MECHANICAL SPECIFICATIONS

Section 15010 - General Requirements

A. General
1. Specifications are applicable to all contractors and/or subcontractors for mechanical systems.
2. Check other plans and specifications and fully coordinate with other trades, owner and architect requirements.
3. Conform to all general and special conditions of contract as specified by architect and/or owner.
4. Visit site, check facilities and conditions and make all necessary observations and measurements. Note conditions under which work is to be performed and take all items into consideration in bid.
5. Systems are to be complete and workable in all respects, placed in operation and properly adjusted.
6. Each contractor shall provide for his own clean-up, removal and legal disposal of all rubbish daily.
7. Contractor shall protect his work, his existing and adjacent property against weather.
8. Contractor to protect his work, materials, apparatus and fixtures from damage. Any work damaged by failure to provide protection required, shall be removed and replaced with new material at the contractor's expense.
9. Contractor must confirm all utility company requirements and connection points in field, prior to starting work.
10. Arrange for and obtain owner's and insurance representative's permission for any service shutdowns.
11. The contractor shall be solely responsible for construction means, methods, sequences of construction and the safety of workmen.
12. No piping, ductwork, wiring, etc., shall be installed or routed above electrical panels and equipment.
13. The mechanical contractor shall coordinate with the electrical contractor and obtain a written approval identifying the electrical characteristics of all mechanical equipment prior to ordering of equipment. No additional payment will be made for lack of contractor coordination of electrical characteristics.
14. During construction the contractor may uncover an existing condition that will have to be modified. Any such work which comes under the jurisdiction of this contractor shall be done by this contractor without extra cost to the owner, as though fully detailed on plans and/or described in the specifications.
15. Work related to the existing building shall be coordinated to minimize interference or interruption of normal building use by owner. Refer to architectural plans for phasing requirements.

B. Codes, permits, standards and regulations
1. Conform to all applicable codes (local, state, national codes, NFPA, OSHA, etc.), government regulations, utility company requirements, and applicable standards.
2. Obtain permits and pay all fees. Arrange for all required inspections and approvals.

C. Related work specified elsewhere
1. Openings and chases, when shown on architectural drawings.
2. Temporary water service, sanitary facilities, fire protection and heating during construction.
3. Poured-in-place concrete.
4. Finished painting.
5. Electric power wiring.

D. Drawings
1. The systems as shown on mechanical drawings are diagrammatic. Confirm all dimensions by field measurement.
2. The exact locations for fixtures, equipment and piping which is not covered by drawings, shall be obtained from the architect or his representative in the field and the work shall be laid out accordingly.
3. Drawings and specifications are intended to supplement one another. Any materials or labor called for in one but not the other shall be furnished as if both were mentioned in the specifications and shown on the drawings.

E. Base equipment, materials and substitutions
1. All equipment and materials shall be new, free of defects and UL labeled.
2. Base bid manufacturers are included in the specification or listed in schedules on the drawings. All other manufacturers are considered substitution.
3. The name or make of any article, device, material, form of construction, fixture, etc., stated in this specification, whether or not the words "or approved equal" are used, shall be known as a "standard".
4. All proposals shall be based on "standards" specified.
5. The equipment schedules on the drawings indicate manufacturers equipment model numbers that this design has been based on. The use of other manufacturer's equipment that is listed as acceptable alternates that entails general trades, structural, mechanical, electrical, etc., revisions is this contractor's responsibility. Any additional cost of such changes shall be paid by the contractor submitting the acceptable alternates which necessitates changes in installing such submitted alternate equipment, even though such costs may be part of another division of work.
6. Substitutions are subject to the approval of the owner. If a substitution is submitted, it is the contractor's responsibility to evaluate it and certify that the substitution is equivalent in all respects to the base specifications.
7. If substitutions are approved, notify all other contractors, subcontractors, etc., affected by the substitution and fully coordinate with them. Any costs resulting from substitution, whether by this contractor or others, shall be the responsibility of and paid for by the substituting contractor. Approved shop drawings do not absolve this contractor from this responsibility.
8. All equipment shall be installed in full accordance with the manufacturer's data and installation instructions. It is this contractor's responsibility to check and conform these requirements prior to starting work.

F. Warranty
1. Fully warrant all materials, equipment and workmanship for one (1) year from date of acceptance.
2. Extend all manufacturer's warranties to owner, including five (5) year compressor and ten (10) year heat exchanger extended warranty on HVAC equipment.
3. Repair or replace without charge to the owner all items found defective during the warranty period. In the case of replacement or repair due to failure within the warranty period, the warranty on that portion of the work shall be extended for a minimum period of one (1) year from the date of such replacement or repair.

G. Shop drawing submittals
1. Submit shop drawings for mechanical, plumbing and fire protection systems, including but not limited to sheetmetal, plumbing fixtures and equipment with adequate details and scales to clearly show construction. Indicate the operating characteristics for each required item. Clearly identify each item on the submittal as to mark, location and use, using the same identification as provided on the construction documents.
2. Sheetmetal and fire protection drawings shall be fully dimensioned and coordinated based on field verified building clearances and architectural ceiling layouts. Indicate structural, lighting, ductwork and piping at all critical locations.
3. Contractor shall review and indicate his approval of each shop drawing prior to submittal for review. Shop drawings will not be reviewed by the engineer unless the contractor's approval is noted. Do not start work or fabrication until shop drawings have been reviewed by the engineer and returned to the contractor.
4. Submittals will be reviewed only for general compliance with the contract documents and not for dimensions or quantities. The submittal review shall not relieve the contractor of responsibility for purchase of any item in full compliance with the contract documents or its complete and proper installation.
5. Where submittals vary from the contract requirements, the contractor shall clearly indicate on submittal or accompanying documents the nature and reason for the variations.
6. Each manufacturer or his representative must check the application of his equipment and certify at time of shop drawing submittal that the equipment specified has been properly applied and can be installed, serviced and maintained where indicated on the drawings. Advise engineer in writing with submittal drawings of any potential problems. The manufacturer shall be responsible for any changes that might be necessary because of physical characteristics of equipment that have not been called to the engineer's attention at the time of submittal.

H. Record Drawings
1. Each contractor or subcontractor shall keep one (1) complete set of the contract drawings on the job site on which he shall regularly record any deviations or changes from such contract drawings made during construction.
2. These drawings shall record the installed location of all concealed equipment, piping, electric service, sewers, wastes, vents, ducts, conduit, etc., by measured dimensions to each such item from column centerlines or readily identifiable and accessible walls or corners of the building. Plans also shall show invert elevation of sewers and top elevation of all other below-grade lines.
3. Record drawings shall be kept clean and undamaged and shall not be used for any purpose other than recording deviations from working drawings and exact locations of concealed work.
4. After the project is completed, these drawings shall be delivered to the architect in good condition, as a permanent record of the installation as actually constructed.

Section 15050 - Basic Materials and Methods

A. General
1. Provide all materials, labor, equipment, and accessories required to furnish and install the mechanical items identified in this section.
2. This section includes basic mechanical materials and methods to complement other division 15 sections in this specification and requirements indicated on the mechanical drawings.

B. Excavation and Backfill
1. Perform all excavation and backfill required for installation of below-grade piping.
2. Excavate as required to install piping at required depth and pitch. Pipe to be laid on sand bedding to give uniform bearing along length of pipe (sand inside building and interlocking aggregate outside building).
3. Backfill with bedding material to a minimum of twelve (12) inches above top of pipe and compact. Balance of backfill in indoor grass areas shall be clean earth up to six (6) inches above surrounding grades. Backfill below finished floors shall be sand, and outdoors under paving shall be interlocking aggregate and backfill shall be compacted in maximum twelve (12) inch layers.
4. All other excavations shall be backfilled with clean earth, excluding rubbish and boulders. Backfill shall be thoroughly tamped and puddled.
5. Patch floor to match existing adjacent surfaces.

15050 (cont.)

C. Supports and Hangers
1. Hangers and supports are to be provided to properly support, secure and align piping and to meet field conditions and as manufactured by Grinnell or Michigan.
2. Spacing to comply with ASHRAE standards and local code requirements.

D. Escutcheons
1. Fit all pipe passing through walls, floors or ceilings in finished rooms with steel or brass escutcheons. Where surface is to receive a paint finish make escutcheons prime painted; otherwise make escutcheons nickel or chrome plated. Where piping is insulated, fit escutcheons outside insulation.

E. Pipe Identification
1. Identify each pipe, valve in equipment rooms, above accessible ceilings and in accessible shafts.
2. Color code identification bands or marker backgrounds to identify contents of pipe and direction of flow located near each valve and fitting, on both sides of pipe passing through walls and on long runs at not over 20 foot intervals.

F. Access Panels
1. Contractor shall be responsible for providing all required access panels necessary for his work. This includes any access panels required for HVAC, plumbing and fire protection. Contractor shall also provide access panels for any existing conditions as required.
2. Refer to architectural drawings and specifications for type of access panel and coordinate locations prior to any work.

G. Firestopping
1. All openings through fire rated walls, floors, and/or roofs for ductwork, piping, etc., shall be fire sealed with calcium salicate, silicone "RTV" foam, "3M" fire rated sealants, Hilti Firetop Systems, or approved equal to maintain the intended fire rating and associated UL ratings.

H. Cutting, Patching and Drilling
1. All cutting and patching of the building construction required for this work shall be by this contractor unless shown on architectural drawings and confirmed as to size and location prior to new construction. Cutting shall be in a neat and workmanlike manner.
2. Neatly saw cut all rectangular openings, set sleeve through opening, and finish patch or provide trim flange around opening.
3. Neatly saw cut floors and patch floor to match existing, including floor covering.
4. Contractor shall field verify slab-on-grade or supported floor construction type prior to cutting. Under no circumstances shall this contractor cut a structural floor slab, whether on grade or supported, without prior written approval from the architect. If floor slab indicated to be cut on mechanical plans is found to be structural in nature, do not cut. Contact architect immediately for further directions.
5. Core drill and sleeve all round openings.
6. Do not cut any structural components without architect's written approval, including, but not limited to roof joists, columns, floor joists, beams, girders, structural floor slabs, etc.
7. Patch and finish to match adjacent areas that have been cut, damaged or modified as a result of the installation of the mechanical systems. Fire stop all penetrations of fire rated construction in a code approved manner.
8. All contractors shall confirm with owner, prior to bid, times available for noise producing work such as cutting and core drilling of floors, walls, etc., as well as times for work which requires access into adjoining tenant spaces. Include any premium time in bid.
9. Exact location of roof top air conditioning units shall be approved by the structural engineer. Mechanical contractor shall furnish and install all supplemental support steel for equipment and roof penetrations after approval of structural engineer.
10. The mechanical contractor shall coordinate with the general contractor prior to construction. The mechanical contractor shall provide information regarding openings in walls, floors, etc., concrete equipment pads and foundations to the general contractor. IF the mechanical contractor fails to comply with this request, or if incorrect information is given, the necessary cutting and patching will be performed by the general contractor, at the mechanical contractor's expense.

I. Demolition and Removal
1. Disconnect, cap and remove all piping, ductwork and equipment indicated on the drawings or as required for the project.
2. Any equipment designated by owner to be salvaged shall be protected and delivered to the owner on site.
3. Demolition shall be done in a manner so as not to damage adjacent work and not affect the operation of systems to remain in use. Any item to remain that is damaged by the contractor shall be replaced and/or repaired at the contractor's expense.
4. All open ended piping and ductwork that is to remain shall be capped and properly secured.
5. All electrical devices, wiring, conduit, etc., related to demolished equipment/systems shall be removed. Wiring shall be disconnected at circuit breakers, removed and breakers marked "spare".
6. Mechanical contractor shall remove and reclaim any refrigerant in existing systems prior to demolition of any equipment according to federal requirements.
7. All asbestos removal will be handled by the owner and is not a part of this work.
8. Examine areas and conditions under which demolition work must be performed. This contractor shall coordinate his work with other trades performing demolition work and/or demolition work performed by the owner.
9. Remove all supports, hangers, etc., related to equipment and material indicated to be demolished.
10. Where temperature controls are indicated for demolition, retain the services of a temperature control contractor to perform such demolition.

Section 15100 - Insulation

A. General
1. Furnish all material, labor and equipment as required to install complete plumbing and HVAC insulation as indicated on mechanical drawings and in these specifications.
2. Install in full accordance with manufacturer's recommendations.

B. Plumbing Insulation (as manufactured by Owens Corning, Knauf or Schuller)
1. Insulate all above grade hot and cold water piping with molded fiberglass having an all service jacket.
   - B.a. Insulation thickness schedule:
     - 1.1. Less than (<) 1-1/2" diameter pipe: 3/4" thick.
     - 1.2. 1-1/2"-8" diameter pipe: 1" thick.
2. Include insulation of fittings and valves. Keep vapor barriers intact. Apply to manufacturer's recommendations.
3. Handicapped lavatory insulation - insulate all exposed waste and water supply piping under lavatory with safety covers per ADA requirements as manufactured by Plumberex Specialty Products, McGuire or Truebro.
4. Repair sections of existing piping insulation damaged or damaged during this construction period. Use insulation of same thickness as existing insulation, install new jacket lapping and sealed over existing.

C. HVAC Insulation (as manufactured by Owens Corning, Knauf, Schuller, Armstrong, or Rubatex)
1. Insulate all unexposed supply, return, and exhaust ducts with 1-½" thick foil faced reinforced kraft jacket fiberglass duct wrap fully secured to duct. Lap and tape seams and secure tightly to the ducts with wire or stick pins.
2. All insulation to be applied in full accordance with the manufacturer's recommendations and comply with 25/50 flame and smoke hazard ratings per ASTM E-84, NFPA 255 and UL 723.
3. Insulate refrigerant suction line with 1/2" elastomeric foam insulation with joints and seams sealed vapor tight.
4. Insulate air conditioning condensate drain piping with 1/2" thick molded fiberglass insulation.
5. Provide removable insulation sections to cover parts of equipment which must be opened periodically for maintenance including metal vessel covers, fasteners, flanges, chilled water pumps, valves and accessories.
6. Repair damaged sections of existing mechanical insulation damaged during this construction period. Use insulation of same thickness as existing insulation, install new jacket lapping and seal over existing.
7. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

Section 15200 - Piping and Valves

A. General
1. Furnish all material, labor, equipment, and accessories as required to install complete plumbing and HVAC piping systems as indicated on mechanical drawings and in these specifications.
2. Install in full accordance with local code requirements, other specification section requirements and manufacturer's recommendations.

B. Connections to equipment furnished by others
1. Provide valved water connection for equipment furnished by other contractors or owner.
2. Include accessories required by code, drawing or manufacturer's instructions.

C. Sanitary
1. Install sanitary, vents, drains, etc., as indicated on the drawings.
2. Sewers to be pitched a minimum of 1/4" per foot for 3" sizes and under and 1/8" per foot for 4" sizes and larger or to grades indicated on drawings.
3. Changes in direction and branch connections shall be made with approved drainage fittings compatible with the piping system material in which it is installed.
4. Install cleanouts at each change in a direction of piping greater than 45 degrees.
5. All fixtures and sanitary drains shall be vented as indicated on drawings and in accordance with code.
6. PVC piping shall not be installed unless permitted by code and shall not be installed in return air plenums.
7. Sanitary and vent material shall be as follows:
   - C.a. Below grade sanitary
     - 7.1. Service weight - cast iron pipe ASTM A-74-82 with ASTM C-564-80 neoprene compression joints or no-hub with clamps.
     - 7.2. PVC-DWV plastic ASTM D-1785 with ASTM D-2665 DWV solvent weld socket fittings.

15200 (cont.)

   - C.b. Above grade sanitary and vent material shall be as follows:
     - 7.1. No-hub cast iron pipe CISPI 1-301-78.
     - 7.2. PVC-DWV plastic ASTM D-1785 with ASTM D-2665 DWV solvent weld socket fittings.
     - 7.3. SCH. 40 galvanized steel pipe ASTM A-120-83 with cast iron screwed fittings ANSI B-16.22 1983.

D. Domestic Water Piping
1. Install domestic water piping as indicated on drawings. Include all fittings, valves, hangers, and other accessories including water meter and backflow preventer. Extend domestic water piping to all fixtures and equipment required for complete installation.
2. Include unions, or other disconnect means, stops or valves for isolation of fixtures and equipment. Valves to be fully compatible with piping for service intended as manufactured by Nibco, Crane or Milwaukee. Include hose or drain valves at low points where fixtures cannot be used for drainage.
3. Install shock absorbers at each quick closing fixture and where required to prevent water hammer as manufactured by J.R. Smith, Sioux Chief or Zurn.
4. Hangers on insulated pipe to be outside of insulation, sized accordingly with a sufficient saddle to protect insulation as manufactured by Grinnell or Michigan.
5. Domestic water piping shall be as follows:
   - D.c. Above grade - type "L" hard copper ASTM B 88-832 with wrought copper fittings ASTM B 16.22 1980 and non-lead or antimony solder joints.
   - D.d. Below grade - type "K" soft copper without joints.
6. Flush, vent and sanitize all water piping with chlorine as required per AWWA, local building department and health department codes.
7. Domestic hot and cold water piping under concrete floor to be covered with sand so that piping will not become embedded in the floor slab.
8. All piping under concrete floor shall be type "K" soft copper, continuous. No splices or fittings will be allowed.
9. Extreme caution must be taken so that no copper piping and insulation under concrete floors becomes crushed, cut, split or deformed during the pouring of the floor slab.

E. Fire Protection Piping
1. See Section 15300, Fire Protection Systems.

F. Firestopping
1. See Section 15050, Basic Materials and Methods.

Section 15300 - Fire Protection Systems

A. General
1. Furnish all labor, materials and equipment as required to install a complete fire protection system for project.

B. Design Basis
1. Design basis for system shall be per NFPA 13 (latest edition) and local code requirements.
2. System shall be hydraulically calculated as required by code.
3. Pipe sizes indicated on drawing are approximate and shall be verified per the contractor's hydraulic calculations.

C. Drawings and Calculations
1. Contractor shall prepare submittal drawings and hydraulic calculations for space in accordance with owner's insurance company building department, and local fire authority requirements.
2. Contractor shall perform a flow test data on city water main and submit data with calculations.
3. Contractor and designer shall be state certified.

D. Piping
1. All piping shall be installed in accordance with NFPA 13, 14 (latest edition) and local code requirements.
2. Fire protection piping shall be as follows:
   - D.a. Inside building - pipe and tubing shall be steel or copper in accordance with NFPA requirements.
   - D.b. Piping shall match existing building standards.
   - D.c. Contractor shall arrange with owner and insurance underwriter prior to shut down of existing systems.
   - D.d. Flush all piping upon completion of project and test per NFPA requirements.
   - D.e. No piping shall be installed at locations subject to freezing.

E. Sprinkler Heads
1. Sprinkler heads shall be UL listed, match existing building standards and be manufactured by Central, Star or Viking.
2. Sprinkler heads shall be as follows:
   - E.a. Areas with exposed structure:
     - 2.1. Upright - rough brass.
   - E.b. Areas with ceilings:
     - 2.2. Recessed pendent - chrome plated with matching two (2) piece, flush escutcheon.
     - 2.3. Concealed - brass finish with off-white ceiling cover plate.
     - 2.4. Sidewall - chrome plated with off-white, two (2) piece, semi-recessed escutcheon.
3. Install higher temperature sprinkler heads where required by code or application.
4. Submit samples of sprinkler heads to architect prior to fabrication of any piping.

F. Valves
1. Install all valves as required by NFPA 13, UL or FM listed and as manufactured by Grinnell, Hammond or Milwaukee.
2. All shut-off valves shall be fitted with tamper switches by fire protection contractor and wired by electrical contractor. Tamper switches shall be as manufactured by Notifier, Potter or Viking.

G. Firestopping
1. See Section 15050, Basic Materials and Methods.

Section 15400 - Plumbing Fixtures and Equipment

A. General
1. Furnish all fixtures and equipment indicated and scheduled on drawings, complete with all accessories, controls, etc., as required.
2. Install in full accordance with manufacturer's recommendations and place in satisfactory operation.

Section 15700 - HVAC Systems and Equipment

A. General
1. Furnish all equipment, material, labor, tools, etc., for the complete HVAC system. Install complete and place in operation.
2. Contractors bidding this project shall visit this site and familiarize themselves with all conditions affecting their work. Submission of a bid on this project shall be construed as having such knowledge.
3. Verify exact conditions in field and coordinate with these drawings and other trades before beginning new work.
4. Determine exact locations for all new and relocated equipment, piping, conduits and ductwork in field.
5. Coordinate work of this contract with other trades. Conflicts shall immediately be brought to the attention of the architect. Architect's resolution to conflicts shall be final.
6. Any discrepancies between what is shown on drawings or specified and the actual conditions in the field shall immediately be brought to the attention of the architect before proceeding.
7. Building and surfaces damaged during installation shall be repaired, replaced, and/or restored to original condition after completion of work and before acceptance by owner.
8. During construction, all return air ductwork and transfer air openings serving new and existing air handling equipment and/or adjacent tenant spaces shall be protected. Openings which need to remain active shall be covered and protected with MERV 8 filtration media; openings which can remain inactive during construction shall be covered with plastic sheathing and sealed air tight. Filter media shall be replaced regularly as required during construction in order to ensure adequate airflow though all required active openings. In addition, at the end of each phase of construction and at the end of the construction project, all filtration media within each piece of equipment serving the space shall be replaced.

B. Equipment
1. Mechanical contractor to furnish all HVAC equipment indicated and/or scheduled on the drawings complete with bases, isolators, supports and other required accessories.
2. Install complete and place in proper operation per manufacturer's recommendations, lubricate and adjust as required. Furnish and install clean set of filters prior to balancing.
3. Equipment to be make and model as scheduled unless alternate equipment of equivalent quality and performance is submitted as a substitution prior to bidding. All substitution are subject to acceptance without qualification by owner, engineer and architect.
4. Contractor shall perform routine service inspection of all existing HVAC equipment to remain. Lubricate bearing, service control systems, replace fan belts and install new filters in each rooftop unit.
5. Contractor shall field verify refrigerant charge and add refrigerant if the charge is less than manufacturer's specifications.
6. Submit service report to any major component failures or malfunctions. Report shall include cost to service all malfunctioning or damaged items listed. Cost shall include parts and labor. Equipment shall be placed in full operation with controls calibrated upon completion of project.

C. Cooling Coil Condensate Drains
1. Install condensate piping as indicated on drawings. Include all fittings, traps, hangers etc. Extend condensate piping from all equipment drain pans to approved locations for complete installation.
2. Install condensate piping at a uniform minimum slope of 1/8 inch per foot.
3. Condensate piping shall be type "L" hard copper ASTM B 88-832 with wrought copper fittings ASTM B 16.22 1980 and non-lead or antimony solder joints.
4. Insulation - see section "15100 Insulation".

D. See equipment schedules on mechanical drawings.

Section 15800 - Air Distribution Systems

A. General
1. Furnish all materials, labor, equipment and accessories required to install complete air distribution systems.
2. Contractors bidding this project shall visit this site and familiarize themselves with all condition affecting their work. Submission of a bid on this project shall be construed as having such knowledge.
3. Verify exact conditions in field and coordinate with these drawings and other trades before beginning new work.
4. Determine exact locations for all new and relocated ductwork and accessories in field.
5. Coordinate work of this contract with other trades.
6. Any discrepancies between what is shown on drawings or specified and the actual conditions in the field shall immediately be brought to the attention of the architect before proceeding.
7. Building and surfaces damaged during installation shall be repaired, replaced, and/or restored to original condition after completion of work and before acceptance by owner.

B. Ductwork
1. Fabricate and erect all ductwork to ASHRAE and SMACNA standards from no. 1 galvanized steel. Comply with NFPA 90A requirements.
2. Ductwork shall be SMACNA low pressure construction 2" static pressure rating with seal Class B seams and joints.
3. Include all acoustic, airfoil shaped perforated aluminum turning vanes, manual dampers, flexible connectors, grilles and diffusers, acoustic lining, and other sheet metal accessories for the project.
4. All branch connection fittings in rectangular ductwork shall be 45 degree transition type, conical fittings or spin-in fittings with integral air scoops. Butt fittings are not acceptable.
5. Install two (2) inch deep secondary drain pan below all furnaces, hot water generators and domestic water heaters. Pipe three-fourth (3/4) inch drain to mop basin independently of all the other drains.
6. All exposed round ductwork shall be spiral seam ductwork.

C. Duct Liner
1. Acoustic line all rectangular ducts indicated on drawings with one (1) inch thick non-flaking, coated medium density liner, apply to manufacturer's recommendations.
2. Duct dimensions indicated on drawings are clear inside dimensions (free area).
3. Duct liner shall comply with NFPA 90A and 90B (latest edition) requirements.

D. Duct Accessories
1. Flexible ductwork (as manufactured by Thermaflex, Flexmaster or Wiremold).
   - D.a. Flexible ducts shall be independently supported from the structure and connected with plastic draw bands and tighteners. Flexible ducts shall be limited to 48" maximum straight length. Flexible ducts shall be constructed of 1-1/2" insulation with vinyl vapor barrier jacket and rated at 10" WG for sizes though 12", UL listed, and meet 25/50 flame and smoke rating. Flexible ducts are not permitted in rooms without ceiling.
2. Dampers (as manufactured by Ruskin, Nailor or Safe-Air)
   - D.a. Fabricate in accordance with SMACNA Standards. Provide end bearings and locking, indicating quadrant regulators. Blade to be single thickness with continuous hinge or rod.
3. Backdraft Dampers (as manufactured by Ruskin, Nailor or Safe-Air)
   - D.a. Multiple blade, parallel type damper constructed of galvanized steel with felt or flexible vinyl sealed edges, ball bearings, pivot pin and adjustment device for varying pressures.
4. Fire Dampers (as manufactured by Ruskin, Nailor or Safe-Air)
   - D.a. Fabricate in accordance with NFPA 90A and UL555. Dampers shall be suitable for use in the vertical or horizontal position as indicated on the drawings, be type 'B' with blades out of airstream, and be rated for 1-1/2 hours minimum (unless noted otherwise).
   - D.b. Provide duct mounted access doors at all fire damper locations.
5. Access Doors (as manufactured by Ruskin, Nailor or Safe-Air)
   - D.a. Fabricate in accordance with SMACNA standards. Doors to be fabricated of galvanized steel with sealing gasket and quick locking device.
   - D.b. For insulated ductwork, doors shall have minimum one (1) inch insulation with sheet metal cover.

E. Firestopping
1. See Section 15050 Basic Materials and Methods.

Section 15900 - HVAC Instrumentation and Controls

A. General
1. Furnish and install complete temperature control for all HVAC systems.
2. Provide new control devices including thermostats, humidistats, damper operators, motors, temperature sensors, staging relays and other related devices for a complete operational system per the operating sequence and industry standards.
3. Mount all controls furnished as accessories to equipment and provide all control wiring required for proper operation. All wiring shall be in conduit per N.E.C. and local code requirements.

B. Sequence of Operation:
1. Rooftop Unit (RTU-1)
   - B.a. Wall mounted thermostat shall sequence cooling. Provide with sub-base to manually select cooling, fan on-off, auto operation.
   - B.b. Unit shall operate in occupied or unoccupied modes based upon BMS sequence as determined by owner.
   - B.c. Unoccupied mode - The supply fan will be off, the outdoor air damper will go to 100% closed position and unit will cycle on with call for cooling.
   - B.d. Occupied mode - The supply fan shall run continuously, the outdoor air damper will open to the minimum air position and the unit will go into the heating or cooling mode, based upon room sensor setpoint temperature.
   - B.e. A low temperature thermostat will de-energize the supply fan and close the outside air damper if the mixed air temperature is sensed at 40 degrees F or colder.
   - B.f. A duct mounted, photoelectric smoke detector (furnished by electrical contractor and installed by mechanical contractor) shall shut down the unit, close the outside air damper and send a signal to the fire alarm panel when activated. Both safeties will require manual reset, and will activate an alarm at the local control panel.
2. Ductless Split System A/C (AC-1)
   - B.a. Wall mounted thermostat shall sequence heating and cooling. Provide with sub-base to manually select heating, cooling, fan on-off, auto operation.
   - B.b. Unit shall operate in occupied or unoccupied modes based upon time clock sequence as determined by owner.
   - B.c. Unoccupied mode - The supply fan will be off, and unit will cycle on with call for heating or cooling.
   - B.d. Occupied mode - The supply fan shall run continuously, based upon room thermostat setpoint temperature.
3. Fan Powered Variable Air Volume Box with Electric Reheat (FPVAV-1)
   - B.a. Space mounted thermostat shall modulate the damper operator on the vav box to maintain a space setpoint temperature.
   - B.b. B.b. The thermostat shall also control the electric reheat coil to maintain the space temperature. The damper operator shall be furnished by the temperature control contractor.
4. Exhaust Fan (EF-1)
   - B.a. Interlock fan with light switch to operate when lights are turned on (interlocking wiring) by electrical contractor.

Section 15950 - Testing, Adjusting and Balancing

A. General
1. After installation, check all equipment and perform start up in accordance with the manufacturer's instructions.
2. All piping shall be tested and free of leaks as required by the local authority having jurisdiction.
3. Work that is scheduled to be concealed or insulated shall remain uncovered until required tests have been completed. If the construction schedule requires, arrange for tests on sections of the system at a time.
4. Balance all systems, calibrate controls, check for proper operation and sequence under all conditions and make all necessary adjustments.
5. Instruct owner in operation of systems and submit operating and maintenance manual for all equipment and systems.
6. Submit air and water balance report from independent AABC or NEBB certified subcontractor for all air and water systems per AABC or NEBB standards.
7. Submit the final certified test and balance report to the Landlord for approval.

B. Balancing, Start Up and Instructions
1. After equipment is placed in operation, systems shall be balanced to within 10% of design flow with report submitted to owner. Balancing shall be performed by an independent AABC or NEBB certified contractor.
2. Contractor shall adjust and/or replace as necessary the fan and motor pulleys and sheaves to achieve the design air flow within 10%.
3. Balance the air systems prior to balancing refrigerant systems.
4. Test, adjust and balance cooling systems during summer season and heating systems during winter season. Balance systems when the outside air conditions are within 5 degrees F wet bulb temperature of the maximum summer design condition and within 10 degrees F dry bulb temperature of the minimum winter design condition.
5. Start up and place all systems in operation and tag all switches and controls with permanent labels.
6. Instruct owner on proper operation and preventative maintenance of system.

MORPHE
#029
THE FLORIDA MALL
8001 SOUTH ORANGE BLOSSOM TRAIL
SUITE #410B
ORLANDO, FL 32809

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lga PARTNERS

NATHANIEL J. KOBB, PE:0078000, EB:0007857; EXPIRES: 02-28-2019

NO.	DATE	DESCRIPTION
1	09/04/2018	PERMIT/BID SET

DATE:	08/20/2018
DRAWN BY:	STAFF
PROJECT NO.:	18125
FILE NAME:	2018-0918 M3.0.dwg

MECHANICAL SPECIFICATIONS

M3.0

GRAPHIC SCALE