

SECTION 20 05 00
GENERAL MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Description of system:
 - 1. Products:
 - a. Access doors, panels, and frames.
 - b. Covers for exposed vertical piping.
 - c. Equipment guards.
 - d. Motors and controls.
 - e. Rain hoods and counter flashings.
 - f. Penetrations.
 - g. Structural steel for supports.
- B. Drawings use and interpretation:
 - 1. Drawings are diagrammatic and indicate general arrangement of systems and equipment, except when specifically dimensioned or detailed.
 - 2. For exact locations of building elements, refer to dimensioned architectural/structural drawings.
 - 3. Field measurements take precedence over dimensioned drawings.
 - 4. Piping and ductwork plans are intended to indicate size, capacity, approximate location, direction and general relationship of one work phase to another, but not exact detail or arrangement.
- C. Installation of systems and equipment:
 - 1. Installation is subject to clarification as indicated in reviewed Shop and Field Coordination Drawings:
 - a. Generally, lay out piping requiring gravity drainage first; then lay out large pipe mains, ductwork and electrical conduit.
 - b. This procedure is intended to promote orderly installation, but not to establish trade precedence.
 - c. Dimensions indicated are limiting dimensions.
 - d. Do not use equipment exceeding dimensions indicated on detail drawings or arrangements that reduce required clearances or exceed specified maximum dimensions.
 - e. In mechanical equipment room corridors and aisle ways, maintain clear head room between floor and underside of ducts, pipes, and equipment to allow for future replacing of equipment and major components (e.g., coils, fans, heat exchangers, pumps).
- D. Description of systems: Provide materials resulting, upon completion, in functioning systems in compliance with performance requirements specified, and modifications resulting from reviewed Shop and Field Coordination Drawings.

1.2 QUALITY ASSURANCE

- A. Perform work in accordance with following codes and standards:
 - 1. Mechanical Code of New York State.
 - 2. Energy Conservation Construction Code of New York State.
 - 3. Plumbing Code of New York State.
 - 4. American Gas Association.
 - 5. National Electrical Code 2002 Edition.

6. National Fire Protection Association.
7. Authorities having jurisdiction.

1.3 PROTECTION

- A. Provide covering and shielding for all stored on-site or installed equipment to protect from damage.
- B. Repair, restore and replace damaged items.
- C. Protect nameplates on motors, pumps and similar equipment.
- D. Protect plumbing fixtures and brass or chromium plated trim, valves and piping from damage.
- E. Keep dirt and debris out of pipes and ducts by capping or plugging open ends:
 1. Keep plug or cap in place until final connections are made.

1.4 JOB CONDITIONS

- A. Cause as little interference or interruption of existing utilities and services as possible:
 1. Schedule work which will cause interference or interruption in advance with BNL, Construction Manager, Architect, authorities having jurisdiction, and affected contractors.
- B. Keep roads clear of materials and debris.
- C. Examine Contract Documents to determine how other work will affect execution of mechanical work.
- D. Examine site and become familiar with existing local conditions affecting work.
- E. Determine and verify locations of existing utilities on or near site.
- F. Make arrangements for and pay for necessary permits, licenses, and inspections.
- G. Record drawings:
 1. Keep a complete set of mechanical drawings in job site office for indicating actual installation of mechanical systems and equipment.
 2. Use this set of drawings for no other purpose.
 3. Where material, equipment, or system components are installed differently from that indicated, indicate such differences clearly and neatly.
 4. At project completion, submit record set of drawings in accordance with Division 1.
- H. Operation and maintenance data: See Division 1.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Acceptable manufacturers:
 1. Motors:
 - a. Base:
 - 1) Reliance Electric.
 - b. Optional:
 - 1) Baldor.
 - 2) Century Electronics; E-Plus.
 - 3) General Electric; Energy Saver.
 - 4) Westinghouse Motor.
- B. Use only prime quality, new materials, apparatus and equipment.

2.2 ACCESS DOORS, PANELS, AND FRAMES

- A. Access doors, panels and frames: See Section 08 31 16:

1. Provide where indicated on Drawings.
2. Where not indicated on Drawings, provide access panels and/or doors at walls, and inaccessible ceilings as required to permit access to equipment, devices and piping requiring service, adjustment, or inspection.
3. Size:
 - a. As required to allow access, inspection, service, and removal of items served.
 - b. Minimum 18 x 18 IN.

2.3 COVERS FOR EXPOSED VERTICAL PIPING

- A. Covers for exposed vertical piping:
 1. 18 GA stainless steel (type 302) with No.4 finish.
 2. Fasten seams and joints with stainless steel pop rivets.

2.4 EQUIPMENT GUARDS

- A. Equipment guards:
 1. Use suitable structural frames with minimum 12 GA, 3/4 IN galvanized mesh, or expanded metal mesh.
 2. Attach to equipment by removable clips and bolts with wing nuts, or other approved connectors.
 3. At belts, provide opening for measuring RPMs. End of shaft shall be protected from accidental contact.
 4. Provide at belts, couplings, moving machinery and equipment in accordance with OSHA.
 5. Design for easy access to belts and other items requiring replacement.

2.5 MOTORS AND CONTROLS

- A. Motors:
 1. Provide motors indicated in Division 23.
 2. Motors shall be ball or roller bearing type, high efficiency type, and have starting and running characteristics consistent with torque and speed requirements of driven machine:
 - a. All motors 25 HP and larger shall have greasable bearings.
 3. Motor efficiency:
 - a. NEMA Standard MG1-12.53a.
 - b. Indicate full load efficiency on each nameplate.
 - c. Minimum motor efficiency to comply with ASHRAE 90.1-2001, Table 10.2.
 4. Use motors rated in accordance with NEMA performance standards to carry full nameplate load continuously at maximum temperature rise of 40 degC above ambient with service factor of 1.15.
 5. Motor powers as scheduled.
 6. Do not allow power requirements of driven machine to exceed nominal nameplate rating of motor furnished.
 7. Do not include service factor when selecting motor power.
 8. Motors 1/2 HP and over: 460/3/60.
 9. Motors less than 1/2 HP: 115/1/60.
 10. Provide for items which require electric drive.
 11. Motors for certain pieces of equipment will be controlled by adjustable frequency drives (AFD's). These motors shall be designed for inverter-duty, have 1600 volt insulation for 460 V motors and double shielded bearings:
 - a. Meet NEMA MG1-31.
 - b. Provide grounding system for protection from static and AFD induced currents.
 12. Where equipment with motors will be driven by adjustable frequency drives (AFD's), provide motors that are compatible with AFD's.

- B. Motor controls and wiring for controls:
 - 1. Provide complete installation of controls and wiring for controls for Division 20 through 25 packaged/pre-wired equipment:
 - a. Include line voltage controls, low voltage controls, control switches, starters, disconnects, conduit, and wiring.
 - b. Locate disconnects on outside of equipment enclosures or guards.
 - 2. Starters, disconnects, conduit, and wiring furnished under Division 20 through 25 shall comply with applicable Division 26 specifications.
 - 3. Where equipment is specified with packaged/pre-wired controls, but is furnished instead with loosely shipped components that require field wiring, coordinate complete installation and assume costs.

2.6 RAIN HOODS AND COUNTER FLASHINGS

- A. Rain hoods and counter flashings not exposed to view:
 - 1. Stainless steel: Minimum 20 GA.
 - 2. Sheet copper: Minimum 24 OZ/SF.
- B. Rain hoods and counterflashings exposed to view:
 - 1. Material specified in Section 07 62 00.

2.7 PENETRATIONS

- A. Maintain fire and smoke ratings where mechanical items penetrate fire and fire/smoke rated building elements.

2.8 STRUCTURAL STEEL FOR SUPPORTS

- A. Structural steel for supports: ASTM-A36:
 - 1. Galvanize members installed in fan plenums, areas of high humidity and condensation, and outside.
 - 2. Furnish other members with shop coat of rust inhibiting primer.
 - 3. Shop fabricate for field assembly using bolts.
 - 4. Minimize field welding.
 - 5. Retouch primer after field welding.

PART 3 - EXECUTION

3.1 GENERAL

- A. When changes in location of work are required, obtain approval of BNL before making change:
 - 1. Make changes at no extra cost.
- B. Provide necessary offsets and crossovers in piping and ductwork, whether indicated or not.
- C. Install piping and ductwork parallel to walls and vertically plumb.
- D. Do not change indicated sizes without approval of BNL.
- E. Electrical equipment:
 - 1. Install no ductwork or piping in or above communication equipment rooms, electrical equipment rooms and closets.
 - 2. Install no ductwork or piping above panelboards, switchboards, motor control centers, or motor control panels.
 - 3. Floor drains may be installed in floor of electrical equipment rooms.
- F. In elevator machine rooms, install no piping except floor drains and fire protection piping that specifically serves the room.

- G. Roof penetrations:
 - 1. Make penetrations through roofs prior to installation of roofing.
 - 2. For penetrations required after installation of roofing:
 - a. In built up roofing (BUR), provide curbs, cants and counter flashings.
 - b. In elastic sheet roofing (ESR), arrange and pay for flashing work by authorized roofer; provide counter flashings.
 - 3. Repair and replace roof construction which is damaged by this work in manner which will not nullify roof warranty.

3.2 LOCATING SERVICEABLE DEVICES

- A. Install devices that may require adjustment, service, or maintenance in normally accessible locations, or provide flush-mounted access doors:
 - 1. Such devices include but are not limited to equipment, valves, filters, motors, drives, air terminal units, compressors, unions, traps, strainers, thermometers, gauges, switches, measurement devices, coils, detectors, dampers, sensors, monitors, backflow prevention devices, water-hammer arresters, drains, floor sinks, cleanouts, test stations, signal devices, sprinkler, air vents, expansion joints, and system drains.
 - 2. Arrange piping, conduit, ducts, and related work to facilitate maintenance.
 - 3. Relocate items which interfere with access.

3.3 CUTTING AND PATCHING

- A. Perform or pay for cutting, fitting, repairing, patching and finishing of work of other sections where it is necessary to disturb such work to permit installation of mechanical work.
- B. Avoid cutting, where possible, by setting sleeves or frames, and by requesting openings in advance:
 - 1. Coordinate locations with work of other sections.
- C. Before cutting of structural elements, obtain written approval of BNL:
 - 1. Use only approved methods.
 - 2. Neatly cut holes as small as possible to admit work.
 - 3. Do not weaken walls or floors; locate holes in concrete to miss structural sections.
- D. Locate openings and sleeves to permit neat installation of piping, ductwork and equipment.
- E. Do not remove or damage fireproofing materials:
 - 1. Install hangers, inserts, supports, and anchors prior to installation of fireproofing.
 - 2. Repair or replace fireproofing removed or damaged, at no extra cost.

3.4 EXCAVATING AND BACKFILLING

- A. See Section 31 23 33.

3.5 INSTALLATION OF EQUIPMENT

- A. Install equipment in accordance with manufacturer's recommendations and as specified.
- B. Provide necessary anchoring devices and supports:
 - 1. Use structural supports suitable for equipment, or as indicated.
 - 2. Check loadings and dimensions of equipment with shop drawings.
 - 3. Do not cut or weld to building structural members.
 - 4. Provide equipment supports even though not detailed on architectural and structural drawings.
- C. Verify that equipment will fit support layouts indicated:
 - 1. Where substitute equipment is used, revise indicated supports to fit.
- D. Arrange for necessary openings to allow entry of equipment:
 - 1. Where equipment cannot be installed as structure is being erected, provide and arrange for openings, boxes, sleeves or other devices to allow later installation.

- E. Install rain hoods and metal counter flashings as indicated, and to make penetrations of mechanical work through walls and roofs water and weathertight:
 - 1. Furnish clamps, waterproofing material and labor.
 - 2. Where metal flashings are applied over concrete, paint concrete with 1/8 IN of mastic cement first.
 - 3. Set flashing in mastic cement, watertight.
- F. Provide concrete foundations (isolation pads) or housekeeping pads for mechanical equipment as follows unless indicated otherwise:
 - 1. Install 3-1/2 IN high concrete housekeeping pads. Outside dimension of pad shall be at least 4 IN larger in all directions than base of equipment.
 - 2. Use 3,000 PSI concrete.
 - 3. Reinforce with No.4 bars, 12 IN OC each way, with short No.4 dowels into floor at 24 IN OC each way, with 6 IN minimum penetration into floor.
 - 4. Chamfer top edges 3/4 IN.
 - 5. Make faces smooth.
 - 6. Set anchor bolts for equipment.
- G. Provide concrete pads for air handling units. See mechanical and structural drawings.

3.6 INSTALLATION OF EQUIPMENT FURNISHED BY BNL OR OTHER DIVISIONS

- A. Receive, uncrate and set in place mechanical equipment furnished by BNL or other Divisions.
- B. Provide rough-in and final connections to equipment requiring mechanical services:
 - 1. See Section 25 50 00.
 - 2. For existing equipment: Obtain rough-in data from inspection of same.
 - 3. For equipment furnished by BNL or other divisions: Obtain rough-in data from final shop drawings.
- C. Install loosely shipped fittings, valves, and other items furnished as integral part of equipment.

3.7 PAINTING

- A. See Section 09 91 23.

3.8 FIELD QUALITY CONTROL

- A. Perform indicated tests to demonstrate workmanship, operation, and performance:
 - 1. Conduct tests in presence of BNL and, if required, inspectors of agencies having jurisdiction.
 - 2. Arrange date of tests in advance with BNL, manufacturer and installer.
 - 3. Give inspectors minimum of 24 hours notice.
 - 4. Furnish or arrange for use of electrical energy, steam or water required for tests.
 - 5. Furnish materials required for test.
- B. Repair or replace equipment and systems found inoperative or defective and retest:
 - 1. If equipment or system fails retest, replace it with products conforming to Contract Documents.
 - 2. Continue remedial measures and retests until satisfactory results are obtained.
- C. Test equipment and systems for each item, unless otherwise recommended by manufacturer:
 - 1. Tests specified in Section 20 08 00, Testing and Balancing need not be duplicated under other sections.

3.9 INDOOR AIR QUALITY

- A. Develop and implement an Indoor Air Quality Management plan for the construction and pre-occupancy phases of the building as follows:

1. If air handlers must be used during construction, filtration media with a Minimum Efficiency Reporting Value of 8 in accordance with ASHRAE 52.2-1999 must be provided at each return register.
2. Replace all filtration media immediately prior to occupancy. Filtration media shall have a Minimum Efficiency Reporting Value of 13 in accordance with ASHRAE 52.2-1999.
3. After construction ends and prior to occupancy, conduct a minimum of two-week building flush-out utilizing 100% outside air.
4. After the flush-out, replace all AHU filter media in accordance with the requirements of Section 23 73 29.

3.10 ADJUST AND CLEAN

- A. Inspect equipment and put in satisfactory working order.
- B. Clean exposed and concealed items: See Cleaning (Section 01 74 23):
 1. Clean air surfaces of coils, fans (including fan wheels and motors), air handler plenums and air filter frames.
 2. Clean floor drains, cleanouts, and plumbing fixtures.
 3. Clean specialties such as traps and strainers and equipment surfaces such as pumps, motors, boilers, chillers, etc.
 4. Clean finned elements of fin tube radiation with compressed air.
 5. Clean piping of tags, debris and other construction materials before insulating or painting.
 6. Wipe all ducts and air plenums clean inside.

3.11 COMMISSIONING

- A. See Section 23 90 00.

END OF SECTION

