listed, suspended from structure above and with all necessary parts for a complete system. System shall have a thermostat, safety controls, relays, disconnects, contactors, etc. and be suitable for specified voltage. Locate thermostat as directed by Architect. Units shall be manufactured by Modine or approved equal.
2. Gas Unit Heaters: Heaters shall be AGA and U.L. Listed, suspended from structure above and with all necessary parts for a complete system. System shall have a thermostat, electronic ignition, safety controls, relays, disconnects, contactors, etc. and be suitable for specified voltage. Locate thermostat as directed by Architect. Units shall be manufactured by Modine or approved equal.
3. Infrared Heaters: Heaters shall be gas fired low intensity infrared heaters. Locate thermostat with on-off switch as shown on the drawings. Reflectors shall rotate and made of polished aluminum. System shall have a hot surface ignition control system. Heaters shall be Modine or approved equal.

AH. Floor and Wall Heating Mats: Heaters shall be U.L. Listed, 16" wide matt, heavy duty nylon outer jackets and all necessary parts for a complete system. System shall have a thermostat, safety controls, relays, disconnects, contractors, etc. and be suitable for 230 volts, 1 phase service. Install all controls in adjacent electrical room. Units shall be manufactured by Qmark Chromalox.

AI. Variable Refrigerant Volume System: System by Daikin, Mitsubishi, LG, or Lennox. Provide a complete and functioning system with all accessories and appurtenances. Coordinate with manufacturer for all piping size, quantity of piping, routing and installation. Controls by manufacturer, provide a central control monitor located in back of house area. refer to schedules, diagrams and floor plans for VRV system.

AJ. Demolition: Provide materials and labor required for the removal of mechanical equipment as noted on the drawings. Remove all devices related to the demolition of partitions and ceilings of the existing building.

END OF SECTION 15020

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REGISTERED
JASON W. DAWSON
LICENSED PROFESSIONAL ENGINEER
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REVISIONS

ISSUE FOR CONSTRUCTION 3/26/18

'B'-ISSUE DATE

'C'-ISSUE DATE

'D'-ISSUE DATE

'E'-ISSUE DATE

'F'-ISSUE DATE

MECHANICAL SPECIFICATIONS

SHEET NUMBER

M0.01

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